

**Utilizing the Network Effect on Open Innovation: An Exploration  
of Japanese Firms Collaborations with Foreign Partners**

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## Abstract

In recent years, open innovation has been regarded as an important way of creating innovation for firms. Open innovation is a way for Japanese firms to maintain a competitive advantage. Drawing on the notion of Network Effect, in order to produce more innovative products, it is said that cooperation with foreign partners with different ideas and technologies is necessary rather than collaboration among Japanese firms. However, Japanese firms have not successfully collaborated with foreign partners, and no research has been focused on both side of focal and partners. In order to clarify the problem, we conducted an exploratory survey for both Japanese firms and foreign firms. As a result of collecting respondents of 122 Japanese firms and 126 foreign firms for hypothesis verification, we conclude that a number of important factors exist for Japanese firms to implement open innovation with foreign firms as partners. The results will provide valuable suggestions to Japanese firms trying to implement open innovation with foreign firms.

**Keywords:** Innovation, Open Innovation, Network Effect  
**7,924words**

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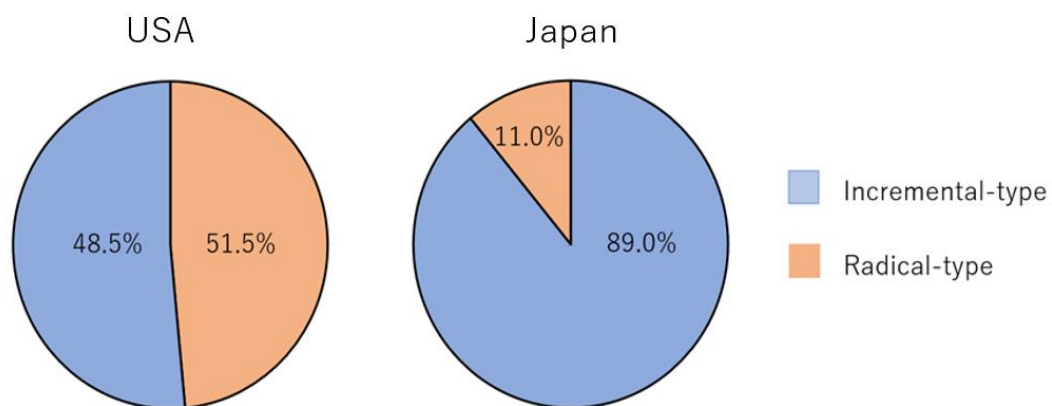
## 1. INTRODUCTION

How can a firm maintain its competitive advantage? Obviously, it is necessary to create innovation. The objective our research is to find out how Japanese firms can activate their innovation activity through open innovation with foreign partners.

Innovation is classified as either radical or incremental innovation (Christensen, 1997). Ito (2010) define as radical innovation that has a significant impact on a market and on the economic activity of firms in that market, and incremental innovation concerns an existing product, service, process, organization or method whose performance has been significantly enhanced or upgraded. Schumpeter's view radical innovation creates major disruptive changes, whereas incremental innovation continuously advances the process of change (Schumpeter, 1942). According to Iwao *et al.* (2017), radical and incremental innovation are required alternately to improve the firm's performance. However, incremental innovation account for the majority of the outcome of innovation in Japan. "Business R&D and Innovation Survey 2009" by United States Census Bureau (USCB) and the National Science and Technology Foundation (NSTF) shows that comparing the "quality of innovation" between Japanese and U.S. firms. U.S. firms created both innovations equality, whereas Japanese firms created innovations are imbalanced. The Japanese firms created radical innovation only 11% (Figure 1). Therefore, it is the

problem of the Japanese firms that radical innovation is relatively less.

Figure 1: Comparing the “quality of innovation” between Japan and U.S.



Source: Based on “Business R&D and Innovation Survey 2009” by USCB and NSTF

Why Japanese firms have not been able to create radical innovation? In recent years, the progress of globalization and information technology (IT) in the economy is bringing about the intensification of international competition and the increasingly short life-cycle of products. Under these circumstances, Ministry of Economy (2016) said that the form innovation takes has been shifting from that of “closed innovation” based on vertical integration in which the same firm completes the entire process from R&D to commercialization to that of “open innovation” in which the process of R&D or commercialization is carried out by using external technology and other resources.

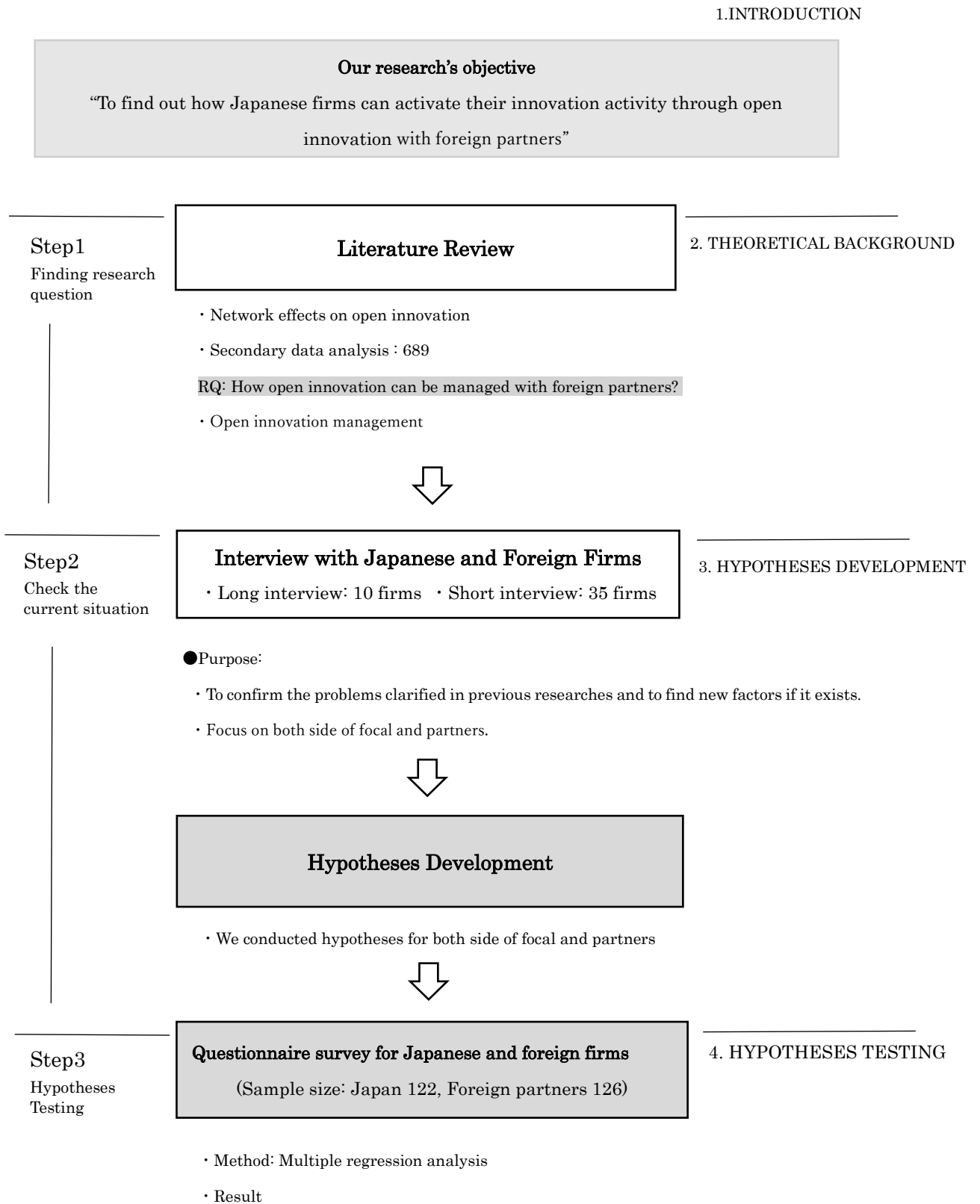
Japanese firm's approach to open innovation have activated compared to before, however, it has not been going well (Ministry of Economy, 2017). According to the World Economic Forum's (WEF) "The Global Competitiveness Report", the firm's competitiveness of each country is represented based on the Global Competitiveness Index, and one of which is "capacity for innovation". Japan moved down in this ranking from first place in 2012 to twenty-one place in 2017. Because, Japan is lacking ability for pursuing open innovation. Moreover, that indicating Japan itself become to loose the international competitiveness (Cabinet Office, 2017).

Partners are important because of open innovation is made through cooperation with others. In other words, open innovation can be said to be based on utilizing the network effect. A firm needs to collaborate with partners who has different ideas or technologies. How a firm can bridge to a different network is the key for success. According to Yoshimura (2006) and Ushimaru (2015), the quality of innovation in a firm depends on its partner. In other words, who you work with is the critical question for pursuing radical innovation through open innovation.

The objective of this study is to propose ways for Japanese firms to create radical innovation through open innovation with foreign partners. Collaboration with foreign partners is a success factor to create radical innovation. We review previous studies

about open innovation through network optimization and how open innovation can be managed with foreign partners in Chapter 2 and 3. Then, we confirmed it by Japanese and foreign firms' interview. Figure 2 is our research's flow.

Figure 2: Our research flow



Source: Authors



## 2. THEORETICAL BACKGROUND

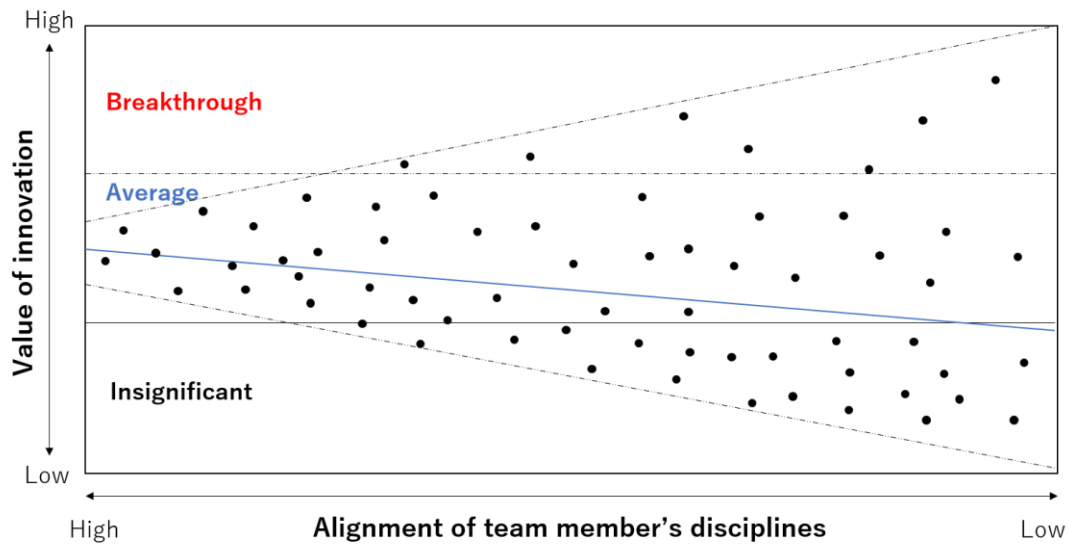
In this section, first, we explain about network effect, and why it is important for open innovation. Also, we analyzed articles to grasp the current arguments on open innovation management of Japanese firms and we explore a research question. Second, we review previous studies about how open innovation can be managed with foreign partners.

### 2-1. Network Effects on Open Innovation

Why foreign partners are so important to the open innovation of Japanese firms? Firms build a relationship with other firms on open innovation. This relationship between firms and firms is said to be network. According to Adler and Kwon (2002), effective network is an important operating resource for firms and businesses. Polanyi *et al.* (1957) said that economic transactions are based on social networks and are embedded into the existence of society. Granovetter (1985) proposed the “relational embeddedness theory” about network. “Relational embeddedness” shows the degree of ties between the network constituting members. People who connect weak ties have the advantage of easy access to different knowledge, and people who connect strong ties have the advantage of easy access to reliable knowledge (Coleman, 1988). This theory adapts to various social actors. Uzzi (1996,1997) only focused on the relationship between firms. Subsequently, Dicken

*et al.* (2001) and Yeung (2005) built them into the inter-firm network. Usui (2013) explained that the importance of a network structures based on Burt (1992) effects on new market-based knowledge developments and acquisitions in global markets. According to Usui (2013:96), “Burt (1992) indicated that the spread of information about new ideas and opportunities must come through the weak or strong ties that connect actors in separate cliques. No matter how numerous its members are and how valuable social capital they have generated, one clique is only one source of knowledge, because actors connected to one another tend to know about the same things at almost the same time.” According to Wakabayashi (2015), such weak ties like bridging different cliques together is likely to create radical innovation. On the other hand, “bonding network” is to collaborate companies with close relations. Such strong ties is likely to create incremental innovation. Fleming (2004) indicated that what the outcomes of innovation could be created through the ties between members (figure 3).

Figure 3: Outcome of innovation



Source: Based on Fleming (2004)

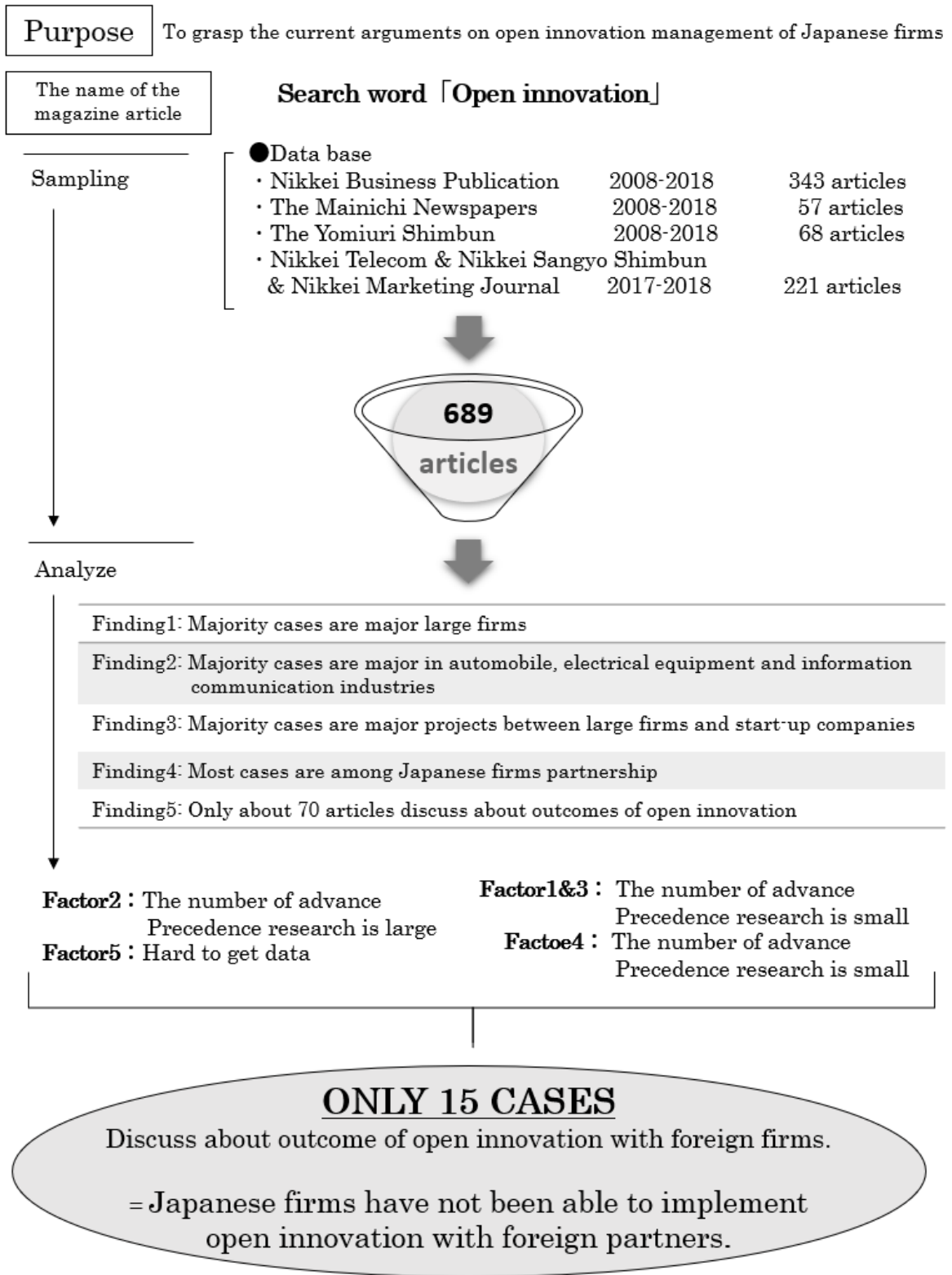
Each dot represents outcome of innovation. The vertical axis represents the value of innovation, and the horizontal axis represents the alignment of team member's discipline. The value of innovation is "breakthrough", "average", "insignificant" in the order of the highest innovative, which is similar significance to the quality of innovation in this study. Therefore, we show high value indicates "radical innovation", the average is "incremental innovation", and low value indicates "failure". Fleming (2004) stated that when a creative team is made up of people from very similar disciplines, the average value of its innovations will be high, but it will be unlikely to achieve a breakthrough. On the other hand, a group of people from very diverse disciplines is more likely to

achieve breakthroughs but will also produce many more low value innovations (2004: 22). The alignment of team member's discipline refers to the degree of strength of ties between firms. Members with strong ties are "homophily", and members with weak ties are "heterophily" (Yoshimura, 2006). As stated above, collaborate with heterophilic members is effective for creating radical innovation. However, Japanese firms have too high collaborate rate with homophilic members such as Japanese firms in the same industries. Therefore, even if there is a risk, Japanese firms need to increase collaboration with heterophilic members such as foreign partners.

## 2-2. What is Reality?

In this section, we analyzed articles on the internet. The purpose of the secondary data analysis is to grasp the current arguments on open innovation management of Japanese firms. We analyzed 689 articles and revealed five trends of Japanese firms. There were 70 cases of open innovation implementation. Among them, there were only 15 cases of collaborations with foreign partners. Survey methods and analysis results are described in detail in Figure 4.

Figure 4: Secondary data base analysis flow



Source: Authors

We clarified that Japanese firms have not been able to collaborate with foreign partners.

Therefore, we are going to explore this problem by literatures review and firms interview.

The following is research question.

**RQ: How Japanese firm manage open innovation successfully with foreign partners?**

### 2-3. Open Innovation Management

Next, what kind of problems are there when implementing open innovation with foreign partners? We found two factors. First, Jasimuddin and Naqshbandi (2017) indicated that the mediating role knowledge-management capability in the linkage between leadership and open innovation, using data collected from 172 subsidiaries of multinational enterprises based in France. He explained that higher levels of leadership can lead to enhanced knowledge-management capability and improved open innovation outcomes. That is, leadership has a direct, positive impact on knowledge-management capability and open innovation (Jasimuddin and Naqshbandi 2017: 1). Takagaki (2012) studied the recognition patterns of leaders who choose strategies in a changing business environment. According to this case study, firms that are representatives of global firms (Canon, Sony, Uniqlo, Samsung, Toshiba etc.) have a synergistic relationship between organization knowledge management and innovation in the process of becoming a global

scale firm. The role of the leader is important for this process. Leaders' ingenuity and knowledge management bring cost reduction and competitive advantage, and firms grow on a global scale. Dowson and Kitagawa (2016) links the relationship between knowledge and innovation to network formation in the case study of the digital media industry in London. His theory is needing diversity and controlling of knowledge for network formation in global scale to creating innovation.

Next, Robertson *et al.* (2011) said that absorption ability that farms absorb and utilize the management resources of other farms will influence the creation of incremental-type. To the contrary, according to Zhou *et al.* (2017), adaptive ability is important to create radical-type as an example of innovation management in China's industrial technology. According to Nishino (2010), adaptive ability is to adapt flexibly in vigorous environment. In particular, emerging-market companies are developing new proprietary systems by taking advantage of their adaptive capacity contrary to innovations of industrialized countries in open innovation (Amuro,2015). Shimizu (2001) said that management style adaptability is important for promotion of innovation. Definition of management style adaptability is the ability of superiors to adapt management modalities to the specific requirements of given situation in communication with internal and external organizations. It starts from understanding forms of communication with internal and

external organizations, personal profiles, and strategic systems etc. and that it will lead to adaptation among companies. Based on the problem that has been dealt with over the years such as local adaptation for global cooperation, Yves *et al.* (2001) conduct multivariate data analysis and discuss the adaptability and globalization of enterprises. In addition, Nishino (2010) and Kodama (2012) stated that the ability to overcome the crisis due to industry change and environmental change had influence on corporate growth for Hong Kong firms and Chinese venture firms. The ability to overcome is to adapt to markets and firms that change with various external factors. They said that it had a positive influence on innovation ability.

Therefore, we found that (1) knowledge management ability, (2) adaptive capacity are key factors that promote implementing open innovation with foreign partners.

### 3. HYPOTHESES DEVELOPMENT

In this section, we conducted explorative field work and developed our hypotheses based on previous studies and the result of interviews.

#### 3-1. Interview with Japanese and Foreign Firms

The objective of interview is to confirm the problems clarified in previous studies and



to find new factors if it exists. We interviewed Japanese and foreign firms. Because, the previous research only focused on the problems of focal firm but did not focus on both side of focal and partners. From cases study, only 15 firms have implemented open innovation with foreign partners. Therefore, we conducted explorative field work. We participated in the event of open innovation, where we short interviewed for 15 to 30 minutes twenty-two Japanese firms and thirteen foreign firms that are interested in open innovation. Among the firms that we conducted a short interview, we interviewed for 60 to 90 minutes seven Japanese firms that have implemented open innovation to hear detail stories. In addition, we interviewed for 60 to 90 minutes with three intermediary firms in order to grasp the current argument of relationship between firms and firms when open innovation implement. Figure 5 is our interview's flow. We described more details about interview in appendix 1 and 2. Open innovation needs to find a partner from among many unspecified candidate firms (Yoneyama *et al.* 2016). Therefore, we do not narrow down the industry and the firm size.

Figure 5: Interviews flow

**Short time interview (15~30min)**

	Japanese firms	Foreign firms
Firms details	<b>Interview : 22</b> <b>【Firms size】</b> · Major firms 27% · Small & medium sized firms 18% · Start-up company 55%  <b>【Industry types】</b> · Information communication 50% · Manufacturing 32% · Service 14% · Wholesale 4%	<b>Interview : 13</b> <b>【Firms size】</b> · Major firms 23% · Start-up company 77%  <b>【Industry types】</b> · Information communication 61% · Manufacturing 23% · Service 16%



● Among the firms that we conducted the short interviews, we interviewed Japanese firms that have implemented open innovation to hear detail stories.

**Long time interview (60~90min)**

	Japanese firms
Answer content	<b>Interview : 7</b> (a) Aggressive collaboration and risk of information leaks. (b) Worry about the decision to be able to keep up early. (c) Differences in business practices and legal regulations. (d) Insufficient approval of the management layer inside the company. (e) Prevalence of NIH syndrome. (f) The importance of the role of mediation. (g) Insufficient language and communication skills. (h) We have not been able to break away from the subjectivity of old companies. (i) Inadequate understanding of international markets. (j) The network with overseas companies has not been built enough. (k) No human resources can lead inside the company.

**Interview with Intermediary(60~90min)**

● Purpose: to grasp the current argument of relationship between firms and firms when open innovation implement.

	Intermediary firms
Answer content	<b>Interview : 3</b> (a) The role of intermediary companies is important for smooth cooperation between the two parties. (b) the agency itself is immature and not adequately supported. (c) There are a lot of mediation between domestic companies.

Source: Authors

From the previous studies and interviews results, there were five problems when implementing open innovation with foreign partners (figure 6).

Figure 6: Some important factors for managing open innovation with foreign partners

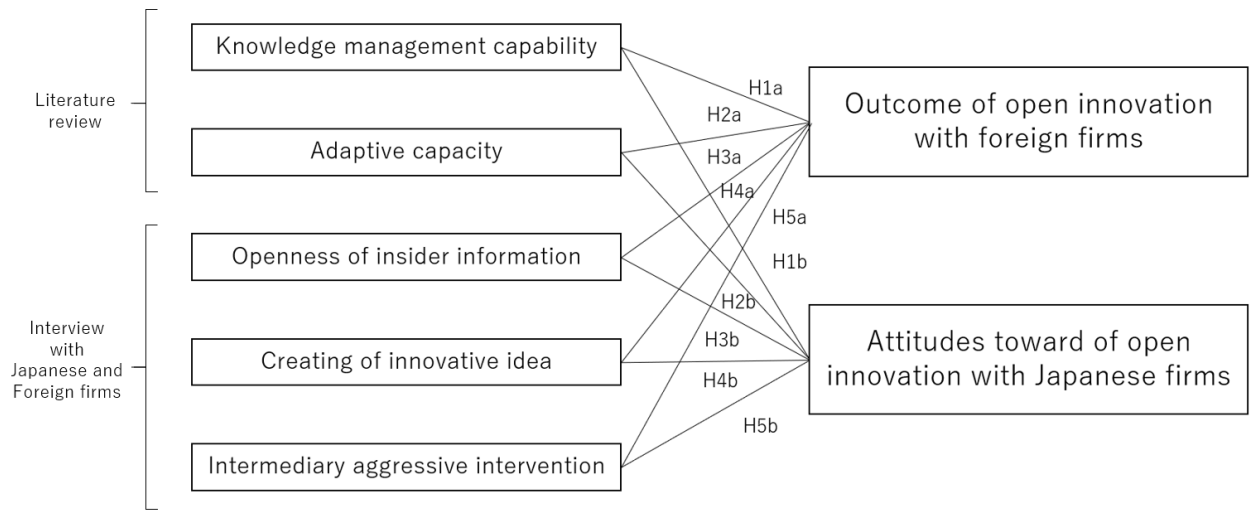
<b>Internal factors</b>	<input type="radio"/> Insufficient organization. <input type="radio"/> Risk avoidance tendencies. <input type="radio"/> The difficulty of creating new ideas.
<b>Internal and External factor</b>	<input type="radio"/> Not adapted to external resources.
<b>External factor</b>	<input type="radio"/> The importance of existence of intermediary firms.

Source: Authors

### 3-2. Hypotheses

Our purpose of this study is to propose ways for Japanese firms to create radical innovation through open innovation with foreign partners. Therefore, we will construct hypotheses both side of Japanese firms and foreign partners. From issue (figure 6) are clarified by previous studies and interviews. Hypotheses that affects “the outcome of open innovation with foreign partners” for Japanese firms, and “attitudes toward open innovation with Japanese firms” for potential foreign partners.

Figure 7: Conceptual framework for H1 to 5



Source: Authors

Knowledge management capability is effective for drastic improvement of organization (Jasimuddin and Naqshbandi 2017). According to Teigland et al. (2000), it is necessary to form a common corporate culture for borderless R&D. For that, it is important that leaders of each organization share information. In the interview, a manager from firm A said, “the spread of the old-fashioned values of the upper management is impeding attitude toward open innovation with foreign firms,” a manager from start-up company B said, “start-up companies are short of funds and talent, so there is no leader with knowledge and experience about open innovation. The insufficiency of organizational structure is a problem,” a manager from firm C said, “it takes time to improve the organizational structure. It has too many disadvantages to improve it,” and a manager

from Taiwanese firm D said, “I would like to collaborate with Japanese firms that can make early decision.” Here, we constructed H1a and H1b.

**H1a (for Japanese firms): Knowledge management capability has a positive impact on the outcome of open innovation with foreign partners.**

**H1b (for potential foreign partners): Knowledge management capability has a positive impact on attitude toward open innovation with Japanese firms.**

According to Izawa (2011), Japanese firms need a strategy to adapt to the global market.

In the interview, a manager from start-up company E said, “start-up companies have insufficient organizational structure. Therefore, there is a tendency that not to be able to adapt to others,” a manager from large firm F said, “even large firms, it is difficult to match the core of management resources each firm. It takes time and cost to do it,” a manager from foreign firm G said, “the low adaptive capacity of Japanese firms is due to their strong self-sufficiency.” From here, we constructed H2a and H2b.

**H2a: Adaptive capacity has a positive impact on the outcome of open innovation with foreign partners.**

**H2b: Adaptive capacity has a positive impact on attitude toward open innovation with Japanese firms.**

Open innovation is a kind of risk management. The Innovator’s Dilemma is to avoid the

entry and cooperation of other firms that could threaten the business of the firm in the future (Christensen, 1997). Hibara (2018) stated that Japanese firms tend to concentrate on improving their business rather than bringing about new business in cooperation with others because of The Innovator's Dilemma. Also, avoiding the risk of information leak affects the degree of openness on open innovation. According to Iwakado *et al.* (2016), Japanese firms are implementing open innovation with low openness of insider information. Japanese firm tend to have self-sufficiency and heresy elimination. In the interview, a manager from firm H said, "the valance of the openness of insider information is important," a manager from large firm I said, "we are careful with the contract with foreign firms. We think that collaborate with foreign firms is risky", a manager from firm J said, "in the case of cooperation with foreign firms, we are very afraid of theft of technology and information leakage", and a manager from foreign firm K said, "Japanese firms should lower cooperation hurdles. We would like more disclosure of insider information". From here, we constructed H3a and H3b.

**H3a: Openness of insider information has a positive impact on the outcome of open innovation with foreign firms.**

**H3b: Openness of insider information has a positive impact on attitude toward open innovation with Japanese firms.**

According to Takeyama (2011), open innovation is expected to create innovative ideas. Kimura (2015) stated that start-up companies are expected to play a role in bringing new innovations together with ideas from different fields. In the interview, a manager from foreign firm L said, “Japanese firms have high technical capabilities and are reliable, but I feel that creation of innovative idea is scarce compared to other countries”. From here, we constructed H4a and H4b.

**H4a: Creation of newer idea orientation has a positive impact on the outcome of open innovation with foreign partners.**

**H4b: Creation of newer idea orientation has a positive impact on attitude toward open innovation with Japanese firms.**

Our interview survey shows that the majority of Japanese firms, particularly the start-up companies, were seeking active intervention by intermediaries. Open innovation does not go well if other firms have problems even if the firms improves organization. Also, there are problems related to legal regulations such as intellectual property and shifts in understanding of the international market in borderless cooperation. Therefore, the presence of intermediaries is regarded as important. On the other hand, a manager from intermediary firm M said, “our firm has insufficient lack of ability to mediate open innovation and funds power. We would like to grow our firm from now on”, a manager

from intermediary firm N said, “our firm is only supporting to match up firms and firms.

We have not been able to mediate afterward.” From here, we constructed H5a and H5b.

**H5a: Intermediary aggressive intervention has a positive impact on the outcome of open innovation with foreign partners.**

**H5b: Intermediary aggressive intervention has a positive impact on attitude toward open innovation with Japanese firms.**

Based on the hypotheses above, quantitative surveys will be conducted on both Japanese firms and foreign partners and verified.

#### 4. HYPOTHESES TESTING

In this section, we conducted a questionnaire survey to Japanese and foreign firms. This was done for the purpose of obtaining quantitative data for hypotheses verification.

##### 4-1. Procedure and Sampling

We distributed questionnaires at the events of open innovation, sent e-mails, and used SNS (Facebook, Twitter, WeChat) from October 9, 2018 to November 2, 2018 to the questionnaire subject using the online web questionnaire tool (Google Form). Samples were targeted at the employees of Japanese and foreign firms who are engaged in



innovation and R&D. We do not narrow down the industry, the firm size and the country.

Figure 8: Detail of samples

	<b>Japanese Firms</b>	<b>Foreign Firms</b>
Period	2018/10/9~11/02	2018/10/09~11/02
Unit of analysis	Business unit	Individual
Sample size	122	126
Detail of samples	<ul style="list-style-type: none"> <li>● Experiences of open innovation with foreign firms <ul style="list-style-type: none"> <li>• Yes: 63.9 % 【N=78】</li> <li>• No: 36.1% 【N=44】</li> </ul> </li> <li>● Firm age <ul style="list-style-type: none"> <li>• ~4 【20.5%】</li> <li>• 5~14 【52.5%】</li> <li>• 14~29 【10.7%】</li> <li>• 30~ 【6.4%】</li> </ul> </li> <li>● Number of employees <ul style="list-style-type: none"> <li>• ~9 【13.2%】</li> <li>• 10~99 【58.7%】</li> <li>• 100~299 【11.6%】</li> <li>• 300~ 【16.5%】</li> </ul> </li> <li>● Industry <ul style="list-style-type: none"> <li>• Manufacturing 【27.6%】</li> <li>• Service 【25.0%】</li> <li>• Information and communication 【47.3%】</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>● Experiences of open innovation with Japanese firms <ul style="list-style-type: none"> <li>• Yes: 54 % 【N=68】</li> <li>• No: 46% 【N=58】</li> </ul> </li> <li>● Firm age <ul style="list-style-type: none"> <li>• ~4 【22.2%】</li> <li>• 5~14 【53.2%】</li> <li>• 14~29 【21.4%】</li> <li>• 30~ 【3.2%】</li> </ul> </li> <li>● Number of employees <ul style="list-style-type: none"> <li>• ~9 【23.0%】</li> <li>• 10~99 【50.0%】</li> <li>• 100~299 【11.9%】</li> <li>• 300~ 【15.1%】</li> </ul> </li> <li>● Industry <ul style="list-style-type: none"> <li>• Manufacturing 【20.0%】</li> <li>• Service 【28.0%】</li> <li>• Information and communication 【52.0%】</li> </ul> </li> <li>● Country <ul style="list-style-type: none"> <li>• Asia 【77.6%】</li> <li>• Europe 【15.7%】</li> <li>• North America 【5.7%】</li> </ul> </li> </ul>

Source: Authors

Our questionnaire paper based on our 5 hypotheses that depend on the semi-structured interview and literatures. We set total of 20 items. First, we provided 2 choice answers of Yes or No for Japanese firms and foreign firms that whether they have experience of open innovation with Japanese firms or foreign firms. In the case of Yes, answered the following questions based on the experience of open innovation, and in the case of No, answered the following questions based on assuming that they will be implement open innovation. The answer items are set to 5 grades from 1 (strongly disagree) to 5 (strongly agree). The remaining five questions are about firm samples.

#### 4-2. Data analysis and result

We set total of 20 question items that based on hypothesis. Each question item was divided into five variables by factor analysis. Reliability tests were conducted to verify the reliability among question items, cronbach's alpha was an appropriate value. And reliability was confirmed. Then, it was confirmed that each variable is independent from the value of VIF (Range for 1~6 variable).

In this research, we examine using multiple linear regression. Multiple linear regression is method the dependent variable using a plurality of independent variables.

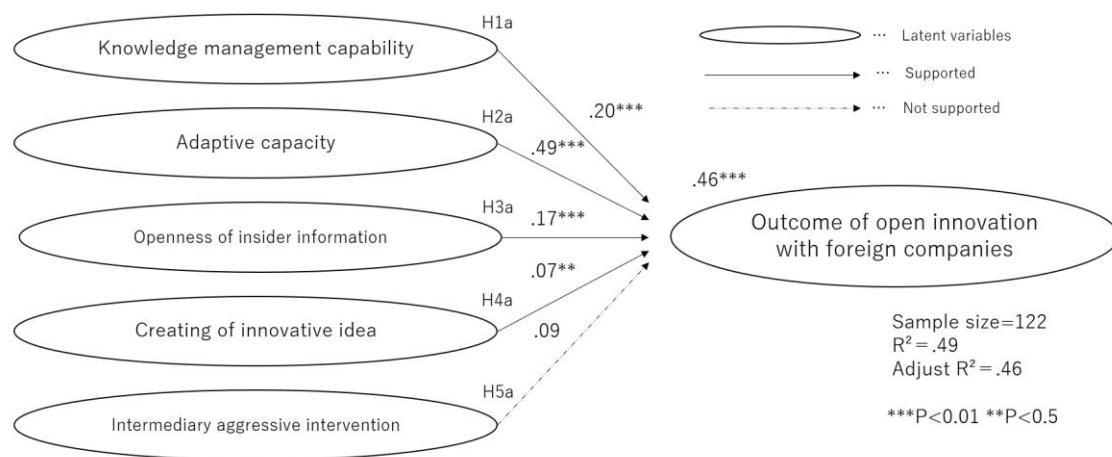
We quantitatively analyze a causal relationship that the five independent variables influence dependent variables for Japanese firms and foreign firms.

First, it is analysis of Japanese firms. Standardize coefficients (R-squares) which five explanatory variables give to a dependent variable was 0.46. When standardization estimates were seen, we have shown that the factor of knowledge management capability recorded 0.2, the factor of Adaptive capacity recorded 0.49, the factor of Openness of insider information recorded 0.17, the factor of Creation of newer idea orientation recorded 0.007 and the factor of Intermediary aggressive intervention recorded 0.009.

About the P-Value indicating the significance probability, Knowledge management capability recorded 0.001, Adaptive capacity recorded 0.00, Openness of insider information recorded 0.003, Creation of newer idea orientation recorded 0.032 and Intermediary aggressive intervention recorded 0.23 (\*\*P<0.05, \*\*\*P<0.01).

Figure 9: Result of hypothetical model for Japanese firms

Model		Unstandardized coefficients		Standardized coefficients	Sig.	Collinearity Statistics	
		B	Std. Error	Beta		Tolerance	VIF
1	(Constant)	.600	.305		.004		
	Knowledge management capability	.150	.059	.203	.001	.689	1.451
	Adaptive capacity	.474	.073	.485	.000	.806	1.242
	Openness of insider information	.130	.058	.165	.003	.829	1.206
	Creating of innovative idea	.060	.061	.069	.032	.895	1.117
	Intermediary aggressive intervention	.057	.047	.086	.230	.898	1,114



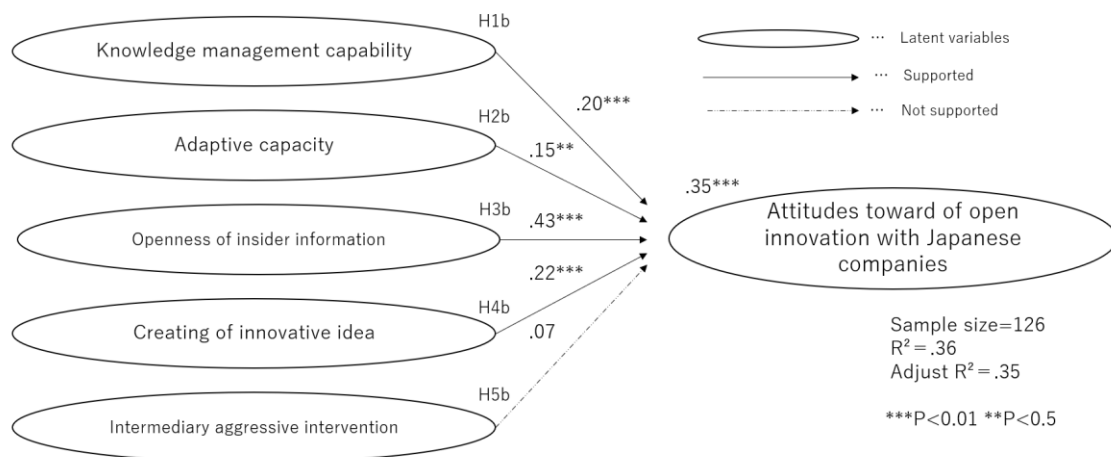
Source: Authors

Next, it is analysis of partner Foreign firms. We set total of 20 question items that based on hypothesis. Each question item was divided into five variables by factor analysis. Reliability tests were conducted to verify the reliability among question items, cronbach's alpha was an appropriate value. And reliability was confirmed. Then, it was confirmed that each variable is independent from the value of VIF (Range for 1~6 variable). Standardize coefficients (R-squares) which five explanatory variables give to

a dependent variable was. When standardization estimates were seen, we have shown that the factor of Knowledge management capability recorded 0.2, the factor of Adaptive capacity recorded 0.15, the factor of Openness of insider information recorded 0.42, the factor of Creation of newer idea orientation recorded 0.22 and the factor of Intermediary aggressive intervention recorded 0.07. About the P-Value indicating the significance probability, Knowledge management capability recorded 0.008, Adaptive capacity recorded 0.03, Openness of insider information recorded 0.001, Creation of newer idea orientation recorded 0.004 and Intermediary aggressive intervention recorded 0.4. (\*\*P<0.05, \*\*\*P<0.01)

Figure10: Result of hypothetical model for foreign partners

Model		Unstandardized coefficients		Standardized coefficients	Sig.	Collinearity Statistics	
		B	Std. Error	Beta		Tolerance	VIF
1	(Constant)	1.590	.279		.000		
	Knowledge management capability	.076	.028	.198	.008	.950	1.053
	Adaptive capacity	.038	.018	.153	.031	.983	1.017
	Openness of insider information	.328	.018	.426	.004	.949	1.053
	Creating of innovative idea	.188	.064	.219	.000	.940	1.064
	Intermediary aggressive intervention	.013	.014	.069	.354	.960	1.042



Source: Authors

## 5. DISCUSSION AND IMPLICATION

### 5-1. Discussion

In this section, we discuss based on analysis results. First, we discuss analysis result of Japanese firms. Knowledge management capability (H1a) influences Japanese firms to promote open innovation with foreign partners in the previous study. The relationship

between knowledge management capability and open innovation is a proven theory only for France multinational firms (Jasimuddin and Naqshbandi, 2017). Therefore, it was necessary to verify when Japanese firms implement open innovation with foreign partners. As a result, knowledge management capability was proved to be an important factor on open innovation not only for French multinational firms, but between Japanese and foreign firms.

Adaptive capacity (H2a) proved to be related that Japanese firms to promote open innovation with foreign partners. It has already been studied as a factor that exists between innovation and global scale collaboration, but there was no research aimed at Japanese and foreign firms. We found that adaptive capacity has a strong correlation in the model of Japanese firms.

Openness of insider information (H3a) and creation of newer idea orientation (H4a) were supported. We found that these factors have positive impact on the outcome of open innovation with foreign partners. These hypotheses were constructed based on our interview survey. Therefore, we add new factors that promote open innovation of Japanese firms with foreign partners.

Intermediary aggressive intervention (H5a) was not supported. In our interview survey, many Japanese firms said that intermediary are necessary for open innovation

collaborate with foreign firms. However, as a result, intermediary aggressive intervention has no positive impact on the outcome of open innovation with foreign partners.

Next, we discuss analysis result of foreign partners. We found that knowledge management capability (H1b) influences foreign partners to attitude toward open innovation with Japanese firm. Foreign firms have clear goals for open innovation, and they seek partners that have established an organization for knowledge management capability.

Adaptive capacity (H2b) proved to be related that attitude toward open innovation with Japanese firm. In our interview survey, foreign firms evaluated that Japanese firm have low adaptive capacity due to their strong self-sufficiency. Japanese firms need a strategy to adapt to management resources such as technologies and ideas, business usage and values of firms the global market.

Openness of insider information (H3b) was particularly strong correlated with model of foreign firms. Japanese firms in general tend to take risk-avoidance behavior. Foreign partners need more insider information disclosure from Japanese firms.

Creation of newer idea orientation (H4b) has a positive impact on attitude toward open innovation with Japanese firms. Japanese firms are required from foreign partners to



create innovative ideas as well as technical capabilities.

Intermediary aggressive intervention (H5b) was not supported the same as H5a. It has no positive impact on attitude toward open innovation with Japanese firms.

What can we say from those results? Comparing four supported hypotheses with the results of Japanese and foreign firms, the Japanese firms result showed a strong correlation between the factors (knowledge management capability and adaptive capacity) mentioned in the previous studies and the outcome of open innovation with foreign partners. However, foreign firms result showed a strong correlation between the factors (openness of insider information and creation of newer idea orientation) clarified from our interviews survey and the attitude toward open innovation with Japanese firms. We found this gap of result because we focus on both side of focal Japanese firms and foreign partners. It is assumed that the factors that we clarified that are based on the facts that actual business transaction between Japanese firms and foreign partners.

H5a and H5b were not supported. In our interview survey, both Japanese firms and foreign firms stated that existence of intermediary firm is important on implementing open innovation with foreign firms. However, as a verification result, they do not need intermediary firms. There are two things that can be considered. First, we consider that the firms are seeking for intermediary is only at the early stage of matching between

firms and firms. In our interview survey, it was said that firms are seeking opportunities and ways to discover open innovation partners. Therefore, we consider that firms do not need intermediary to support in the process of open innovation after matching. Second, we consider that the current arguments of intermediary firms are not yet able to fulfill the role that firms desire. Intermediary firms are still underdeveloped on open innovation with foreign partners. We interviewed three intermediary firms, all of them felt their own lack of ability. Therefore, we consider that what firms are seeking is not in agreement with what the intermediary firms offer. In addition, as a result of the questionnaire, we found that about 65% of the responding Japanese firms have implemented open innovation with foreign partners. This fact is a new finding that we could not be found in the secondary data base analysis.

## 5-2. Theoretical and Practical Implications

In the academic field, we have studied global open innovation focus on both side of focal and partners. Two factors (H1 and 2) clarified from the previous studies were supported as they were. Moreover, two new factors (H3 and 4) clarified from the interview survey were also supported. Therefore, we propose these new influential factors. In future study, we need to take a close look on openness insider information and creation of newer idea

orientation.

In this research, we conducted an interview survey and a questionnaire survey based on the opinions of the actual sites on both sides and demonstrated the relationship of open innovation between Japanese firms and foreign firms. It can be said that this is a practical significance contributing to Japanese firms that are willing to engage in open innovation with foreign firms. Japanese firms are motivated to open innovation with foreign firms, but they have not been implemented from various problems. However, there has been no survey that examines and compares the real information of both sides as to what the problem is like. Therefore, it has significance to make proposals to clarify the information the firm really wanted to know and promote open innovation with foreign firms.

What should Japanese firms do to implement open innovation successful with foreign partners? All four factors are issues of organization. Therefore, Japanese firms need to improve the own organization, understand their management resources correctly. Also, do not be afraid of risk to collaborate with foreign partners, and need to maintain open mindedness toward foreign partners. Then, Japanese firms need to have a leader who can implement those factors.

## 6. CONCLUSION

Open innovation is a new management strategy and open innovation is necessary for firms to maintain the competitive advantage. We do research on both perspective of Japanese firms and foreign partners, with the problem that Japanese firms have insufficient implementing open innovation with foreign partners. We constructed hypotheses and clarified four factors necessary for Japanese firms by quantitative analysis. This includes the evaluation of Japanese firms as seen from foreign firms. Therefore, it is practical proposal for Japanese firms. In Japan, there are firms that still cannot be implemented even among domestic companies. However, implementing open innovation with foreign partners has great merit because of the network effect. It is expected that Japanese firms will need to open innovate with foreign firms in the future. Our research contributes to Japanese firms as a proposal for understanding and solving problems that encountered during collaboration. Japan's capacity for innovation and international competitiveness will improve if Japanese firms are implementing open innovation with foreign partners. As a limitation of this research, the sample population is small. We did not narrow down the industry and the country. However, the collected samples were three industries of information communication, manufacturers, and services. Moreover, only 23 countries were able to recover. Implementation of research with increased sample types and numbers is a future subject. Also, we could not explain

the relationship between intermediary firm and global open innovation. There is a possibility that problems with the firm size and industries may differ. Further insight into these aspects are left to future work.

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Accompanying material 1 : Short interview list (Japanese firms & Foreign firms)

Number	DATE	Place(Method)	
<b>Short interview (Japanese firms and Foreign firms 15~30min)</b>			
No.1 (Japan medium size) Information and communication	8/24(2018)	NEDO Incubation center (Kanagawa)	<ul style="list-style-type: none"> <li>There is concern about information leakage and technology stealing</li> </ul>
No.2 (Japan startup) Information and communication	8/24(2018)	NEDO Incubation center (Kanagawa)	<ul style="list-style-type: none"> <li>Speed of decision does not much</li> <li>High risk</li> </ul>
No.3 (Japan startup) Manufacturing	8/24(2018)	NEDO Incubation center (Kanagawa)	<ul style="list-style-type: none"> <li>Insufficient organizational structure of firms</li> </ul>
No.4 (Japan startup) Information and communication	8/24(2018)	NEDO Incubation center (Kanagawa)	<ul style="list-style-type: none"> <li>Fair dealing is difficult</li> </ul>
No.5 (Japan startup) Information and communication	8/24(2018)	NEDO Incubation center (Kanagawa)	<ul style="list-style-type: none"> <li>Feel the problems of language and communication</li> </ul>
No.6 (Japan startup) Manufacturing	8/24(2018)	NEDO Incubation center (Kanagawa)	<ul style="list-style-type: none"> <li>Low reliability</li> <li>Risk of contract abandonment</li> </ul>
No.7 (Japan medium size) Service	8/24(2018)	NEDO Incubation center (Kanagawa)	<ul style="list-style-type: none"> <li>Understanding of foreign companies and international markets is poor</li> </ul>
No.8 (China startup) Information and communication	8/24(2018)	NEDO Incubation center (Kanagawa)	<ul style="list-style-type: none"> <li>Principle of self-sufficiency is strong</li> </ul>
No.9 (China medium size) Information and communication	8/24(2018)	NEDO Incubation center (Kanagawa)	<ul style="list-style-type: none"> <li>High maintainability</li> <li>Insufficient organizational structure</li> </ul>
No.10 (Japan startup) Information and communication	8/24(2018)	NEDO Incubation center (Kanagawa)	<ul style="list-style-type: none"> <li>Possibility of occurrence of NIH syndrome</li> </ul>
No.11 (China startup) Information and communication	8/24(2018)	NEDO Incubation center (Kanagawa)	<ul style="list-style-type: none"> <li>Cooperation speed is slow</li> <li>Be passive</li> </ul>
No.12 (China startup) Service	8/25(2018)	cafe shop (Oemachi)	<ul style="list-style-type: none"> <li>Cooperation goal is not clear</li> </ul>
No.13 (China startup) Information and communication	8/25(2018)	cafe shop (Oemachi)	<ul style="list-style-type: none"> <li>Insufficient organizational structure</li> </ul>
No.14 (China startup) Manufacturing	8/25(2018)	cafe shop (Oemachi)	<ul style="list-style-type: none"> <li>Do not feel attractive to ideas</li> </ul>
No.15 (China medium size) Information and communication	8/26(2018)	cafe shop (Shinagawa)	<ul style="list-style-type: none"> <li>Business practice is different</li> <li>Problems of laws and intellectual property</li> </ul>
No.16 (India medium size) Manufacturing	8/26(2018)	cafe shop (Shimbashi)	<ul style="list-style-type: none"> <li>Intermediary is required</li> </ul>
No.17 (Japan large size) Service	8/29(2018)	BASEQ (TOKYO MIDTOWN HIBIYA)	<ul style="list-style-type: none"> <li>Worried about information leakage</li> </ul>
No.18 (Japan large size) Manufacturing	8/29(2018)	BASEQ (TOKYO MIDTOWN HIBIYA)	<ul style="list-style-type: none"> <li>Coordination speed does not match</li> </ul>
No.19 (Japan large size) Manufacturing	8/29(2018)	BASEQ (TOKYO MIDTOWN HIBIYA)	<ul style="list-style-type: none"> <li>Insufficient organizational structure</li> </ul>
No.20 (Japan startup) Service	8/29(2018)	BASEQ (TOKYO MIDTOWN HIBIYA)	<ul style="list-style-type: none"> <li>No leaders familiar with open innovation</li> </ul>
No.21 (Japan large size) Information and communication	8/29(2018)	BASEQ (TOKYO MIDTOWN HIBIYA)	<ul style="list-style-type: none"> <li>The evaluation of Japanese firms is very low</li> </ul>
No.22 (Japan startup) Service	10/9(2018)	BASEQ (TOKYO MIDTOWN HIBIYA)	<ul style="list-style-type: none"> <li>There are intellectual property rights and regulatory problems</li> </ul>
No.23 (USA large size) Service	10/9(2018)	BASEQ (TOKYO MIDTOWN HIBIYA)	<ul style="list-style-type: none"> <li>The speed of commercialization is too slow</li> </ul>

No.24 (Japan startup) Service	10/9(2018)	BASEQ (TOKYO MIDTOWN HIBIYA)	<ul style="list-style-type: none"> <li>· High maintainability</li> <li>· Be passive</li> </ul>
No.25 (Japan large size) Information and communication	10/9(2018)	BASEQ (TOKYO MIDTOWN HIBIYA)	<ul style="list-style-type: none"> <li>· The technical ability is very high, but the idea is very old</li> </ul>
No.26 (Japan startup) Information and communication	10/9(2018)	BASEQ (TOKYO MIDTOWN HIBIYA)	<ul style="list-style-type: none"> <li>· The cost and speed are not balanced</li> </ul>
No.27 (Japan medium size) Information and communication	10/21(2018)	cafe shop (Yokohama)	<ul style="list-style-type: none"> <li>· Insufficient organizational structure</li> </ul>
No.28 (Japan startup) Information and communication	10/21(2018)	cafe shop (Yokohama)	<ul style="list-style-type: none"> <li>· The need for intermediary intervention</li> </ul>
No.29 (Japan medium size) Service	10/21(2018)	cafe shop (Yokohama)	<ul style="list-style-type: none"> <li>· Business habits are different</li> </ul>
No.30 (Japan startup) Information and communication	10/21(2018)	cafe shop (Yokohama)	<ul style="list-style-type: none"> <li>· The purpose of open innovation is different</li> </ul>
No.31 (Japan startup) Information and communication	10/23(2018)	TORANOMONHILLS	<ul style="list-style-type: none"> <li>· Do not understand the management of the firms</li> </ul>
No.32 (Japan startup) Information and communication	10/23(2018)	TORANOMONHILLS	<ul style="list-style-type: none"> <li>· Organizational structure exists.</li> </ul>
No.33 (Japan startup) Information and communication	10/23(2018)	TORANOMONHILLS	<ul style="list-style-type: none"> <li>· Possibility of leaking information</li> </ul>
No.34 (Canada startup) Service	10/27(2018)	Rakuten Crimson House	<ul style="list-style-type: none"> <li>· Language barriers. Standing on innovation is different</li> </ul>
No.35 (Israel-startup) Service	10/27(2018)	Rakuten Crimson House	<ul style="list-style-type: none"> <li>· Feel somewhat arrogant posture</li> <li>· High maintainability</li> </ul>



Accompanying material 2 : Long interview list (Japanese firms & Intermediary firms)

Number	DATE	Place(Method)	
<b>Long interview (Japanese firms, 60~90min)</b>			
No.1 (Japan startup) Service	8/10(2018)	The office of the other party (Higashi jijo)	<ul style="list-style-type: none"> <li>· Aggressive collaboration and risk of information leaks.</li> <li>· Worry about the decision to be able to keep up early.</li> </ul>
NO.2 (Japan startup) Information and communication	9/29(2018)	cafe shop (Shibuya)	<ul style="list-style-type: none"> <li>· Differences in business practices and legal regulations.</li> <li>· Insufficient approval of the management layer inside the company.</li> </ul>
NO.3 (Japan startup) Information and communication	10/13(2018)	The office of the other party	<ul style="list-style-type: none"> <li>· The importance of the role of mediation.</li> </ul>
NO.4 (Japan large size) Information and communication	10/21(2018)	cafe shop (Yokohama)	<ul style="list-style-type: none"> <li>· The network with overseas companies has not been built enough.</li> <li>· No human resources can lead inside the company.</li> </ul>
NO.5 (Japan startup) Service	10/28(2018)	cafe shop (Shinjuku)	<ul style="list-style-type: none"> <li>· Insufficient language and communication skills.</li> </ul>
No.6 (Japan large size) Information and communication	11/3(2018)	The office of the other party (Nishinobashi)	<ul style="list-style-type: none"> <li>· We have not been able to break away from the subjectivity of old companies.</li> <li>· Prevalence of NIH syndrome.</li> </ul>
NO.7 (Japan startup) Service	11/7(2018)	cafe shop (Ochanomizu)	<ul style="list-style-type: none"> <li>· Inadequate understanding of international markets.</li> </ul>
<b>Long Interview (Intermediary firms,60~90min)</b>			
No.1 (Japan startup) Service	7/22(2018)	cafe shop (Tokyo operacity)	<ul style="list-style-type: none"> <li>· The role of intermediary companies is important for smooth cooperation between the two parties.</li> </ul>
NO.2 (Japan startup) Service	9/11(2018)	The office of the other party (Kamijicho)	<ul style="list-style-type: none"> <li>· The agency itself is immature and not adequately supported.</li> </ul>
NO.3 (Japan startup) Service	10/18(2018)	The office of the other party (Oremachi)	<ul style="list-style-type: none"> <li>· There are a lot of mediation between domestic companies.</li> </ul>

Accompanying material 3 : Questionnaire survey (Japanese firms& foreign firms)

海外企業と日本企業とのオーブン・イノベーションに関するアンケート

私たちは日本企業と海外企業とのオーブン・イノベーションに関するアンケートを実施し、その結果について「日本企業と海外企業とのオーブン・イノベーション」に関する調査結果を報告するための「アンケート」を実施しております。この調査結果を報告するために、必要事項を記入し、アンケートを返信していただきます。アンケートの回答は、匿名で集約され、その結果を公表させていただきます。また、特定の個人が特定されることのないよう、個人情報は削除させていただきます。アンケートにご協力ください。

※お願い

1. 海外企業とオーブン・イノベーションに関する経験はありますか？

- はい
- いいえ

質問 2 に進んでください。

以下20個の質問は、海外企業とのオーブン・イノベーションに関する質問です。海外企業とオーブン・イノベーションを実施した経験がある場合は、【その経験をもちに】お答えください。実施した経験がない場合は、【海外企業がオーブン・イノベーションのパートナーであることを想定】し、5段階評価であげたの意見をお答え下さい。

- 5 : とてもそう思う
- 4 : そう思う
- 3 : どちらともいえない
- 2 : あまりそう思うのではない
- 1 : 全く思わない

※このアンケートでのオーブン・イノベーションとは、企業と企業間の技術提携（社員の異動）や共同開発（共同開発）を指し、M&Aなどは含まれません。

2. オープン・イノベーションの例、貴社に知識や技術が流出する可能性があるリーダー（担い手）がいる。\*

- 全く思わない
- 1
- 2
- 3
- 4
- 5
- とてもそう思う

3. オープン・イノベーションの例、貴社に信頼できる経営幹部やリーダー（担い手）がいる。\*

- 全く思わない
- 1
- 2
- 3
- 4
- 5
- とてもそう思う

4. 貴社は新しいオープン・イノベーションの機会を求めている。\*

- 全く思わない
- 1
- 2
- 3
- 4
- 5
- とてもそう思う

5. 貴社は様々な企業に対して提携先を拡大していき、新しい提携先を探している。\*

- 全く思わない
- 1
- 2
- 3
- 4
- 5
- とてもそう思う

6. 貴社は企業全体（経営陣や経営幹部も含めて）でオープン・イノベーションの推進に積極的である。\*

- 全く思わない
- 1
- 2
- 3
- 4
- 5
- とてもそう思う

質問 7 に進んでください。

7. 貴社は海外企業に信頼されるような実績がある。\*

- 全く思わない
- 1
- 2
- 3
- 4
- 5
- とてもそう思う

8. 貴社は技術/ノウハウなどの知識を蓄積してオープンにしている。\*

- 全く思わない
- 1
- 2
- 3
- 4
- 5
- とてもそう思う

9. 貴社は独自の技術や知識を保有し、海外企業とのオープン・イノベーションに積極的にアプローチしている。\*

- 全く思わない
- 1
- 2
- 3
- 4
- 5
- とてもそう思う

10. 貴社は自社の情報資産や技術資産に関するセキュリティ対策を強化している。\*

- 全く思わない
- 1
- 2
- 3
- 4
- 5
- とてもそう思う

11. 貴社は革新的なアイデアを開発するために積極的に外部人材を雇用している。\*

- 全く思わない
- 1
- 2
- 3
- 4
- 5
- とてもそう思う

12. 貴社は革新的なアイデアを打ち出すために積極的に外部人材を雇用している。\*

- 全く思わない
- 1
- 2
- 3
- 4
- 5
- とてもそう思う

13. 貴社は、起業家精神（新しい事業を創出しようとする気質や胆略）を持つ人材が多い。\*

- 全く思わない
- 1
- 2
- 3
- 4
- 5
- とてもそう思う

質問 7 に進んでください。

14. 貴社は高い信頼性や信用を築くことにより、海外企業と提携している。\*

- 全く思わない
- 1
- 2
- 3
- 4
- 5
- とてもそう思う

15. 貴社の業務プロセスを海外企業に開放してもらう機会を示している。\*

- 全く思わない
- 1
- 2
- 3
- 4
- 5
- とてもそう思う

16. 貴社のアイデアや技術の提供を海外企業に求めようとする機会を示している。\*

- 全く思わない
- 1
- 2
- 3
- 4
- 5
- とてもそう思う

17. 海外企業とオープン・イノベーションの推進に、積極的な役割を担っている。\*

- 全く思わない
- 1
- 2
- 3
- 4
- 5
- とてもそう思う

18. 海外企業とオゾン・イノベーション業界の間に、何かコラボレーションの機会を期待していますか？

1  2  3  4  5

19. 貴社は海外企業から協力を期待されていると感じていますか？

1  2  3  4  5

20. 貴社は海外企業と比べると海外企業とのオゾン・イノベーション業界に相対的な強みを持っていると感じていますか？

1  2  3  4  5

21. 貴社は海外企業とのオゾン・イノベーション業界の条件が揃っていても他の企業と比べて、多くを期待していますか？

1  2  3  4  5

22. 貴社は海外企業と比べて、海外企業とのオゾン・イノベーション業界の条件が揃っていても他の企業と比べて、多くを期待していますか？

1  2  3  4  5

1  2  3  4  5

23. 貴社の従業員数を教えてください。

1  10人未満  
2  10人以上100人未満  
3  100人以上300人未満  
4  300人以上

### Questionnaire on open innovation with Japanese companies

We are Nihon University college of Law, Utsu Seminar 11th term, Team PCB. We are studying about "A study of Japanese companies to cooperation with foreign companies". We collect responses from the questionnaire for research. Please tell us your opinion on "Corporate cooperation with Japanese companies".

This answer will not be used for purposes other than research purposes. Also, it will not be announced as information that a particular individual can identify. Since it is contents that can be answered in about several minutes, please understand the purpose and please kindly cooperate with the questionnaire.

1. Have you experienced cooperation with Japanese companies?

1  Yes  
2  No

If you answered "Yes", please answer about the existing Japanese companies. Answered "No", please answer Japanese companies as potential open-innovation partners.

Please answer the following 20 questions assuming that Japanese companies are in corporate partnership.

- 5 : Strongly agree
- 4 : Agree
- 3 : Neither agree nor disagree
- 2 : Disagree
- 1 : Strongly disagree

In addition, Corporate collaboration within this questionnaire refers to technology collaboration between companies and companies. (excluding M&A etc.)

2. In cooperation with a Japanese partner, do you want a prominent leader of who can manage knowledge of the their company?

Strongly disagree      Strongly agree

3. In cooperation with a Japanese partner, do you want a reliable leader of who can extensive experience of the their company?

1  2  3  4  5

【質問は以上です。ご回答ありがとうございました。】に記入してください。

質問は以上です。ご回答ありがとうございました。貴社の回答が私たちに有効に役立ちます。送付が完了を申しあげさせていただきます。

4. Do you think that it is important for Japanese partner to indicate their cooperation objectives to you?\*

1 2 3 4 5

5. Do you think it is important for Japanese partner have a stance to speed decision making will lead to easier cooperation?\*

1 2 3 4 5

6. Do you think Japanese partner will be positive about cooperation throughout the entire organization, including other departments and executives, will lead to a good impression?\*

1 2 3 4 5

7. Do you think Japanese partner are trusting your company to be important for smooth cooperation?\*

1 2 3 4 5  
Strongly disagree      Strongly agree

8. Do you think Japanese partner should make information more open?\*

1 2 3 4 5

9. Do you think that it is important for Japanese partner to improve their passive attitudes and actively approach to your company?\*

1 2 3 4 5

10. Do you think that Japanese partner reduce risk avoidance behavior of information leakage and technology theft will lead to smooth cooperation?\*

1 2 3 4 5

11. Do you think that it is attractive that if Japanese partner has many innovative ideas?\*

1 2 3 4 5  
Strongly disagree      Strongly agree

12. Do you think it is attractive that a Japanese partner is actively hiring foreign employees?\*

1 2 3 4 5

13. Do you think that it is attractive that a Japanese partner have many talented people with entrepreneurial spirits?\*

1 2 3 4 5

14. Do you think that it is important for Japanese partner to get out of the old values and the commitment of self righteousness?\*

1 2 3 4 5

15. Do you think that showing a stance that Japanese partner will admit your company's strategy will lead to smooth cooperation?\*

1 2 3 4 5  
Strongly disagree      Strongly agree

16. Do you think that it is important for Japanese partner to be understandable the value of their own ideas and technologies?\*

1 2 3 4 5

17. Do you think that smooth cooperation is easy to do when there is active intermediary company intervention?\*

1 2 3 4 5  
Strongly disagree      Strongly agree

18. Do you want to utilize a matching platform website which worldwide available?\*

1 2 3 4 5

19. Are you interested in corporate open-innovation with Japanese companies?\*

1 2 3 4 5  
Strongly disagree      Strongly agree

20. Do you have a willingness to pursue open innovation with Japanese companies?\*

1 2 3 4 5

21. Do you have a specific vision for open innovation with Japanese companies?\*

1 2 3 4 5

**Thank you for your answers so far. Finally please tell us about your company.**

22. Please answer company Age \*

- Less than 5 years
- 5years or more and less than 10years
- 15years or more and less than 30years
- 30years and above

23. Please answer the number of employees \*

- Less than 10 person
- 10 person or more and less than 100 person
- 100 person or more and less than 300 person
- 300 person and above

24. Please answer the country of the company base. \*

**Questionnaire is over here! Thank you!**  
Thank you for your answer. Your answers have helped us.  
Please submit your feedback in the form and cover the site.  
\* If you don't mind, we would like to report the results, so could you please fill in your e-mail address?

#### Accompanying material 4 : Statistics results of Japanese firms

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.697 <sup>a</sup>	.485	.463	.465

a. Predictors: (Constant), Knowledge management capability, Adaptive capacity, Extreme maintainability improvement, Creating of innovative idea, Intermediary aggressive intervention

ANOVA<sup>a</sup>

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	23.607	5	4.721	21.870	.000 <sup>b</sup>
	Residual	25.042	116	.216		
	Total	48.649	121			

a. Dependent Variable: Outcome of open innovation with foreign companies  
 b. Predictors: (Constant), Knowledge management capability, Adaptive capacity, Extreme maintainability improvement, Creating of innovative idea, Intermediary aggressive intervention

#### Coefficients

Model		Unstandardized coefficients		Standardized coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	Constant	.600	.305		1.967	.004	-.004	1.205
	Knowledge management capability	.150	.059	.203	2.525	.001	-.060	0.180
	Adaptive capacity	.474	.073	.485	6.533	.000	.032	0.267
	Openness of insider information	.130	.058	.165	2.249	.003	.015	0.44
	Creation of newer idea orientation	.060	.061	.069	2.015	.032	.331	0.618
	Intermediary aggressive intervention	.057	.047	.086	0.985	.230	-.036	0.149

Source: Based on an analysis result of SPSS

Accompanying material 5 : Statistics results of foreign firms

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.613 <sup>a</sup>	.375	.349	.564

a. Predictors: (Constant), Knowledge management capability, Adaptive capacity, Extreme maintainability improvement, Creating of innovative idea, Intermediary aggressive intervention

ANOVA<sup>a</sup>

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22.967	5	4.593	14.428	.000 <sup>b</sup>
	Residual	38.204	120	.318		
	Total	61.171	125			

a. Dependent Variable: Attitudes toward of open innovation with Japanese companies  
 b. Predictors: (Constant), Knowledge management capability, Adaptive capacity, Extreme maintainability improvement, Creating of innovative idea, Intermediary aggressive intervention

Coefficients

Model		Unstandardized coefficients		Standardized coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	Constant	1.590	.279		5.707	.000	1.038	2.142
	Knowledge management capability	.076	.028	.198	2.681	.008	0.62	0.315
	Adaptive capacity	.038	.018	.153	2.110	.031	.002	0.074
	Openness of insider information	.328	.018	.426	5.755	.000	.215	0.441
	Creation of newer idea orientation	.188	.064	.219	2.943	.004	.062	0.315
	Intermediary aggressive intervention	.013	.014	.069	0.930	.354	-.015	0.040

Source: Based on an analysis result of SPSS