

Print ISSN: 1738-3110 / Online ISSN 2093-7717
<http://dx.doi.org/10.15722/jds.14.9.201609.31>

Qualitative Simulation on the Dynamics between Social Capital and Business Performance in Strategic Networks

Dong-Seok Kim*, Chang-Kwon Chung**

Received: August 15, 2016. Revised: September 2, 2016. Accepted: September 15, 2016.

Abstract

Purpose - This study develops a simulation model that looks at the dynamics between social capital and business performance in strategic networks to understand their behaviors in relation to each other, and to suggest dynamic relationship strategies.

Research design, data, and methodology - Based on existing literature, this study identifies the complex causal loop diagram on social capital and business performance in strategic networks, and converts them into a simulation model for observing how the changes in business environment and relationship dependency affect social capital and business performance.

Results - The simulation results showed that, first, the formation in social capital and business performance of networks with low relationship dependency was less affected by the changes in business environment. Second, the formation in social capital and business performance of networks with high relationship dependency was negatively impacted by the changes in business environment. In other words, higher relationship dependency strengthened the impact of changes in business environment on business performance.

Conclusions - Thus, this study confirmed that in strategic networks, the changes in business environment and the degree of relationship dependency dynamically affect business performance, and that relationship dependency mediates the degree in which changes in the business environment affect business performance. The results of the simulations were further verified through actual business cases.

Keywords: Social Capital, Business Performance, Strategic Networks, System Dynamics, Qualitative Simulation.

JEL Classifications: L14, C31, C61, L25.

1. Introduction

Business management environment in recent years has been changing at an unpredictable pace, and the competition has heightened even more due to the blurred boundaries between industries. To overcome the challenges imposed by the fast-changing business environment, companies have been looking towards strategic alliances as a way to achieve sustainable growth and to gain competitive advantage. However, many such alliances often come to an end before achieving their intended goals, with previous

studies reporting that 60% of the strategic alliances have not been successful (Lambe et al., 2002). Because of this, social capital formed through cooperative relationships, such as mutual exchange and trust, has gained attention as a major factor for success in strategic networking between organizations and/or businesses.

However, while many studies have looked into the relationship between social capital and business performance in the field of business management, the results of the studies have been inconclusive, ranging from positive (Westlund & Adam, 2010) to negative (Coleman, 1998). More recently, Villena et al.(2011) reported there to be a non-linear relationship between the two variables in strategic networks.

Despite continuous development in theoretical understanding and a great number of researches conducted on social capital and business performance, contrary findings are still being reported on their relationships, pointing to a need for

* First Author, Ph.D Student, Dept. of Management, Seoul School of Integrated Sciences & Technologies, Seoul, Korea.
 Tel: +82-2-405-6175, E-mail: lgcjds2@gmail.com

** Corresponding Author, Research Fellow, Interdisciplinary Program of EcoCreative, The Graduate School, Ewha Womans University, Seoul, Korea. Tel: +82-2-3277-3868, E-mail: cck@K-bridge.org

a new approach from a new perspective in studying social capital and business performance.

Since singular and quantitative approaches have been limiting the understanding on the formation and role of social capital in strategic networks, the processes of which are inherently complex, what is required now is a holistic and comprehensive approach that looks from a structural perspective on the relationship between social capital and business performance.

In this context, this study attempts to investigate the relationship between social capital and business performance in strategic networks using a structural and dynamic approach, to provide a theoretical basis on which business executives can conduct appropriate decision-making based on the characteristics of their firm's business environment and strategic networks.

For this purpose, strategic network, a complex system for business management which includes abstract concepts such as social capital, is structured into causal relationships and, using a model that allows mutual feedback between variables, qualitative simulation is performed to predict business performance. Qualitative simulation is a useful methodology that simplifies the structure of complex systems and observes how variables change over time through a balancing mechanism (Saadatpour et al., 2016).

This research has both academic and practical goals. In terms of academic goals, first, it attempts to study the integrated structure of the relationship between social capital and business performance in strategic networks. Therefore, this study aims to provide the logical support on why social capital and business performance form different relationships in different situations. Second, by examining how the relationship between social capital and business performance change over time using a dynamic model, this study predicts the dynamic changes that occur in the complicated management system created by strategic networks. Third, this study shows how social capital and business performance shift due to relationship dependency and changes in the business environment by using a situational approach.

In terms of practical goals, first, this research conducts simulations on how the business performance of a strategic network is affected by relationship characteristics and changes in the business environment, to provide prediction models for better business performance. Second, this study aims to propose appropriate relationship strategies that will allow firms in strategic networks to respond to the changes in the business environment, and present guidelines on critical factors on which to focus management efforts to improve business performance based on the network's characteristics. Lastly, through Distribution business case study, we confirm the results of simulation.

This study is composed as follows. After existing literature on strategic networks and social capital, it is reviewed in Section 2. Section 3 explains the research methodology including system dynamics and the research model. Section

4 interprets the simulation results and suggests guidelines for business performance management, and verifies the simulation results based on actual business practices. Finally, Section 5 discusses the study's results, implications, and limitations, and proposes suggestions for future studies.

2. Literature Review

2.1. Strategic Networks

Companies form strategic relationships and maintain cooperation with mutually complementary businesses to gain competitive advantage. These relationships can be seen as strategic networks (Murray & Kotabe, 2005). Generally, these strategic networks are connections formed between companies to utilize each other's resources, and as such, can be defined as cooperative relationships between mutually dependent organizations (Borgatti & Foster, 2003).

Strategic networks, understood from a business management perspective, are long-term bonds formed between independent organizations to gain competitive advantage over those outside the network. Thus, strategic networks entail comprehensive cooperation in terms of technology, distribution, production, sales, and capital based on voluntary and cooperative contracts (Gulati et al., 2000). One of the characteristics in strategic networks is that the organizations involved have both mutual independence and dependence at the same time (Sydow & Windeler, 1998), and this duality simultaneously endows mutual autonomy and governance, trust and control.

Existing literature on the business performance and organizational relationships in strategic networks explain such relationships using resource dependence theory (Pfeffer & Salancik, 1978), marketing channel theory (Frazier, 1983), transaction cost theory (Williamson, 1985), resource-based theory (Tyler, 2001), social capital theory (Tsai & Ghoshal, 1998), and information processing theory (Hult et al., 2004).

The central proposition of these theories is that organizations in the strategic network gain special benefits when they invest in relational assets, exchange information, or strategically merge resources. However, this is not necessarily the case as shown by Dyer et al. (2001) who found that a high percentage of the strategic partnerships were terminated before achieving their intended goals.

Meanwhile, concepts such as network and social capital have been gaining notice as important research topics in the field of business strategy and organization (Gulati et al., 2000). In social capital theory, the performance of strategic networks is explained based on network types and structures formed between organizations, cognitive systems shared by members of the organizations, and interactive human relationships, and social capital is highlighted as an important factor for business performance in strategic networks. In recognition that companies whose performance

depends on strategic networks face the need to effectively manage those cooperative relationships, this study will utilize social capital theory to explain how these companies can enhance business performance.

2.2. Social Capital

Inkpen and Tsang (2005) understood social capital to occur from the relationships between individuals or organizations in a network and to mean the sum of the useful resources built from such relationships. As a sociological concept, social capital formed from social structures or relationship networks, such as trust and cooperation, mutually interact to positively impact the network, and such interactions have been studied from diverse perspectives in many fields of study (Kwon & Adler, 2014).

Williamson (2008) categorizes social capital as bonding social capital, which emphasizes close bonding, and bridging social capital, which centers on bridging relationships. Bonding social capital refers to social capital created within an organization or in the organization's networks and gained based on the close bonds formed internally. On the other hand, bridging social capital focuses on the network relationships of individuals, where social capital is the resource gained from social relationships and networks from an individual perspective. As this study proposes to investigate the social capital that occurs between organizations with mutually complementary goals in strategic networks, it has its focus on bonding social capital.

Although social capital has been mainly dealt in sociology, it is also being increasingly studied in business management where research has largely focused on looking into the relationship between social capital and business performance. Westlund and Adam (2010) studied companies in multiple countries and industries and found a positive relationship between social capital and business performance. Specifically, the study found that major indicators of social capital such as relational assets, network type, transaction frequency, trust, relationship commitment, organizational culture, interaction, value sharing, etc. have a positive effect on financial and operational performance.

However, other studies found that social capital can also bring negative effects (Coleman, 1998). Since 2010, studies have reported that there is a non-linear relationship between social capital and business performance. For instance, Villena et al. (2011) suggested that, in distribution networks, social capital has a positive effect on the performance of the buyer only up to a certain point after which too much social capital adversely affected performance, that is, that the relationship between social capital and business performance is non-linear and U-shaped.

In addition, strategic networks give birth to various mutual or conflicting interests among the members within the networks, which leads the organizations involved to place

more attention towards relationship management to achieve better business performance. As the organizations in the strategic network work on relationship management, social capital such as trust, goal-sharing, and organizational structure is formed, and in turn, this social capital affects the behavior or thinking of the members in the organization (Borgatti & Foster, 2003). Thus, the relationship between social capital and business performance should be understood as a feedback structure, and as dynamically changing over time even in the same network.

Westlund and Adam (2010) studied the positive and negative relationships among variables for social capital and business performance based on data from multiple countries and firms. However, their findings showed that the relationships are varied. Therefore, to explain the causal relationships in more detail, this study utilizes the structural model proposed in Kim and Chung (2016) to develop its dynamic simulation model to study the structure and dynamics of the relationship between social capital and business performance, and analyze social capital and business performance through qualitative simulation using system dynamics for an in-depth exploration into their circulative and non-linear behavior.

2.3. Relationship Dependency

Relationship dependency occurs because a firm usually does not hold all necessary resources for its business within its organization, and the degree of dependency depends on the essentiality of the required resource and its substitutability (Jacobs, 1974). In studies on general distributive channels, relationship dependency is generally used to refer to the degree in which partners can be substituted. In network relationships as well, relationship dependency points to how easily substituted the partners in the network can be (Heide & John, 1988).

The concept of relationship dependency can be understood to include dependency on individual partner firms, the total sum of mutual dependency among partners that form relationships, and the degree of imbalance in such mutual dependency (Kumar et al., 1995). In this study, relationship dependency is defined as the degree in which the network relationship can be substituted (Heide & John, 1988) and will be examined as a characteristic of strategic network.

3. Methodology & Research Design

3.1. Qualitative Simulation

Research methodology for social sciences can be largely divided into qualitative and quantitative study. In business management, as a social science, the central goal is to contribute to the decision-making in companies and organizations, and quantitative research is often used to

achieve this goal by researchers in business management which involves extracting variables from previous studies to conduct statistical analysis and verification.

However, the down-side of quantitative research is that the methodology may not fully reflect the dynamic behavior of companies in a rapidly changing, complex business environment. On the other hand, qualitative research includes a variety of methodologies other than numerical analysis, one of which is qualitative simulation (QSIM).

To overcome the limitations of positive research, this study will utilize QSIM as it is the more appropriate method for understanding and capturing the complex structure of business performance and its dynamic changes.

Early research on qualitative reasoning were mainly conducted in the field of physics. While phenomena and results are explained through numerical measurements derived from equations in physics, researchers of qualitative reasoning have attempted to explain physical phenomena and predict results with the subject's state values (+, 0, -) or proportional value (increase, decrease, stable).

As a method of qualitative reasoning, QSIM can infer the structure and behavior of physical systems without precise quantitative knowledge (Kuipers & Berleant, 1988). QSIM uses differential equations to partition the system parameters into the initial values of the variables and their domains of variation for discretization (Gallois & Pierron, 2016), and reduces complex systems into simple structures to predict the difference in the degree of variation or structural changes in systemic variables based on interactive mechanisms over time (Saadatpour et al., 2016). Thus, QSIM simplifies complex system models into causal structures to enable predictions on the pattern of change in variables within the system. Thus, this study will employ system dynamics within the basic design of QSIM to predict the output values from variation in the core variables in the system of strategic networks.

3.2. System Dynamics

In the term 'system dynamics,' system refers to structure,

and dynamics, dynamic behavior (Kim, 2000). In other words, system dynamics is a method that creates a structural model for the variables comprising a system to study the dynamic characteristics of the system through simulation (Slootweg, et al., 2003). This methodology can be divided into systems thinking and simulation. Systems thinking identifies the relationships among variables in the system to analyze their structures through a causal loop diagram and thus, is appropriate for expressing the feedback structure of the variables. On the other hand, simulation is useful in identifying the characteristics of dynamic behavior through dynamic modelling, and it is appropriate for finding the best combination of variables based on various scenarios which can become useful reference for decision-making (Featherston & Doolan, 2013).

In this study, a causal loop diagram is created based on the findings from previous studies to illustrate the causal loop and feedback structure of social capital and business performance in strategic networks, then the diagram is converted into a simulation model using qualitative and abstract variables whose units are normalized through Normalized Unit Modelling By Elementary Relationship (NUMBER) method (Kim, 2000).

NUMBER is a research method that converts complex systems into simple structures for the application of QSIM in the field of social science (Kim, 2000). This core of this method is the normalization of abstract variables which are difficult to quantify, based on ideas behind qualitative reasoning in physics and QSIM. As such, NUMBER is a useful method that enables simulations to involve abstract variables such as social capital.

3.3. Research Design

3.3.1. Research Model

The variables affecting the formation of social capital and business performance in strategic networks and their causal relationships found in existing literature are listed in <Table 1>.

<Table 1> The Causal Relationship between Social Capital and Business Performance

| Division | Causality | Reference |
|----------|--|------------------------|
| Sector A | Strength of Strategic Networks → Cost Competitiveness(+) | Zaheer et al.(2000) |
| | Cost Competitiveness → Financial Performance (+) | Wagner et al.(2003) |
| | Financial Performance → Relationship Commitment (+) | Gruen et al.(2000) |
| | Relationship Commitment → Strength of Strategic Networks (+) | Rauyrueen et al.(2007) |
| | Strength of Strategic Networks → Strategic Interaction (+) | Elg et al.(2001) |
| | Strategic Interaction → Network Managing Cost (+) | Wilkinson et al.(2002) |
| | Network Managing Cost →Financial Performance (-) | Bhagwat et al.(2007) |
| | Strategic Interaction → Trust (+) | Das et al.(2001) |

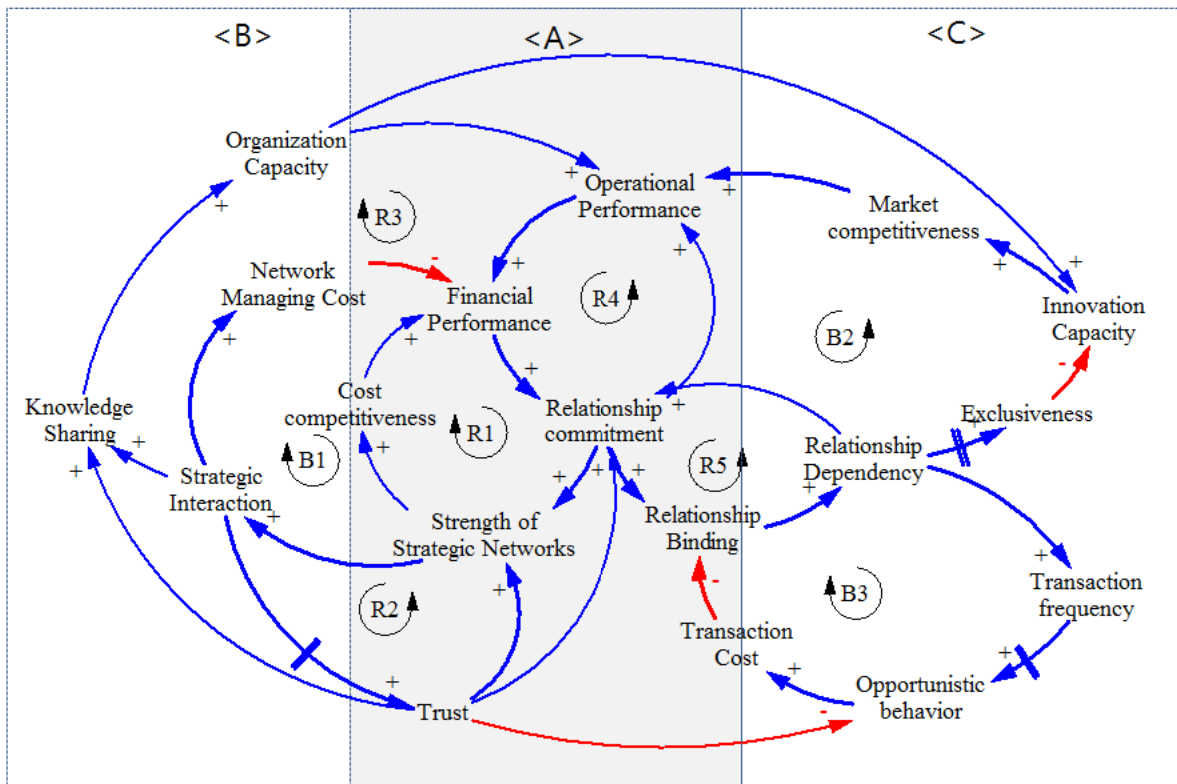
| Division | Causality | Reference |
|----------|--|---|
| Sector B | Trust → Strength of Strategic Networks (+) | DeWever et al.(2005) |
| | Trust → Knowledge Sharing (+) | Chow et al.(2008) |
| | Trust → Opportunistic Behavior (-) | Lui et al.(2009) |
| | Trust → Relationship Commitment (+) | Kassim et al.(2006) |
| | Strategic Interaction → Knowledge Sharing (+) | Tsai & Wenpin (2002) |
| | Knowledge Sharing → Organization Capacity (+) | Liao et al.(2007) |
| | Organization Capacity → Operational Performance (+) | Prajogo et al.(2006) |
| | Operational Performance → Financial Performance (+) | Orlitzky et al.(2003) |
| | Relationship Commitment → Operational Performance (+) | Krause et al. (2007) |
| Sector C | Relationship Commitment → Relationship Binding (+) | Zhao et al.(2008) |
| | Relationship Binding → Relationship Dependency (+) | Hennig-Thurau et al.(2002) |
| | Relationship Dependency → Exclusiveness (+) → Innovation Capacity (-) | Jackob & Nikolaus (2010) Gassmann et al.(2004) |
| | Innovation Capacity → Market Competitiveness (+) | Liao et al.(2007) |
| | Market Competitiveness → Operational Performance (+) | Barros et al.(2009) |
| | Relationship Dependency → Transaction Frequency (+) | Rasheed et al.(2001) |
| | Transaction Frequency → Opportunistic Behavior(+) → Transaction Cost (+) | Williamson(2008) |
| | Transaction Cost → Relationship Binding (-) | Lorenzoni et al. (1999) |
| | Organization Capacity → Innovation Capacity (+) | Liao et al. (2007) |

<Figure 1> is a total causal loop diagram that visualizes the structure of the causal relationships listed in <Table 1>. Sector A in <Figure 1> expresses the process in which a strategic network and social capital is formed, and shows that strategic networks are formed to improve business performance and the interaction in this process builds trust. Here, it can be seen that trust positively affects the overall network in various ways, while the network managing costs maintain the balance in the system.

Sector B shows how the trust built in strategic networks increases the knowledge sharing within the network to positively impact operational performance. In addition, trust and strategic interaction expands knowledge sharing, which leads to an increase in organizational capability and operational performance. A loop is formed among operational performance, financial performance, and relationship commitment, where enhancement in operational performance results in better financial performance which then leads to stronger commitment in the relationship.

However, in Sector C, the stronger relationship commitment leads to an increase in relationship dependency, which then results in an increase in exclusivity against those outside of the network or organization. This balance loop continues on to decrease the organization's innovative capacity, to negatively affect the company's market competitiveness and thus, to reduce operational performance. Furthermore, the increase in relationship dependency leads to the formation of a balance loop in which Transaction Frequency (+) → Opportunistic Behavior (+) → Transaction Cost (+) → Bonding (-). Thus, Sector C shows how the social capital formed within the network can adversely affect the network's performance over time.

As such, <Figure 1> presents the structural analysis of the positive and negative impacts of social capital on business performance in strategic networks, where, over time, the time delay effect in the network causes social capital to negatively impact business performance. This time delay effect is further analyzed through a dynamic simulation model in the following section.



* Created by author based on Kim & Chung (2016)

<Figure 1> Total Causal Loop Diagram

3.3.2. Dynamic Simulation Model

<Figure 2> is a stock-flow diagram that converts the total causal loop diagram in <Figure 1> into a simulation model. To facilitate this conversion, the variables are categorized as either stock or flow to define their relationships to each other (Kim, 2000). The relationships between the variables are generally expressed in equations, however, as this research model includes an abstract variable, namely social capital, it is difficult to express the relationships in such way. To overcome this issue, this study applied the NUMBER method, which enhances the objectivity of research models that include abstract variables (Kim, 2000). Specifically, NUMBER sets the basic relationships among variables categorized as either stock or flow and normalizes the variables into measurement units using values between 0 and 1, therefore mechanically eliminating the researcher’s subjectivity in simulations based on abstract causal loop diagrams or cognitive maps to relatively improve the study’s objectivity.

As shown in <Figure 2>’s stock-flow diagram, organizational capacity, market competitiveness, innovative capacity, operational performance, relationship commitment, trust, cost competitiveness, and financial performance were

set as stock variables, and the remaining variables as flow variables. Although there are various factors that can impact business performance in a strategic network, as this model looks at the relationship between social capital and business performance, only the variables that are deemed relevant to this topic were included in the model. In addition, the initial value for all stock variables were set as the median value between 0 and 1, that is, 0.5.

The dynamic interactions between and among the stock and flow variables can be explained as follows. Cost competitiveness is affected by the strength of the strategic network and transaction costs. Trust is built over time as mutual interactions occur in the strategic network, and decreases with the occurrence of opportunistic behavior. The increase in relationship commitment depends on financial performance, trust, and relationship dependency, and its decrease, on transaction cost and financial performance. Organizational capacity increases with greater knowledge sharing, and its decrease is considered a depreciation which, in the simulation, is set to regularly reduce by 5%. Innovative capacity increases with the improvement in organizational capacity while decreasing with greater exclusivity. Market competitiveness increases in parallel to innovative capacity, and decreases when there are greater changes in business environment and reduction in innovative

capacity. Operational performance is determined by organizational capacity and market competitiveness, and financial performance, by network management cost, operational performance, and cost competitiveness.

3.3.3. Simulation Design

As can be seen in <Figure 1>, the balance loop that causes negative impact on the strategic network's performance activates as relationship dependency increases over time. Therefore, to see how relationship dependency affects business performance, relationship dependency is considered a type of relationship and is given input values for simulation, with low dependency was set as 0.3 and high dependency as 0.9.

Changes in the business environment is set as a variable and refers to all external environmental factors affecting business management, including changes in consumer preferences, appearance of new competition due to technological development, various regulations, and changes in suppliers.

For the purposes of this study, changes in the business environment will be highlighted for its effect on strategic networks, therefore, input values are determined for changes

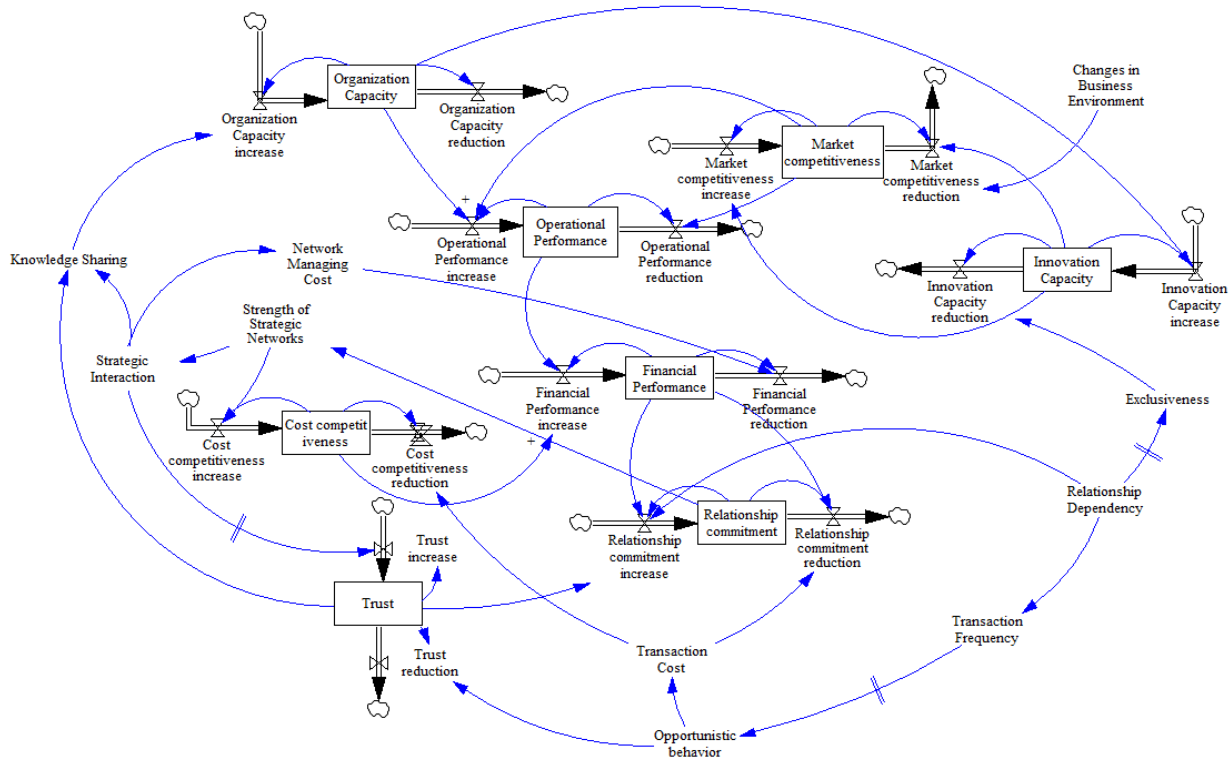
in the business environment for simulation: stable business environment as 0.1 and changeable business environment as 0.9

By controlling relationship dependency and changes in business environment, this simulation will predict the dynamic change in operational and financial performance, the two representative variables for business performance, and in social capital, whose representative variable is trust.

<Table 2 > Simulation Case

| Division | Relationship Dependency | | Changes in Business Environment | |
|----------|-------------------------|-------------|---------------------------------|-------------|
| | Situation | Input Value | Situation | Input Value |
| CASE 1 | Low | 0.3 | Low | 0.1 |
| CASE 2 | Low | 0.3 | High | 0.9 |
| CASE 3 | High | 0.9 | Low | 0.1 |
| CASE 4 | High | 0.9 | High | 0.9 |

Note: Vensim PLE version was used to create the causal loop diagram and to perform the simulations.



<Figure 2> Stock -Flow Diagram

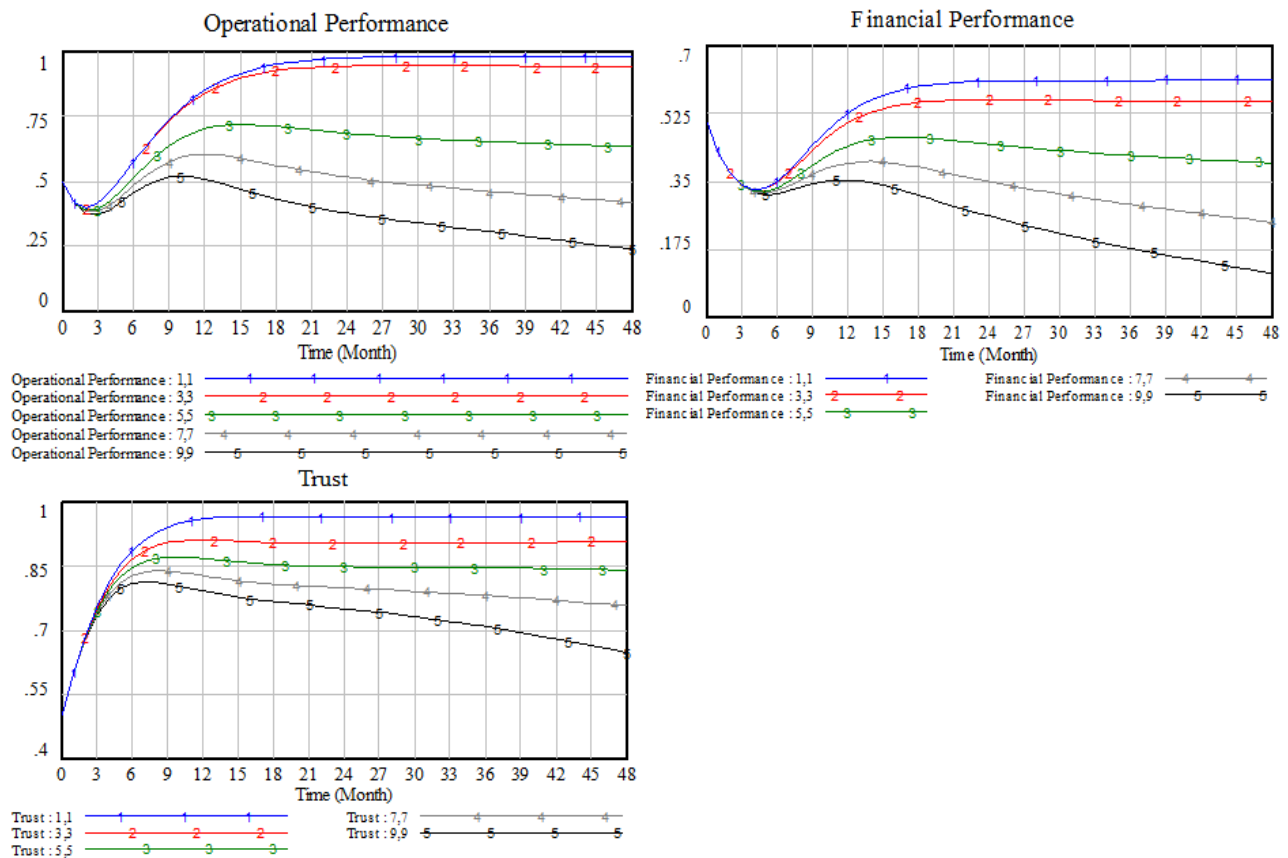
4. Results

4.1. Validity Analysis

The validity of a research model can be analyzed in terms of either its model structure or model behavior (Wright et al., 2016). The structural validity of the research model used in this study was verified through structural analysis with a focus on causal and feedback relationships based on existing literature, and different input values for variables result in the overall system (Winz et al., 2009). For this study, responsiveness analysis was conducted prior to

simulation by inputting incrementally higher values for the two important variables in this model, namely, relationship dependency and changes in business environment, and observing the changes in the overall model (Winz et al., 2009).

<Figure 3> shows the results of the multiple simulations conducted using values (0.1, 0.1) (0.3, 0.3) (0.5, 0.5) (0.7, 0.7) (0.9, 0.9) for relationship dependency and changes in business environment. The responsive analysis on the model used in this study shows that different input values for each variable resulted in different system output values.

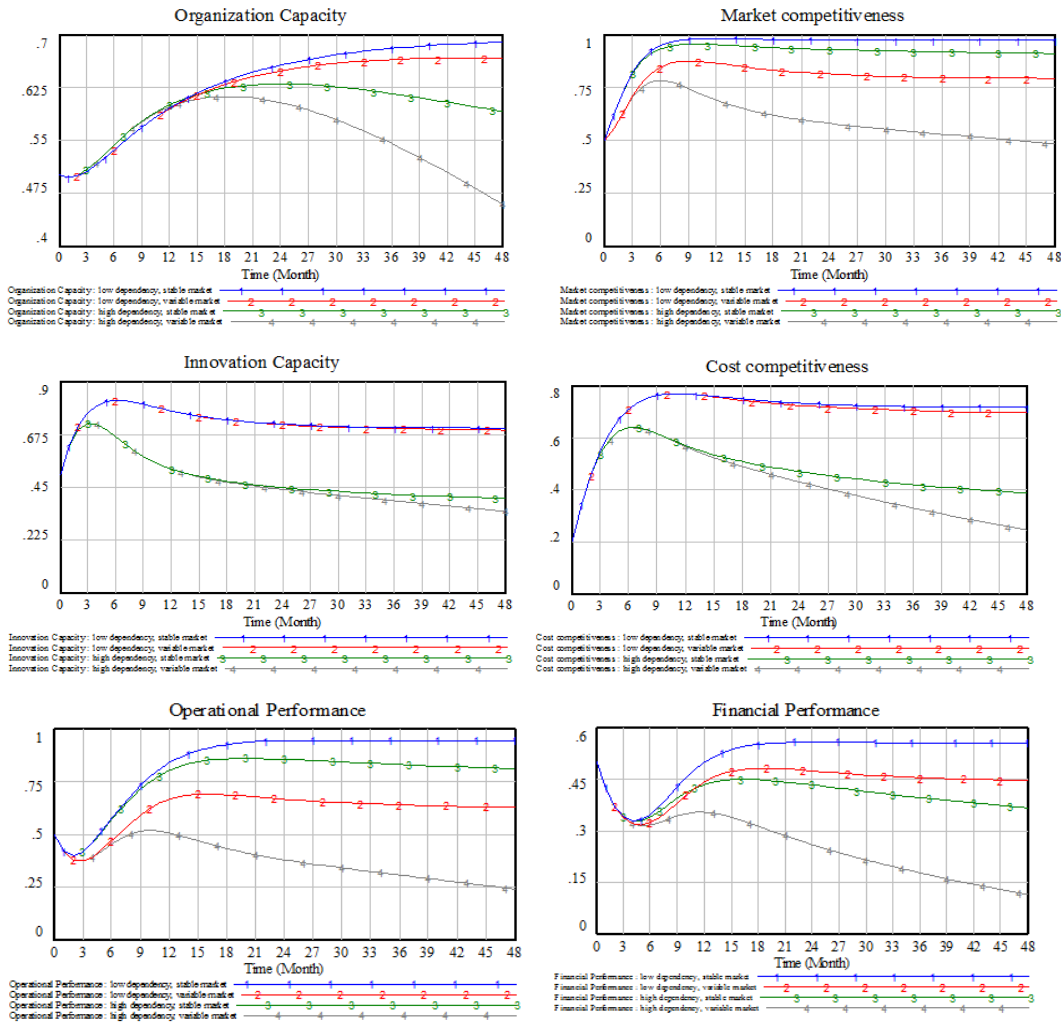


<Figure 3> Results for Responsiveness Analysis

4.2. Simulation Results

In the causal loop diagram above, relationship dependency was identified as a core variable affecting the network's performance, and thus, it can be understood as a network characteristic. Therefore, first, the values for relationship dependency were manipulated for simulations on

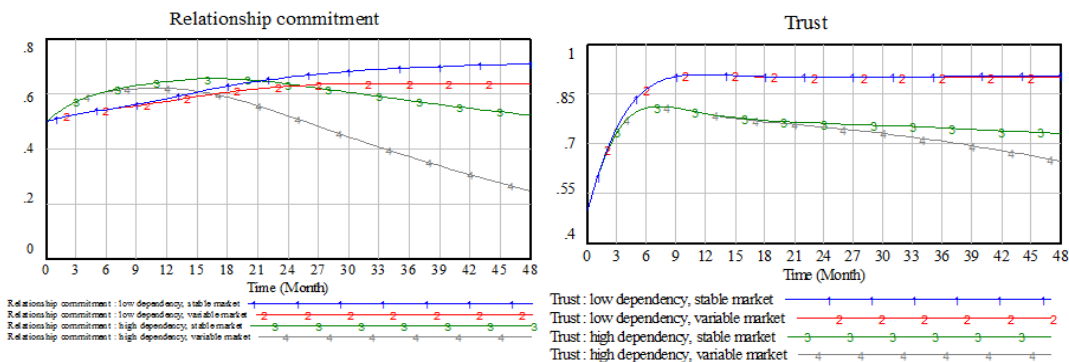
how the changes in the values for relationship dependency affect business performance. Next, to reflect changes in the environment external to the network, change in the business environment was set as a variable to see how the dynamic shifts in simulation results depending on the stability of the business environment.



<Figure 4> Simulation Results (1)

<Figure 4> shows the simulation results for a set period of 48 months using different input values for relationship dependency and changes in business environment. Trust, innovative capacity, and cost competitiveness show high

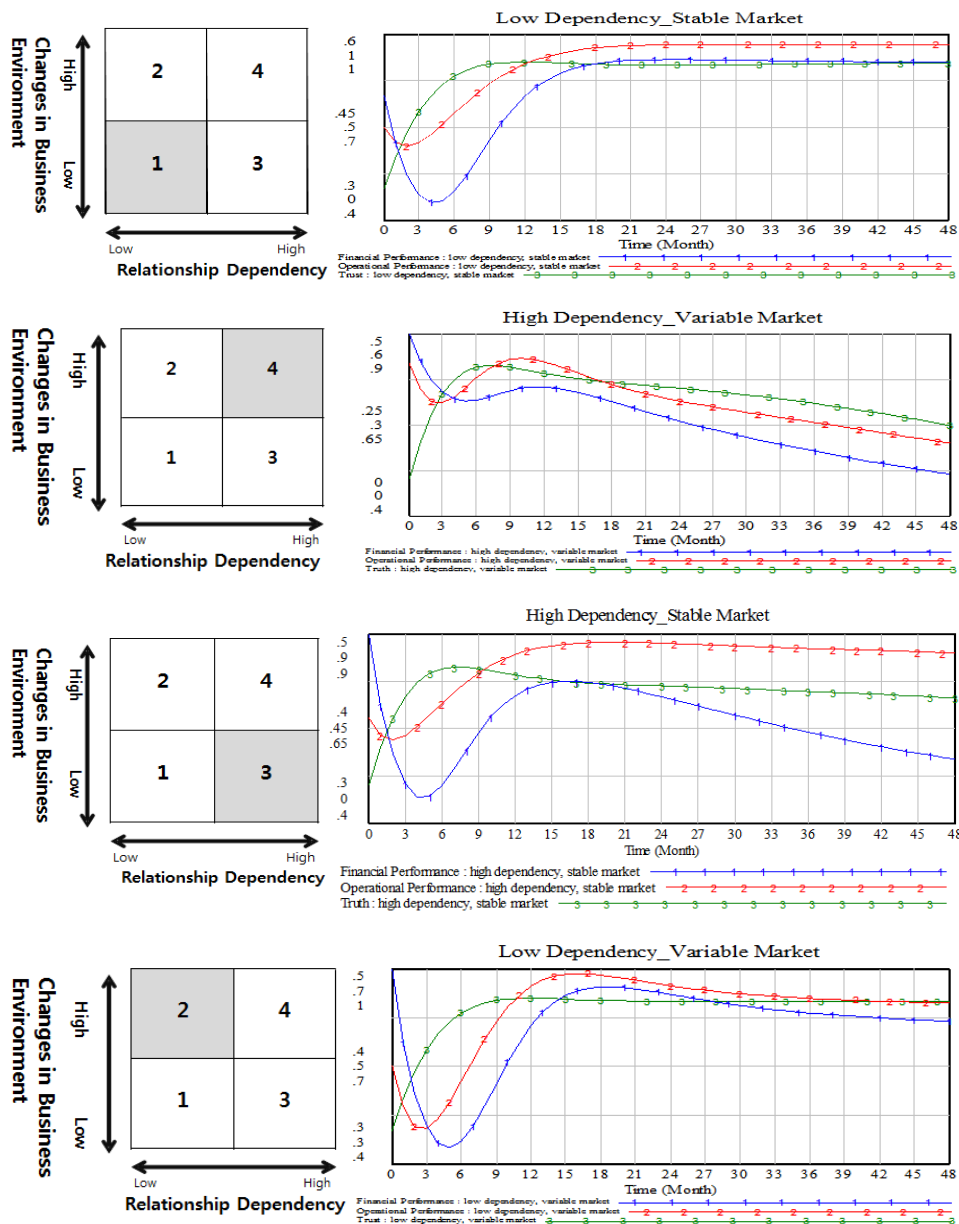
levels in Cases 1 and 2, whose relationship dependencies are low, while exhibiting steep drop in Case 4, whose relationship dependency is high with greater changes in business environment.



Operational performance is highest for Case 1 which has a stable business environment and low relationship dependency, followed by Case 3 whose business environment is stable but relationship dependency is high. Therefore, operational performance can be understood as being heavily influenced by changes in business environment where a stable business environment results in higher operational performance, while being less influenced by relationship dependency.

On the other hand, financial performance dropped initially for all cases, then recovered in the order of Case 1, 2, 3,

then 4. That is, Cases 1 and 2, whose relationship dependencies are low, achieved higher financial performance while Cases 3 and 4, whose relationship dependencies are high, exhibited lower financial performance. In particular, Case 4, which has high relationship dependency and a variable business environment, shows noticeable drop in financial performance. <Figure 5> illustrates the dynamic simulation on the formation of social capital and business performance based on changes in business environment and relationship dependency for each case.



< Figure 5 > Simulation Results (2)

It can be observed that Case 1 exhibits formation and maintenance of trust, as well as recovery and maintenance of financial performance after an initial drop. Case 2 shows a sharp decrease in operational performance due to the variable business environment but recovered quickly, showing that low relationship dependency enables fast system recovery.

In Case 3, trust is built quickly and is maintained in the long-term. In terms of business performance, Case 3's financial performance recovers after a steep decrease but drops again after some time. The increase in opportunistic behavior due to relationship dependency, resulting in greater transaction cost, can be cited as the reason for this second drop in financial performance. Case 4 also exhibits fast build up of trust but does not maintain its level of trust, and continuous decrease in the long-term is also found in its financial and operational performance.

In sum, Cases 1 and 2, whose relationship dependencies are low, are able to maintain trust at a high level as well as show high financial and operational performances compared to Cases 3 and 4 whose relationship dependencies are high. Both Cases 2 and 4 are simulations under variable business environments, with low relationship dependency for Case 2 and high relationship dependency for Case 4. Under the same level of changes in business environment, Case 2 is better able to build social capital (trust) compared to Case 4. Thus, it can be said that higher relationship dependency strengthens the negative impact caused by changes in business environment on the formation of social capital (trust).

In terms of operational and financial performance, changes in business environment has a negative impact on business performance, as can be seen by how Case 2

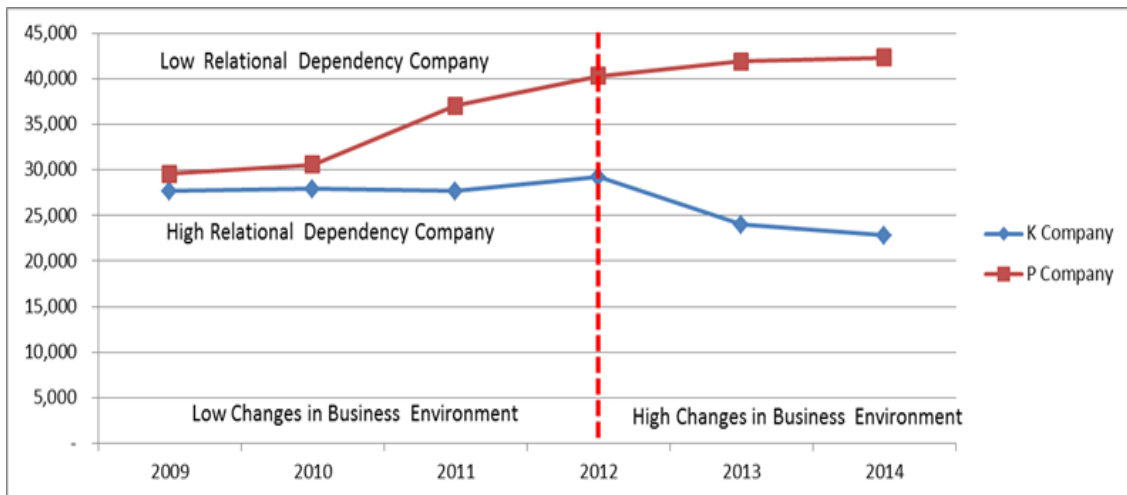
(whose relationship dependency is low) maintains better performance compared to Case 4 (whose relationship dependency is high). Therefore, higher relationship dependency enables changes in business environment to affect business performance to a greater degree.

Based on these results, it can be concluded that relationship dependency in a strategic network mediates the impact changes in business environment have on the formation of social capital (trust) and business performance.

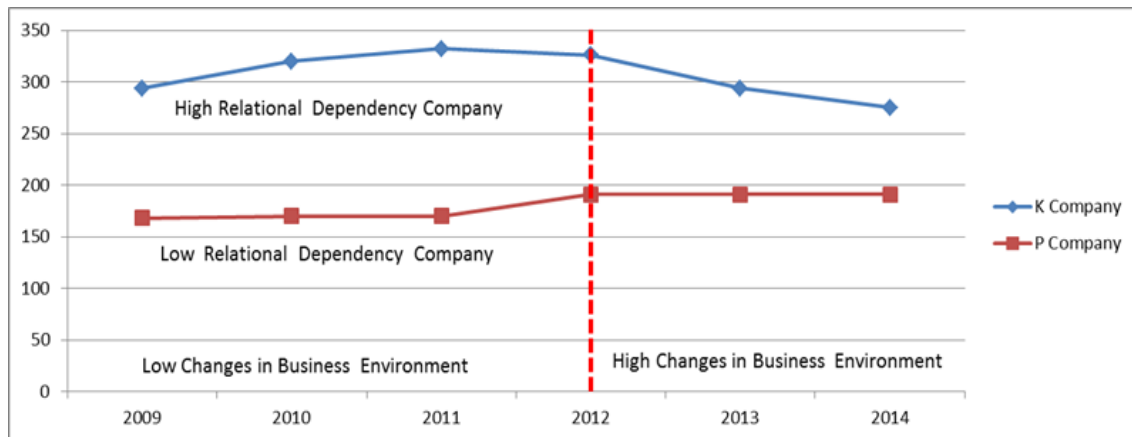
4.3. Business Case Study

<Figure 6> and <Figure 7> show the trends in revenue and number of distribution networks at two Korean companies. These two companies operate door-to-door sales in the Health & Beauty industry, and have door-to-door sales companies as strategic partners in their distribution networks. As the social capital between door-to-door sales companies is an important factor for business performance in door-to-door sales, these two companies are good subjects for research on social capital in strategic networks. More than 95% of Company K's sales comes from door-to-door sales distribution, while Company P diversified its operations so that only 35% of its sales comes for their door-to-door sales distribution network.

For both companies, the 2012 amendment in Korea's regulation for door-to-door sales resulted in a rapid change in the business environment, and as can be seen in <Figure 6> and <Figure 7>, their performances fluctuated where Company P's sales increased and its distribution network was maintained, while Company K's sales and its distribution network decreased.



< Figure 6> Trend in Sales at Companies K and P (2009-2014)



Source: Electronic Regulatory Filing System of the Korea Financial Supervisory Service, Korea's Fair Trade Commission

<Figure 7> Trend in Number of Distribution Networks at Companies K and P (2009~2014)

The trends in the sales and distribution network of these two companies corroborate the simulation results given above. That is, the two companies' relationship dependency on their distribution networks differ, and when the business environment changed in 2012, Company P with low dependency was able to improve its financial performance (Sales) and maintain its operational performance (number of distribution networks). However, Company K with high dependency faced rapid decrease in revenue and also a decrease in distribution networks after 2012.

It can be said that Company P was able to avoid the adverse effect changes in business environment on business performance due to low relationship dependency while Company P experienced negative impact from changes in business environment due to its high relationship dependency. Thus the companies' behaviors match the results of the simulation performed in this study.

5. Conclusion and Implication

5.1. Conclusion

This study created a structural model based on the causal relationship between the formation of social capital and business performance in strategic networks, and identified the sectors in which social capital is formed and business performance is negatively and/or positively affected.

Through this model, it was possible to observe that social capital affects the system negatively over time due to the exclusivity and opportunistic behavior that occurs in the network with time. In addition, such causal relationships were visualized in a dynamic model to predict how business performance is affected by relationship dependency and

changes in the business environment.

The results of the simulations showed that higher relationship dependency led to decrease in social capital (trust) and financial performance in the long-run. In particular, when there is high relationship dependency and a significant change in the business environment, not only social capital and financial performance but also operational performance decreased.

Furthermore, high relationship dependency enabled changes in the business environment to have stronger impact business performance. That is, relationship dependency was found to have a mediating effect on the relationship between changes in the business environment and business performance.

5.2. Implications

This research attempted to look at the formation of social capital and business performance in strategic networks using a structural and dynamic approach. As such, the implications of its findings can be listed as follows.

From an academic perspective, first, this study's approach to understand the interaction among variables through structural analysis of the overall system overcomes the limitations of existing studies on social capital and business performance, and enables better understanding of the non-linearity of the relationship between social capital and business performance reported by recent studies by explaining it in terms of specific situations and temporal changes. Secondly, this study presents a specific prediction model. In other words, this study showed that a situational approach is needed in investigating the effect of social capital on business performance. Thirdly, the simulation results in this paper show that matches the actual

distribution network business case. It would be possible to extend these studies utilizing the results.

In terms of practical implications for business managers, first, the findings of this study exemplified that, in distributive networks with high relationship dependency, strengthening the cooperative relationship can lead to decrease in financial performance and trust. In particular, if a significant change in the business environment is expected, high relationship dependency will cause a significant reduction in financial performance, operational performance, and trust. These findings will be useful for the management in their decision-making on whether to strengthen existing distributive networks or to invest in new networks based on internal and external situations. Second, this research highlighted the need for firms to put more effort in preventing exclusivity or opportunistic behavior from occurring in strategic networks in order to avoid adverse effect on business performance. Such effort can be in terms of implementing an open innovation strategy to cultivate the firm's innovative capacity, which will allow the firm to maintain its market advantage. Third, the case study on Korean firms with distributive networks showed how the simulation results reflect the realities of business management.

Therefore, for a firm with distributive networks, if changes in the business environment is expected, efforts to lower the network's relationship dependency and to diversify the network will be highly beneficial. As illustrated above, the findings of this research contributes to the practical

management of firms with strategic networks such as distributive networks, strategic alliances, and joint ventures by showing how changes in the business environment and dynamic situations affect business performance.

5.3. Limitation and Suggestion

The limitations of this study and suggestions for future studies are as follows. First, the causal loop diagram and simulation model used in this study were based on the general characteristics of strategic networks. In reality, strategic networks vary in type and form and thus, further study is required on specific types of strategic networks. Second, the simulations were conducted based on four scenarios with the different levels of relationship dependency and changes in the business environment, however, it should be noted that this may be insufficient for generalization on the effects of these variables on social capital and business performance. Third, while the variables that affect business performance are diverse, this study only looks at the variables related to social capital and thus can be limited in its findings.

To overcome the limitations listed above, future research may be conducted on specific industries or firms based on customized models, and with further studies, it will be possible to develop a universal prediction model on relationship strategies for strategic networks such as distributive networks and supplier networks.

References

- Barros, C. P., & Peypoch, N. (2009). An evaluation of European airlines' operational performance. *International Journal of Production Economics*, 122(2), 525-533.
- Bhagwat, R., & Sharma, M. K. (2007). Performance measurement of supply chain management: A balanced scorecard approach. *Computers & Industrial Engineering*, 53(1), 43-62.
- Borgatti, S. P., & Foster, P. C. (2003). The network paradigm in organizational research: A review and typology. *Journal of management*, 29(6), 991-1013.
- Chow, W. S., & Chan, L. S. (2008). Social network, social trust and shared goals in organizational knowledge sharing. *Information & Management*, 45(7), 458-465.
- Coleman, J. S. (1988). Social capital in the creation of human capital. *American Journal of Sociology*, 94, 95-120.
- Das, T. K., & Teng, B. S. (2001). Trust, control, and risk in strategic alliances: An integrated framework. *Organization studies*, 22(2), 251-283.
- De Wever, S., Martens, R., & Vandenbempt, K. (2005). The impact of trust on strategic resource acquisition through interorganizational networks: Towards a conceptual model. *Human relations*, 58(12), 1523-1543.
- Dyer, J. H., P. Kale, & Singh, H. (2001). How to make strategic alliances work. *MIT Sloan management review*, 42(4), 37-43.
- Elg, U., & Johansson, U. (2001). International alliances: how they contribute to managing the interorganizational challenges of globalization. *Journal of Strategic Marketing*, 9(2), 93-110.
- Featherston, C. R., & Doolan, M. (2013). Using System Dynamics to Inform Scenario Planning: A Case Study. *Proceeding of International Conference of the System Dynamics Society*(pp.1-10). Massachusetts, USA.
- Frazier, G. L. (1983). Interorganizational exchange behavior in marketing channels: a broadened perspective. *Journal of Marketing*, 47(4), 68-78.
- Gallois, J. P., & Pierron, J. Y. (2016). Qualitative simulation

- and validation of complex hybrid systems. Proceedings of the 8th European Congress on Embedded Real Time Software and Systems (pp.289-298). Toulouse, France: ERTS.
- Gassmann, O., & Enkel, E. (2004). Towards a theory of open innovation: three core process archetypes. Proceedings of the R&D Management Conference (pp. 6-9). Lisbon, Portugal: RADMA.
- Gruen, T. W., Summers, J. O., & Acito, F. (2000). Relationship marketing activities, commitment, and membership behaviors in professional associations. *Journal of marketing*, 64(3), 34-49.
- Heide, J. B., & John, G. (1988). The Role of Dependence Balancing in Safeguarding Transaction-Specific Assets in Conventional Channels. *Journal of Marketing*, 52(1), 20-35.
- Hennig-Thurau, T., Gwinner, K. P., & Gremler, D. D. (2002). Understanding relationship marketing outcomes an integration of relational benefits and relationship quality. *Journal of service research*, 4(3), 230-247.
- Hult, G. T. M., Ketchen, D. J., & Slater, S. F. (2004). Information processing, knowledge development, and strategic supply chain performance. *Academy of management journal*, 47(2), 241-253.
- Inkpen, A. C. & Tsang, E. W. (2005). Social capital, network, and knowledge transfer. *Academy of Management Review*, 30(1), 146-165.
- Jackob, N. G. E. (2010). No alternatives? The relationship between perceived media dependency, use of alternative information sources, and general trust in mass media. *International Journal of Communication*, 4, 589-606.
- Jacobs, D. (1974). Dependency and vulnerability: An exchange approach to the control of organizations. *Administrative science*, 19(1), 45-59.
- Kassim, M. N., & Abdulla, M. A. A. (2006). The influence of attraction on internet banking: an extension to the trust-relationship commitment model. *International Journal of Bank Marketing*, 24(6), 424-442.
- Krause, D. R., Handfield, R. B., & Tyler, B. B. (2007). The relationships between supplier development, commitment, social capital accumulation and performance improvement. *Journal of operations management*, 25(2), 528-545.
- Kim, Dong-Hwan (2000). A Simulation Method of Cognitive Maps. Proceedings of International Conference on Systems Thinking in Management. Geelong, Australia: ICSTM.
- Kim, Dong-Seok, & Chung, Chang-Kwon (2016). Exploratory Study of Causal Relationship between Social Capital and Performance on Strategic Networks: Systems Thinking Analysis. *Korean System Dynamics Society*, 17(1), 41-64.
- Kuipers, B., & Berleant, D. (1988). Using Incomplete Quantitative Knowledge In Qualitative Reasoning. In Proceedings of the 7th National Conference on Artificial Intelligence (pp.324-329). San Mateo, CA.: Morgan Kaufmann.
- Kwon, S. W., & Adler, P. S. (2014). Social capital: Maturation of a field of research. *Academy of Management Review*, 39(4), 412-422.
- Lambe, C. J., Spekman, R. E., & Hunt, S. D. (2002). Alliance competence, resources, and alliance success: conceptualization, measurement, and initial test. *Journal of the academy of Marketing Science*, 30(2), 141-158.
- Lawson, B., & Samson, D. (2001). Developing innovation capability in organisations: a dynamic capabilities approach. *International journal of innovation management*, 5(3), 377-400.
- Lorenzoni, G., & Lipparini, A. (1999). The leveraging of interfirm relationships as a distinctive organizational capability: a longitudinal study. *Strategic Management Journal*, 20(4), 317-338.
- Liao, S. H., Fei, W. C., & Chen, C. C. (2007). Knowledge sharing, absorptive capacity, and innovation capability: an empirical study of Taiwan's knowledge-intensive industries. *Journal of Information Science*, 33(3), 340-359.
- Lui, S. S., Wong, Y. Y., & Liu, W. (2009). Asset specificity roles in interfirm cooperation: Reducing opportunistic behavior or increasing cooperative behavior?. *Journal of Business research*, 62(11), 1214-1219.
- Murray, J. Y., & Kotabe, M. (2005). Performance Implications of Strategic Fit between Alliance Attributes and Alliance Forms. *Journal of Business Research*, 58(11), 1525-1533.
- Nahapiet, J., & Ghoshal, S. (1998). Social capital, intellectual capital, and the organizational advantage. *Academy of management review*, 23(2), 242-266.
- Orlitzky, M., Schmidt, F. L., & Rynes, S. L. (2003). Corporate social and financial performance: A meta-analysis. *Organization studies*, 24(3), 403-441.
- Prajogo, D. I., & Ahmed, P. K. (2006). Relationships between innovation stimulus, innovation capacity, and innovation performance. *R&D Management*, 36(5), 499-515.
- Rasheed, H. S., & Geiger, S. W. (2001). Determinants of governance structure for the electronic value chain: Resource dependency and transaction costs perspectives. *Journal of Business Strategies*, 18(2), 160-176.
- Rauyruen, P., & Miller, K. E. (2007). Relationship quality as a predictor of B2B customer loyalty. *Journal of business research*, 60(1), 21-31.

- Saadatpour, A., & Albert, R. (2016). A comparative study of qualitative and quantitative dynamic models of biological regulatory networks. *EPJ Nonlinear Biomedical Physics*, 4(1), 1-13.
- Slootweg, J. G., De Haan, S. W. H., Polinder, H., & Kling, W. L. (2003). General model for representing variable speed wind turbines in power system dynamics simulations. *IEEE Transactions on power systems*, 18(1), 144-151.
- Sydow, J., & Windeler, A. (1998). Organizing and evaluating interfirm networks: A structurationist perspective on network process and effectiveness. *Organization Science*, 9(3, Special Issue), 265-284.
- Tsai, W., & Ghoshal, S. (1998). Social capital and value creation: The role of intrafirm networks. *Academy of management Journal*, 41(4), 464-476.
- Tsai, W. (2002). Social structure of "coopetition" within a multiunit organization: Coordination, competition, and intraorganizational knowledge sharing. *Organization science*, 13(2), 179-190.
- Tyler, B. B. (2001). The complementarity of cooperative and technological competencies: a resource-based perspective. *Journal of Engineering and technology management*, 18(1), 1-27.
- Villena, V. H., Revilla, E., & Choi, T. Y. (2011). The dark side of buyer-supplier relationships: A social capital perspective. *Journal of Operations Management*, 29, 561-576.
- Wagner, M., & Schaltegger, S. (2003). How does sustainability performance relate to business competitiveness?. *Greener Management International*, 44(Winter), 5-16.
- Westlund, H., & Adam, F. (2010). Social capital and economic performance: A meta-analysis of 65 studies. *European Planning Studies*, 18(6), 893-919.
- Williamson, O. E. (2008). Outsourcing: transaction cost economics and supply chain management. *Journal of supply chain management*, 44(2), 5-16.
- Winz, I., Brierley, G., & Trowsdale, S. (2009). The use of system dynamics simulation in water resources management. *Water resources management*, 23(7), 1301-1323.
- Wright, A. G., & Hopwood, C. J. (2016). Advancing the assessment of dynamic psychological processes. *Assessment*, 23, 399-403.
- Wilkinson, I., & Young, L. (2002). On cooperating: firms, relations and networks. *Journal of Business Research*, 55(2), 123-132.
- Williamson, O. (1985). *The economic institutions of capitalism: Firms, Markets, Relational Contracting*. New York: The Free Press..
- Zaheer, A., Gulati, R., & Nohria, N. (2000). Strategic networks. *Strategic management journal*, 21(3), 203-215.
- Zhao, X., Huo, B., Flynn, B. B., & Yeung, J. H. Y. (2008). The impact of power and relationship commitment on the integration between manufacturers and customers in a supply chain. *Journal of Operations Management*, 26(3), 368-38