

**Project Organization, Diverse Knowledge, and Innovation
Systems in the Korean Game Software Industry**

A Dissertation
Presented to
The Academic Faculty

by

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In Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy in the
School of Public Policy

Georgia Institute of Technology
May 2007

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Project Organization, Diverse Knowledge, and Innovation Systems in the Korean Game Software Industry

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ACKNOWLEDGEMENTS

This work could never have been completed without the support and encouragement of my family and friends. I am grateful to each one of them. I am particularly indebted to my advisor Professor Philip Shapira for his mentorship, guidance, and encouragement throughout my life at Georgia Tech. His questions always forced me to look at issues from an entirely different perspective. I would also like to thank Professors Gordon Kingsley and Juan Rogers for their constructive questions and suggestions. I am also grateful to Professors Gregory Lewis and Douglas Noonan for their suggestions on statistical models. In his course, Professor Lewis introduced a variety of statistical methods that were invaluable to my research.

Most of all, I am indebted to numerous individuals whom I interviewed for this research. I owe many thanks to the companies that responded to my lengthy questionnaire. Without the participation and willingness of both the interviewees and the companies, this research would not be possible. Unfortunately, I am not allowed to acknowledge all of them because of confidentiality dictated by the regulations of the Institutional Review Board. I would also like to express my appreciation to the members of the informal meetings who taught me the technology and jargon of the game industry.

I am grateful to my colleagues in the School of Public Policy at Georgia Tech. Their supports throughout every phase of this process have been invaluable to me. Particularly, I would like to thank Youngsun Baek, Kendall Deas, Carolyn Fonseca, Taehyun Jung, Dirk Libaers, Seongsoo Oh, and Anupit Supnithadnaporn for their heartwarming friendship and bittersweet comments. I would also express my appreciation to Terry Fonseca for her help. I also thank Latissia Caldwell, a member of the staff and a personal friend, for her sincere concern.

Last, but never least, I am most grateful to my family for their support and love throughout this journey. My greatest thanks go to my parents, who have shown faith in me and prayed for me.

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SUMMARY

This research was initiated in the belief that new product development requires the integration of diverse knowledge located in different units or organizations. In recent decades, evolutionary scholars have emphasized the importance of coherent systems and regional scientists have highlighted the importance of geographical proximity for easier transfer of tacit knowledge. Despite the strength of these explanations, they do not adequately address the balance between tacit and explicit knowledge, ignoring different types of knowledge conversion process (Nonaka and Takeuchi, 1995).

My research aims to bring a greater understanding of the integration of diverse knowledge for innovation achievements among different actors. Specifically, this thesis deals with project organization for new product development, exploring three main research areas: (1) company utilization of external companies and freelancers for project formation in relation to resource mobilization of companies; (2) types of knowledge conversion among employees within and between departments; and (3) the impacts of several mediating factors on clustering orientations of companies. These mediating factors include knowledge codification, IT technology for communication, and trust mechanisms that help to mobilize external knowledge and reduce friction among team members.

In this study, data are collected from questionnaire survey (104 firms) and interviews with 34 persons in the Korean game industry. Probit model, tobit model, and OLS regression model were used. The main findings are as follows. First, codified knowledge – concept reports, prototypes, and manuals – is produced through

externalization as a game development project is in progress. Second, among several indicators of internal capability of companies, the type of initial industry –whether game companies started their business in the game industry – and expenditures on the purchase of intellectual property rights from other cultural industries have significant and positive impacts on the utilization of external partners. Third, information communication technology has a significant, negative impact on clustering orientation of companies while reliance on “communities of practice” and “built-in trust” have significant, positive impacts on that. Since the second important factor was labor factor, nurturing labor forces may be set to be a first priority for initial stage of economic development through providing vocational institute and training program. Then, the intervention of local governments on communities of practice as a support team might be needed to compensate a fragmented structure of the communities between large and small companies.

CHAPTER 1

INTRODUCTION

1.1 Research Motivation

The motivation for this research stems from the following questions: How do companies mobilize diverse resources for new product development? How do companies organize and coordinate employees with various types of knowledge and different mindsets? In doing so, how do companies mobilize available resources in their region and how do their strategic behaviors relate to regional clusters?

Historically, geographical concentration of economic activity has interested regional scientists, who have examined cluster regions such as Silicon Valley under the notion of Marshallian economics. This research has traditionally analyzed cluster regions based on static externalities that accrue from specialized input at a lower cost and the existence of a skilled labor pool (Storper, 1997b). However, more recent, analysis has switched its focus from cost-saving externalities to dynamic externalities such as the circulation of knowledge within innovative regional agglomerates and the effects of geographical proximity that facilitate circulation.

This change in focus occurred because evolutionary approaches to the innovation process were finally recognized and because regional competitiveness hinges on technology. Evolutionary approaches emphasize organizational routines and organizational learning, the latter of which assumes that the exchange of knowledge requires both a coherent cognitive framework and strict procedures (the rules of games). In other words, an organizational unit can more easily interact with other innovative

organizational units with the same or similar routines and learn something from them. Regional scientists have aggressively introduced this argument regarding the ease of knowledge transfer owing to coherent systems. From this perspective, geographical proximity plays a crucial role in nurturing coherent systems that promote a common knowledge base and shared rules that facilitate the exchange of tacit knowledge in regional industrial clusters. Therefore, regional scientists have explored how innovative cluster regions achieve coherent systems and construct territories that can be identified by distinctive resources, assets, and rules (Amin and Thrift 1997a, Storper 1997b). In any territory, economic actors exploit the specific territorial resources through cooperation based on shared common knowledge and rules.

One danger with this approach is that it overemphasizes coherent systems, so researchers tend to overlook two important facts: (1) that coherent systems may result in the path dependence of the innovative cluster; and (2) that innovation beyond incremental technological improvements requires the input of original ideas and knowledge. In response to these two problems, regional scientists have begun to concentrate on the enhancement of the reflexivity function of economic actors to avoid the danger of path-dependency in innovative regions (Cooke and Morgan, 1998), and they have attempted to explore the presence of multiple bases of knowledge in various regions (Deroschers, 2001; Florida and Gate, 2001; Rantisi, 2002).

However, these studies assume that geographical proximity is a precondition of the exchange of tacit knowledge, and thus, they do not directly examine the organizing principle of diverse economic actors and their relationship to geographical proximity. Because this assumption has been made partly due to the overemphasis on tacit

knowledge over codified knowledge, the importance of mutual dependence of tacit and codified knowledge in the creation of a new product has been ignored. In order to explain the interactions between diverse economic actors, there is an opportunity to explore how the tacit knowledge of an economic actor is converted to codified knowledge that is understandable to other economic actors with different knowledge bases.

1.2 Research Goals and Objectives

This research attempts to examine how companies integrate diverse knowledge in project organization when they develop a product and how the integration influences their decisions to cluster with their business partners, other firms, and related industries. To answer these questions, this research uses the concept of “externalization” (Nonaka and Takeuchi, 1995) to explore the integration process of diverse knowledge. One area of externalization is through project organization whereby tacit knowledge is codified so that it is understandable to other actors with different knowledge. The spatial organization of project organization is not necessarily associated with geographical proximity among diverse project team members and related economic actors since codified knowledge allows communication among actors in virtual space. Codified knowledge provides economic actors with a common ground on which they can exchange their thoughts and knowledge. In addition, due to the development of information communication technology, the codification of knowledge might lessen the need for geographical proximity. However, the codification of knowledge involves geographic proximity when each project member must interact intensively with other actors to codify tacit knowledge. Moreover, project organization is partly embedded in institutional

endowments since temporary project organizations involve considerable risk and thus require safeguards such as mutual trust. These concepts will be explored through a study of project organizations in the game software industry in Korea.

In summary, this research examines three main research areas: (1) a company's utilization of external companies and freelancers for project formation in relation to the resource mobilization of companies; (2) types of knowledge conversion among employees within and between departments; and (3) the relationships between the externalization process and geographical proximity among the project members. In doing so, this study will examine the impact of several mediating factors, including the presence of codified knowledge, IT technology for communication, and trust mechanisms that help to mobilize external knowledge and reduce friction among team members.

This research utilizes a combination of quantitative and qualitative research methods in a three-step iterative process: (1) conducting initial interviews with scholars and policy makers to obtain a general picture of the game industry in Korea, (2) mailing questionnaire surveys that target software companies for the purpose of examining the organizational and locational characteristics of projects, and (3) conducting in-depth interviews with project members for the purpose of understanding their career-building processes.

By analyzing information about project space and physical proximity, this research will contribute to the understanding of diverse ways of organization and their impact on industrial geography, which will contribute to the field in several ways. First, this research will go beyond existing empirical research (Conford and Naylor, 2001; Egan and Saxenian, 1999; Aoyama and Izushi, 2003) on the locational characteristics of

game companies; however, it will not directly examine the relationships between the software industry and cultural workers/industries. Conford and Naylor (2001) studied the geographical decentralization of publishers (i.e., the producers of hardware and distributors) and the software industry. They found that the British game industry exhibited no geographical proximity between publishers and the software industry. That is, while publishers are primarily located in London so that they have more access to financial communities and clients, the software industry tends to be located in peripheral regions and non-metropolitan regions. While the above study does not examine the relationships between the software industry and cultural personnel or industry, Egan and Saxenian (1999) argue that the strong high-tech base and the migration of creative individuals have led to the rapid growth and geographical concentration of the multimedia industry in San Francisco. In addition, Aoyama and Izushi (2003) alluded to the cultural proximity between the hardware and software industries and the long tradition of *manga* and animation in Japan as sources of competitiveness. Although these two studies begin by emphasizing the important role of creative individuals or the cultural industry, knowledge exchange between cultural contents and the software industry and the relationship between the exchange process and geographical proximity are not concretely examined. This research will provide empirical evidence of how cultural content as a core competitive element in the game industry can be integrated into technological forms.

Despite increasing research efforts by some scholars to analyze project organization as a means of integrating diverse knowledge, only a slim body of empirical research on project organization has been conducted, primarily in western countries and

in certain industries such as the advertising and publishing industries. Thus, by researching the game industry in South Korea (hereafter referred to as Korea), a part of East Asia, this research will contribute to expanding the applications of project organization research in a geographical and industrial sense. In addition, it will improve upon existing research on geographical proximity and innovations by explaining the process of the integration of diverse knowledge in regions and overcoming the dichotomy between tacit knowledge and codified knowledge.

1.3 Overview of the Chapters

Chapter 2 reviews the existing literature that addresses the interactions between evolutionary approaches and regional studies. The review mainly covers the roles and importance of a coherent cognitive framework and diversity in achieving an innovation. This chapter begins by outlining the key ideas of evolutionary approaches, then addressing learning and interaction among related actors on an organizational level based on a coherent framework and diversity and finally discussing how regional studies adopt the ideas of evolutionary approaches but remain somewhat limited in terms of diversity. Based on this discussion, Chapter 3 presents the hypotheses and the data and methodology used to analyze the hypotheses. The hypotheses suggest a focus on (1) the decisions of companies to utilize external partners (i.e., outsourcing) and (2) the relationships of outsourcing with geographical proximity to other related actors. Chapter 4 presents the characteristics of the game industry, its new product development process, and the current developments of the Korean game industry.

Chapter 5 explores the strategic behaviors that game companies exhibit when they mobilize their internal employees and external partners based on an analysis of the characteristics of the labor market in the game industry. This chapter emphasizes the roles of “communities of practice” (Wenger, 1988; Wenger and Snyder, 2000) and examines the outsourcing decisions of the companies in the game industry. Chapter 6 presents how team members with diverse knowledge and skills in the projects for game title development interact, relying on codified knowledge and communication technology. In addition, this chapter explores how game companies interact with external actors such as publishers and game players to access other diverse knowledge and viewpoints. In this chapter, multiple codified forms of knowledge, such as the concept report and detailed plans, prototypes, and manuals in a codified form of knowledge are addressed. Chapter 7 discusses the various locational decisions of outsourcing companies that rely on the external partners to access diverse knowledge and compares them with the decision of non-outsourcing companies. With regard to the locational decisions of outsourcing companies, the hypotheses, related to the impact of several mediating hypotheses on locational decisions, are examined. Finally, Chapter 8 discusses the limitations and the policy implications of this study.

CHAPTER 2

LITERATURE REVIEW

The issue of the geographical concentration of economic activity has long been the focus of regional scientists. Research in this field has generally followed the theory of Marshallian economies, the sources of which reside outside firms¹. Marshallian economies have three sources: specialized suppliers, a labor pool, and knowledge spillover (Breschi and Lissoni, 2001). Traditional regional studies mainly address the co-locations of firms in terms of the former two economies, a so-called static externality that arises without any changes in technology, and argue that the agglomeration region is an outcome of cost minimization² (Storper, 1997b). However, the role of knowledge spillovers—dynamic externalities—in fueling economic growth in agglomeration regions has only recently been the subject of considerable discussion. This change has occurred as a result of evolutionary approaches to innovation as well as the realization of the increased role of technology in regional competitiveness.

This chapter reviews the key ideas of evolutionary approaches (section 2.1), discusses recent developments in regional studies influenced by the evolutionary

¹ Agglomeration economies are external since they involve “cost savings to the firm which result from the concentration of production at a given location, either on the part of the individual firm or by firms in general” (Parr, 2002: 718).

² Californian school (Scott 1988a, 1988b) is one representative example of static externality study. Scott (1988a, 1988b) explains the formation of industrial districts by using the term “linkage costs.” Under the conditions of market uncertainty and fragmented customer demand, firms need to be vertically disintegrated when they search for flexibility and can do so only when they agglomerate since geographical proximity allows firms to reduce linkage costs to find their suppliers and workers.

approaches (section 2.2), and then addresses the limitations of the existing literature (section 2.3).

2.1 Innovation Studies: Evolutionary Theories

Evolutionary approaches to innovation aim at linking technology, organizations, and institutions (Nelson and Winter, 1982; Dosi and Malerba, 1996). Among the several ideas of evolutionary approaches, the one most frequently adopted by regional scientists is that individuals' innovation activities in organizations are coordinated through "organizational routines."

In the seminal work of Nelson and Winter (1982), they argued that the innovation process is full of "uncertainty"³ due to "bounded rationality" and "routines," that leads mistake-ridden discoveries and an imperfect adaptation (Dosi and Nelson, 1994). Then, what is routine? What are the roles of routine in learning? According to Cohen et al. (1996: 683)⁴,

A routine is an executable *capability* for repeated performance in some *context* that has been *learned* by an organization in response to *selective pressures* (Italics in original).

³ Uncertainty differs from risk. The former cannot be forecasted whereas the latter involves a probability estimate (Storper, 1997b). Furthermore, the evolutionary concept of uncertainty is different from the concept in transaction cost economics. Transaction cost economics concerns the occurrence of uncertainty due to opportunistic behaviors of contracting parties (Maher, 1997).

⁴ Since Nelson and Winter's proposition of routine, the concept has widely but sometimes vaguely been used and thus several representative scholars (Cohan, Burkhart, Dosi, Egidi, Marengo, Warglien, and Winter) in evolutionary approaches gathered to discuss the organizational routines at a workshop held August 10-13, 1995, at the Santa Fe Institute. The article reports the discussion results (Cohen et al., 1996).

In the above definition, selective pressures can be understood as market environments. Capability⁵ is “characterized as the capacity to generate action, to guide or direct an unfolding action sequence” (Cohen et al., 1996: 382). What should be noted here is where the nature of routine comes from: it is “context” and “learned” at an organizational level. Routine has been constructed and accumulated by past learning of organizational-specific equipment, strategies, and human resources. Organizations repeatedly adopt and practice newly acquired knowledge when learning outcomes are effective to solve their problems. Such repeated applications standardize learning results and “institutionalized [them] in the form of standard operating rules (routines)” (Dosi and Malerba, 1996: 6). These are mostly embodied in the organizational routine in the form of tacitness that cannot be easily articulated.

Through past learning experiences, routine provides organizations with shortcuts in knowledge-seeking activities. It offers specific knowledge areas and personnel as well as procedures and rules for solving problems. Routine provides a common cognitive framework and agreed rules of procedure, all of which are shared among the organization members (Dosi and Nelson, 1994; Nelson and Winter 1982; Nonaka and Takeuchi, 1995;

⁵ The terms “routine,” “competence,” and “learning” are sometimes used interchangeably since these three terms refer to the same phenomenon. However, for ease of understanding, it should be more precisely defined. According to Dosi and Marengo (1994: 160), competencies represent “the problem-solving features of particular sets of organizational interactions, norms and—to some extent—explicit strategies.” However, as to competence in relation to routine and learning, competence is embodied in routine and the outcome of internal learning and a response to environmental changes (Dosi and Malerba, 1996).

Kim, 1998). These elements allow organization members to communicate with one another more easily without creating cognitive gaps and political conflicts⁶.

Despite the positive role of routine in the learning process, it tends to limit the boundary of search efforts. As mentioned earlier, learning usually takes place based on existing knowledge, and it is guided by specific cognitive frameworks, so-called heuristics, which is one dimension of routine⁷ (Dosi and Nelson, 1994; Nelson and Winter, 1982). Heuristics refer to “concepts and dispositions that provide orientation and a common structure for a range of similar problem-solving efforts” (Cohen et al., 1996). Hence, heuristics restrict the learning behaviors of organizations in terms of the identification of problems, range of knowledge, and search efforts. Therefore, learning becomes local and cumulative (self-reinforcing) within a specific knowledge (Dosi and Malerba, 1996; Nelson and Winter, 1982). Once any knowledge obtained by a specific type of learning behavior provides a solution to a problem (although it is not the optimal result), that learning mechanism will be accepted as a routine and then the following learning activities will be carried out within the specific technological trajectory (Cimoli and Dosi, 1995; Dosi and Nelson, 1994). This self-reinforcing nature of learning

⁶ According to Nelson and Winter (1982: 110), routine “involves a comprehensive truce in intra-organizational conflict and functions as a coordination mechanism since it provides implicit agreement among actors, for example, supervisors and workers.” Therefore, routine imposes the shared rules about what procedures should be conducted for a problem-solving activity “by unit” on every organization member. It resolves problems with reluctance by certain working groups within an organization.

⁷ Routines might be categorized into three types: (1) “standard operating procedures” that determine how much a firm produces without any change in capital stock and in other factors of production, given resources, and constraints; (2) routines that determine the investment behavior of firms; and (3) routines as heuristics that determine what the nature of problem is, what range of search efforts should be made, and how organizations should solve the problem (Dosi and Nelson, 1994).

sometimes leads to path-dependency⁸, organizational inertia (Schoemaker and Marais, 1996), and lock-in.

The above evolutionary thoughts may be summarized as follows: (1) routine is organization-specific since it originates from the learning history of agents; (2) such routine is more likely to exist in the form of tacitness that is not easily articulated and transferred; (3) organizational-specific routine offers both a common cognitive framework and shared rules with each organizational member that might facilitate more active interaction among them; and finally, (4) learning tends to be local, cumulative, and self-reinforcing, and problems of path-dependency might occur.

The innovation process is somewhat contradictory, however, as it cannot be achieved without new ideas, either totally new or already present, “outside” of a firm. In addition, it simultaneously requires a common ground for coordination among actors. Both diversity and coordination mechanisms are necessary to innovation.

It would be natural for evolutionary theorists to take the next step toward exploring how organizations can achieve both diversity and coordination in their learning mechanism. Marengo (1992) examines the internal structure of firms and its effects on innovation, stating that an ideal organization for innovation exists between complete centralization and complete decentralization and allows its divisions that have their own cognitive model to communicate and coordinate actions “via horizontal communication.” A decentralized organization can preserve a distinctive cognitive model and knowledge

⁸ The term, path-dependency, describes this phenomenon: firms and industries continue to develop or use particular technologies or organizational arrangements although they are not the best practices or optimal situations. The economic justification for path-dependency was explained as either “increasing returns” or high start-up costs” (Scherrer, 2004). That is, the past choice of organization limits the number of available alternatives that condition current decisions (Gertler, 2004: 24).

base in each division but fail to coordinate the division; and a centralized organization cannot solve a new problem due to coherent systems.

Several scholars (Levinthal, 1996; Wenger and Snyder, 2000; Malerba and Orsenigo, 2000; Bottazzi et al., 2001) have noted the diverse base of knowledge that exists outside organizations. Such a knowledge base is another way to enhance the innovation capability of firms. Levinthal (1996: 36) claims that innovation opportunities can be expanded if a firm has access to “multiple bases of learning,” which are represented by “communities of practice.” Communities of practice refer to “groups of people informally bound together by shared expertise and passion” in a certain field (Wenger and Snyder, 2000: 139).). In this group, members exchange their knowledge and experiences that are not firm-specific. In this case, one member functions as a “broker” and “coordinator” during the adoption of new knowledge into his firms. He gets a sense of new knowledge through interactions with other members in the communities of practice and can modify the knowledge according to the specific environment of his firm. On the other hand, research at an industrial level focuses on the entry of firms, selection, and innovative learning.

Using a simulation model, Bottazzi et al. (2001) confirms the “oligopolistic phase”—low entry and low rivalry—obstructs the generation of new knowledge whereas the “divergent phase”—massive entry—disrupts the process of adaptation and prohibits self-organization of a company. They suggested that the phase that lies between the above extremes is a “healthy evolutionary phase,”

Such evolutionary research provides some insights (or principles) into the innovation process. First, a firm must have a diverse knowledge base to trigger

innovation beyond gradual technological improvements and technological vitality through new combinations of knowledge, and if it does, it can solve the problems of path-dependency. Therefore, firms should be able to identify and engage in diverse sources of knowledge such as communities of practice and preserve diversity within their organizations.

Second, although diversity is a key requirement for innovation, it does not always provide organizations with opportunities to produce new knowledge and new products. In order to do so, diversity should be coordinated, for example, through a horizontal network within organizations. The coordination problem involves common cognitive knowledge base and the same rules of games with regard to what procedures should be done by whom.

2.2 Regional Innovation Studies

The theoretical developments in evolutionary approaches discussed above have had a great impact on regional studies. In the last two decades, regional studies have begun to focus on the importance of knowledge spillover among the three sources of Marshallian economies. Similar to the evolutionary approaches to firms as learning organizations, regional scientists have identified agglomeration regions as “learning regions” (Florida, 1995), “national/regional innovation systems” (Lundvall, 1992), “externalized learning institutions” (Cooke and Morgan, 1998), and a locus of “relational assets” (Storper, 1997a, 1997b). In the research, geographical proximity is hypothesized as a crucial factor in facilitating the exchange of knowledge, particularly tacit knowledge. The basic argument of the study is that geographical proximity plays a crucial role in

nurturing coherent systems in terms of the knowledge base and rules of games that are considered as preconditions for knowledge exchange in evolutionary approaches.

Geographical proximity in agglomeration regions promotes “collective learning” of local actors, which refers to “a social process of cumulative knowledge, based on a set of shared rules and procedures” (Capello, 1999: 354). Collective learning is possible “thanks to common technological, organizational and institutional routines and behaviors” (Capello, 1999: 356). According to this logic, collective learning automatically occurs because of commonalities among actors in both technological and institutional dimensions, but it does not occur in firms in different regions since the commonalities are region-specific. Therefore, collective learning and its outcomes are “club” goods that only firms in one region have and that external agents are prohibited access to⁹.

The above literature has raised some interesting questions: How can technological, organizational, and institutional proximity be defined, and how can proximity and trust be developed? Technological proximity, which is complementary to technological knowledge¹⁰, can be naturally developed during the economic development of regions. Once certain firms are located in a region, they purposely modify the economic environment of that region according to their specialized demands. Then specialized

⁹ However, at this point, when we consider Capello’s (1999) distinction between industrial districts and innovative milieux, the notion of a social process of collective learning is somewhat confusing. If traditional industrial districts are characterized by several proximities such as cultural proximity, as he claims, knowledge should automatically be circulated in that region.

¹⁰ In fact, technological proximity can not easily be assessed by regional scientists. Therefore, in empirical studies, researchers, in questionnaires, tend to ask about “complementary knowledge, a common approach with suppliers to technical aspects, and trustworthiness in cooperation” with firms (Capello, 1999).

suppliers are attracted to the region, thus developing technological proximity in spite of the “ubiquitification” pressure of globalization (Malmberg, 1999; Maskell and Malmberg, 1999). In spite of the relatively clear definition of technological proximity, organizational and institutional proximity has been somewhat vaguely defined. Kirat and Lung (1999: 30) argue:

Organizational proximity serves to connect the set of agents participating in a finalized activity within the scope of a particular entity. This form of proximity relied upon a certain consistency in the configuration of relationships between agents, and is structured around a common cognitive framework. (Kirat and Lung, 1999: 30)

Institutional proximity... indicates the assembly of agents as parties to a common space composed of representations, models, and rules being applied to thought and action. (Kirat and Lung, 1999: 30)

In this argument, organizational proximity does not refer to the same “internal” organizational structures, and we can hardly say organizational proximity is an independent substantive element, since it seems to be underpinned by institutional proximity¹¹, which offers a coherent cognitive framework and stable/recognized rules at a regional level. This concept is actually similar to the concept of “conventions” (Storper, 1997a, 1997b), which lie beneath transactional linkages. The conventions exist in several dimensions: patterns of resource mobilization; labor markets and inter-firm relationships;

¹¹ Kirat and Lung (1999) follow the notion of North on institution. Simply put, institutions are formal and informal constraints on actors’ behaviors in terms of value systems and thus involve rules of the game, whereas organizations are a place where economic actors take action to accomplish goals according to the permitted rules of the game (quoted from Kirat and Lung, 1999).

conventions that define product quality; relationships between key innovating groups and other groups; the roles of regional and local third parties in harmonizing preference structures; and the ideologies and cultures of local economic actors (Storper, 1997b: 136).

Such conventions reduce uncertainty by facilitating the exchange of knowledge and by reducing the degree of heterogeneity (Storper, 1997b, Maskell and Malmberg, 1999). It provides economic actors with a foundation upon which to build trust. Then, how can regions develop their own distinctive conventions? One explanation for the development of conventions in agglomeration regions comes from the emphasis on the roles of both firm and non-firm organizations. Amin and Thrift (1994, 1997) stress the role of “institutional thickness,” or institutional embeddedness, into a region¹². Imagine all organizations intensively interacting with one another while having a voice in their interests and concerns in an interlocking web of firm and non-firm organizations, such as business support agencies, universities, trade associations, local chambers of commerce, training agencies, and unions. The negotiation process that takes into account all interests in the web develops conventions as well as a regional strategic vision and a broad economic governance capability. This process accelerates the formation of community solidarity and thus a high degree of mutual trust.

Another reason for trust and conventions in regions is suggested by Maskell and Malmberg (1999). In a place where the number of actors and their mobility is limited, the actors have to prove their continued trustworthiness and follow the rules, or they will

¹² Keeble et al. (1999) analyze small and medium-sized high-tech enterprises in the Cambridge region and suggest that by the mid-1990s, the Cambridge region had developed some base for institutional thickness in relation to a science park infrastructure and local business services and recently established several associations with organizations that included the government, the university, and firms for developing consensus among them.

be penalized by their community. This occurs whether or not they are not willing to cooperate, which produces “shared trust”¹³ in the regional dimension. The shared trust encourages interaction among firms and establishes the localized economic trajectory that involves common technological (tacit) knowledge and vision.

2.3 Limitations of the Existing Literature

The arguments of existing regional studies are theoretically weak in several ways. The first problem is that their theoretical framework on the positive relationships of geographical proximity with the interactions of local actors and the innovation process is too simplistic. Harrison et al. (1996) found that innovation is not associated with the density of agglomerations of similar industries. Rather, it is positively associated with metropolitan regions that enjoy urbanization economies. Likewise, Angel (2002) concluded that U.S. manufacturing firms located in specialized agglomeration regions are less likely to collaborate with each other than those in major urban centers. Other empirical studies show that sources of innovation that reside outside of agglomeration regions are more important in the Cambridge (Keeble et al., 1999) and Goteborg regions (Dahlstrand, 1999).

Second, this empirical counterevidence on the positive relations of geographical proximity and innovation is related to the misunderstanding on the acquirements of tacit knowledge. In the argument, although firms whose activities involve explicit knowledge are hypothesized to be geographically dispersed, the exchange of tacit knowledge

¹³ “Shared trust” differs from social capital (Putnam, 1993) in the sense that while the former is the action rules of people wary of penalty, the latter refers to a “generalized trust” (unconditional trust).

requires geographical proximity. This simplified dualism is partly due to the ignorance of “knowledge conversion” (i.e., the interactions between explicit and tacit knowledge).

Nonaka and Takeuchi (1995)¹⁴ challenge the arguments that overemphasize tacit knowledge and ignore the role of explicit knowledge in the generation of knowledge. They claim that new product development in an industry requires the integration of diverse knowledge located in “different” units or organizations, and the integration process can be achieved only by externalization—the transfer of tacit knowledge to explicit knowledge. During the externalization process, the tacit knowledge of individuals is transformed into codified knowledge clearly expressed in a verbal or written form (Nonaka and Takeuchi, 1995) that allows actors to communicate with one another to integrate the different knowledge into new knowledge. In this case, since codified knowledge can be circulated through the actors via documents, telephones, or information technology, geographical proximity among actors does not seem to matter.

In addition, Bengtsoon and Söderholm (2002) proposed hypothetical arguments that every functional division in a modularized production system produces its own tacit knowledge and converts it into a codified form to transfer the knowledge to other divisions of their organization. In this case, they simply meet different actors from time to time for the integration of explicit knowledge and do not need to do so very often. On the other hand, if the innovation process is difficult to break into several stages, externalization strictly depends on face-to-face interactions and continual updates, so this case is more likely to locate closely.

¹⁴ Their four modes of knowledge conversion are: (1) socialization (tacit to tacit), (2) externalization (tacit to explicit), (3) combination (explicit to explicit), and (4) internalization (explicit to tacit).

Another recent empirical study of knowledge exchange argues that innovative cluster is composed of several “epistemic communities” formed between firms and their suppliers and customers. (Breschi and Lissoni, 2001; Lissoni, 2001). Epistemic communities are described as follows:

Small working groups that work on a mutually recognized subset of knowledge issues, and who at the very least accept some commonly understood procedural authority as essential to the success of their collective knowledge-building activities (Lissoni, 2001: 1482)

The epistemic community itself is similar to the concept of coherent learning regions mentioned earlier in the sense that the community shares common knowledge and rules of the game such as “how to conduct research and some norms for the identification of what kind of knowledge ought to be shared and with whom” (Lissoni, 2001: 1482). However, the concept of such a community is distinctive in the sense that it is open to only small working groups within it and closed to other firms located in the same region. So how do they work on technological innovation? The members of the community work on projects or activities, always relying on their codebook, which is a “firm-specific language used for exchanging technical or scientific messages” (Breschi and Lissoni, 2001: 988). This codebook is the result of the externalization process between suppliers and contracting companies and something that is developed by intensive “interactive” efforts to transfer tacit knowledge to codified knowledge (Nonaka and Takeuchi, 1995). Therefore, the epistemic community evolves around firm-specific relationships. In this argument, knowledge is circulated only within the epistemic community based on a codebook—an externalized form of tacit knowledge (Lissoni, 2001: 1499).

Third, the over-emphasis of coherent systems in regional studies tends to ignore the path-dependency problem and the importance of diversity. However, common cognitive frameworks and knowledge that are considered the strength of regional systems might result in a lack of understanding of technological changes that take place in other regions and an ignorance of technological opportunities (Grabher, 1993)¹⁵. In reaction to the path-dependency problem, Cooke and Morgan (1998: 73-74) emphasize the enhancements of the reflexivity function of the innovation system, which refers to the activities to contemplate “whether ends or means need to be changed” (e.g., changing products and markets), to assess the regional innovation system by comparing it to external peer systems, and to focus on the relationship of different elements within the same system for integration.

However, although the intentional actions of local actors should not be overlooked, one question has not yet been answered: How can regions move beyond the existing trajectories when local actors set a new trajectory as a goal? In order to deviate from the existing trajectory, regions should preserve a diverse knowledge base within themselves, such as the decentralized organizations mentioned earlier in evolutionary approaches, or they should rely on external sources¹⁶. In this sense, Florida and Gates (2001) produced evidence of the positive relationship between the openness of a city to a diverse population and the growth of high-tech industry. However, the research does not explain

¹⁵ Grabher (1993) argues that strong, long-term relationships of private and public organizations cause cognitive, technological, and political lock-in of firms and regional decline.

¹⁶ Rantisi (2002) examines how, in his empirical study, the local actors of the New York Garment District utilize another cluster (an emerging design cluster on the Lower East Side) that is dissimilar but in the same industry to catch the current market trend by means of shopping in the stores and consulting designers of boutiques.

how diverse knowledge and people in a city are mobilized and utilized for innovation activities.

Other research examines the source of diversity in specialized agglomeration regions. Several scholars have argued that firms can achieve diversity on the basis of “parallel experimentation”¹⁷ (Losby, 2000; Malmberg and Maskell, 2002; Maskell, 2001). In this argument, even companies in the same industry are assumed to have different views and perceptive powers, and thus, they handle the information differently and conduct their own experiments. Cluster regions are assumed to be composed of many such firms, which are not completely dissimilar. In the case of co-locating firms, geographical proximity allows firms to monitor, compare, and imitate the technologies of other firms in the region through “observability” and “comparability.”

The above argument, however, is somewhat limited, as it does not completely explain the “innovation” process. If one firm successfully and easily imitates another firm without any interaction, the knowledge might be associated with gradual improvement. Moreover, some companies, particularly high-tech companies, are very cautious about exposing their technology and strategic decisions, so clearly diverse knowledge is not easily accessible to all those who want it within innovative regions.

2.4 Implications of the Literature for this Research

This chapter identified and reviewed key elements in the evolutionary approaches and regional studies that focus on innovation processes at an organization and regional level. The existing literature suggests that the learning process and searching patterns for

¹⁷ Marshall long time ago pointed out the advantage of a parallel experimentation and his argument is recently re-introduced by Losby (2000).

innovation are conditioned by organizational routines and by its geographical version, regional conventions. Such routines and conventions are historically nurtured in the course of learning and the problem-solving process over the history of organization and regions. The main arguments for the routines and conventions are that (1) they exist in a tacit form that is not easily circulated to other people, and thus (2) communications among people with different knowledge and routines are not easy, so a coherent cognitive structure and a common knowledge base are critical requirements to the exchange of knowledge and lead to other innovations.

Recently, however, several scholars (Angel, 2002; Bottazi et al., 2001; Dahlstrand, 1999; Harrison et al., 1996; Keebale et al., 1999; Levinthal, 1996; Malerba and Orsenigo, 2000; Marengo, 1992), evolutionary approaches, and regional studies, either theoretical or empirical, have claimed that a coherent system of organizations and regions may hinder innovation and suggested that diverse knowledge must exist and be exchanged through some organizational arrangement such as horizontal networks or deliberate efforts by sectors in the regional community.

This recent shift of research focus in existing studies provides some guidelines according to which this study can be conducted. First, the innovative process should be explored with a balanced view that addresses both diversity and coherence. Particularly, this research explores the hiring practices and patterns of game companies when they recruit new employees and business partners for outsourcing to acquire individuals with new ideas and diversity. Second, to fulfill this balanced view in the dimension of absorbing diverse knowledge, innovation process—the process of game development—will be explored within a framework of knowledge conversion (Nonaka and Takeuchi,

1995, Krogh et al., 2000)—the interaction between tacit knowledge and explicit knowledge. It may be worthwhile to examine the conversion of tacit knowledge into explicit knowledge during each stage of the game development process and explore the tools and mechanisms that facilitate such a conversion.

CHAPTER 3

HYPOTHESES AND METHODOLOGY

3.1 Research Questions

As mentioned in Chapter 2, regional studies on diversity and innovative cluster regions do not explicitly explain how diverse knowledge is mobilized and organized in a geographical sense. If we consider the existence of diversity and its significant role in the upgrading of innovation in cluster regions, we should maintain a balance between the diverse knowledge and the “frictionless” coordination among them. Several research efforts have linked diversity and coherence on the basis of interactions among business organizations, or “organizing diversity” (Grabher and Stark, 1997).

In the empirical study on the advertising industry in London, where relatively small- and medium-sized companies are dominant, Grabher (2001) discussed the existence of “heterarchies.” The five basic features of heterarchies are diversity, rivalry, tags, projects, and reflexivity. While the former two are disintegrative forces in innovative regions, the latter three function as integrative forces. Tags is referred to as a shared self-identification of people within a group regarding rules, protocols, direction for the group. According to Grabher (2001: 354), “tags prevent the polyphony of philosophies and worldwide views within heterarchies from turning into noise.” Tags relate to their own identification in the regions: “We are leading a second wave of advertising industry on the basis of ‘creativity of small companies.’” In addition, tags affect the formation of shared “rules,” along with reflexivity, which involves the self-

identification of their industry on the basis of reviews and evaluations of outsiders' view (e.g., mass media and scholars' definitions of the advertising industry as a cultural industry, not as a business service). In short, tags and reflexivity play the same role as conventions, which is to stabilize interactions.

How is diversity in regions utilized by organizations so as to minimize what Grabher calls "noise"? Several scholars, in addition to Grabher, suggest "project space" as one example in which diverse actors interact with one another (Ekinsmyth, 2002; Grabher, 2001, 2002a, 2002b; Grabher and Stark, 1997; Sydow and Staber, 2002). One type of organization in which the externalization process occurs is the project space. A project organization is constructed for a specific task, and its members belong to different knowledge areas. When the task is complete, it is dismissed. Due to the temporary nature of project organization, a project organization also needs trust as a safeguard and precondition of interactions among members in order to alleviate severe uncertainty about the project organization. One source of trust stems from the past experiences that project members shared (Sydow and Staber, 2002). Other sources are broader institutional endowments such as the reputations within communities of practice (Grabher, 2002a) and the existence of training institutes that provide a human resource pool (Sydow and Staber, 2002).

This research seeks to contribute to the understanding of the integration process of diverse knowledge and its geography among actors through a case study of the game software industry in Korea. Specifically, this research deals with a project organization for the development of new products as an angle to eventually explore the locational

decisions of companies. A project organization is an area where externalization occurs among members with different backgrounds.

In this thesis, three sets of research questions on externalization and geographical proximity are explored:

- (1) When do companies utilize external companies and freelancers for project formation? What are the relationships between the resources of companies and the presence of project organizations?
- (2) What types of knowledge conversion occurs among employees within and between departments? How are organizational decisions made and how are organizational conflicts solved?
- (3) What are the relationships between the externalization process and geographical proximity among other related economic actors? How does the trust-building process and interaction among project members influence the locational decisions of companies?

These questions will be addressed through a case study of the game industry in Korea, which, as in 2004, is the largest market in online game (Korea Game Development and Promotion Institute, 2005: 56). The structure and characteristics of the Korean software game industry are briefly discussed in Section 3.3 and presented in detail in chapter 4. The following section details specific hypotheses that flow from the assessment of the literature and research questions.

3.2 Hypotheses

This research is based on seven hypotheses that examine the relationships between the resources of companies and the presence of project organizations and traces the impact of several mediating factors on clustering (with geographical proximity among the economic actors). The first three hypotheses relate to research question on company utilization of external partners (outsourcing); the next four hypotheses are developed from the research about the impacts of several mediating factors on clustering orientations of the Korean game.

Mobilization of External Partners for Project Organization

The issue of whether companies utilize project organizations is related to the boundary of companies: vertical integration or disintegration. In other words, this decision on the boundary of companies can be rephrased into whether companies outsource their activities or not. This decision is based on two important determinants: (1) technological leakage and (2) the resources of companies (Langlois and Robertson, 1995). Although high-tech companies are very cautious about exposing their technology and strategic choices, they should purchase new resources or external resources if they do not have proper internal resources such as machines and human resources. In addition, the danger from technological leakage seems to be less prevalent in the Korean game industry. Due to a shorter history of the game industry, the Korean game world is still quite small. Presidents and major developers of Korean companies are not only well acquainted but also aware of the repercussions of a bad reputation resulting from misbehavior, as evidenced in the following quote:

The game industry is a small world. The CEOs or development executives in major companies shared the sweets and bitterness of their life in early days of the game industry. Some of them started the business together at the time, and later operated their own business, so they know the implicit margin line for technological leakage. (Interview with JSC, Customer Service and Public Relations, March 17, 2006)

Despite the importance of technological leakage, this research focuses on the relationships between resources and the outsourcing decisions of game companies.

Unlike traditional research such as transaction cost economics, resource-based theory suggests that R&D outsourcing or external partnerships are driven by the internal capabilities of firms (Mol, 2005; Brown and Potoski, 2003). In other words, a firm will outsource its activities if the activities are either not specialized or in non-core fields based on the strategic decisions of the firms. On the other hand, an outsourcing decision may also be influenced by other capabilities such as organizational capabilities of coordinating internal resources and external partners and technological capabilities.

To develop new game software, the labor force inside a firm is a crucial resource. Therefore, if software companies can employ individuals whose expertise is in the cultural sectors, they do not want to rely on external resources through project organizations for fear of technological leakage. In addition, if companies utilize existing cultural content such as animation and *manga* (i.e., comic books), the need for cultural workers inside firms will decrease and thus these companies will be less likely to rely on external actors than other firms.

At this point, we should remember that the decisions about whether or not to buy external resources are also dependent on the presence of resources. In addition, the

resources may not be measured simply by the number of employees or physical equipment and machinery, but by the knowledge base and innovative capacity embodied in the each of employees within the same level of resources. This research uses the historic characteristics of game companies based on the nature of knowledge cumulativeness. Therefore, the degree of use of external partners can be described as follows:

Hypothesis 1: Game companies employing more cultural workers are less likely to utilize external partners such as external firms and freelancers [i.e., the internal workforce hypothesis].

Hypothesis 2: Game companies that import their cultural content from existing industries such as animation are less likely to utilize external partners such as external firms and freelancers [i.e., the Intellectual Property Rights (hereafter, IP) purchase hypothesis].

Hypothesis 3: Game companies that have been accumulating knowledge assets in the game industry are less likely to utilize external partners such as external firms and freelancers [i.e., the history hypothesis].

Mediating Factors I: Knowledge Codification and Information Technology

The relationships between knowledge transfer and geographical proximity among project members involve several mediating factors. Assuming the tacitness of knowledge, regional studies have emphasized the importance of the clustering of firms. However, firms as cost-minimizers and efficient organizers of knowledge assets have tried to

formulate their own knowledge and clarified the different concepts required for processing complicated production processes. As Nonaka and Takeuchi mentioned, knowledge can be codified at a certain level that is not necessarily tacit in nature. The achievements of such efforts may function as centrifugal forces so that the externalization process can be geographically dispersed and the proximity among project members is not considered as important. The need of face-to-face interaction might decrease except during the initial stage of the project.

Another factor can be considered to be against geographical clusters. Codified knowledge as an outcome of externalization can be channeled among project members very easily through “virtual locality” (Grabher 2002a; Bengtsson and Söderholm, 2002) such as project-specific mailing lists or a certain secured website.

Hypothesis 4: If game companies have a well-documented form of their knowledge and production process, the geographical proximity among other related economic actors is not important [i.e., the codification hypothesis].

Hypothesis 5: If software companies have project-specific mailing lists or a secured website for interactions among project members, geographical proximity among other related economic actors is not important [i.e., the IT hypothesis].

Mediating Factors II: The Trust-Building Process during the Formation of Projects

Although the project organization distributes codified knowledge through documents and knowledge exchange, supported by information technology, geographical proximity can still be important since it requires trust among its members (see Figure 3.1 for a simple and a complex model). Particularly, project organization demands more trust because of its nature as a temporary, risky, and task-oriented entity (Ekinsmyth, 2002; Grabher, 2001, 2002a, 2002b; Grabher and Stark, 1997; Sydow and Staber, 2002). The crucial issue is how firms can find trustworthy people during the formation of a project. One source of trust is a “built-in trust” (Maskell and Malmberg, 1999), which is accumulated based on the evaluation of the past experiences among project members (Sydow and Staber, 2002). This reliance on built-in trust does not imply specific spatial tendency because stable relationships with project members allows the members to decide their locations without consideration of competition in the bidding markets. However, if the formation of projects relies on “geographically-clustered networks of resources (among the most important are human resources)” (Ekinsmyth, 2002: 232), geographical proximity will be important. In some industries such as the game industry, which does not have a reliable formal educational system, those who want to work in the industry must prove their ability and reliability in the “communities of practice,” or “groups of people informally bound together by shared expertise and passion” (Wenger and Snyder, 2000: 139). In order to break into the industry and achieve a strong reputation, new entrants usually move to agglomeration regions since the communities of practice tend to be geographically fixed (Grabher 2001, 2002a, 2002b). In other words, the accessibility of firms to the communities of practice guarantees that accessibility to

both a diverse knowledge base and trustworthy individuals. In line with this argument, another favorable environment might be the recommendation and/or existence of vocational institutions (Egan and Saxenian, 1999).

[Hypothesis 6]: If the formation of a project relies on “built-in trust,” geographical proximity among other related economic actors will not have specific spatial tendencies [i.e., the built-in trust hypothesis].

[Hypothesis 7]: If the formation of a project relies on “communities of practice,” geographical proximity among other related economic actors will be important [i.e., the communities hypothesis].

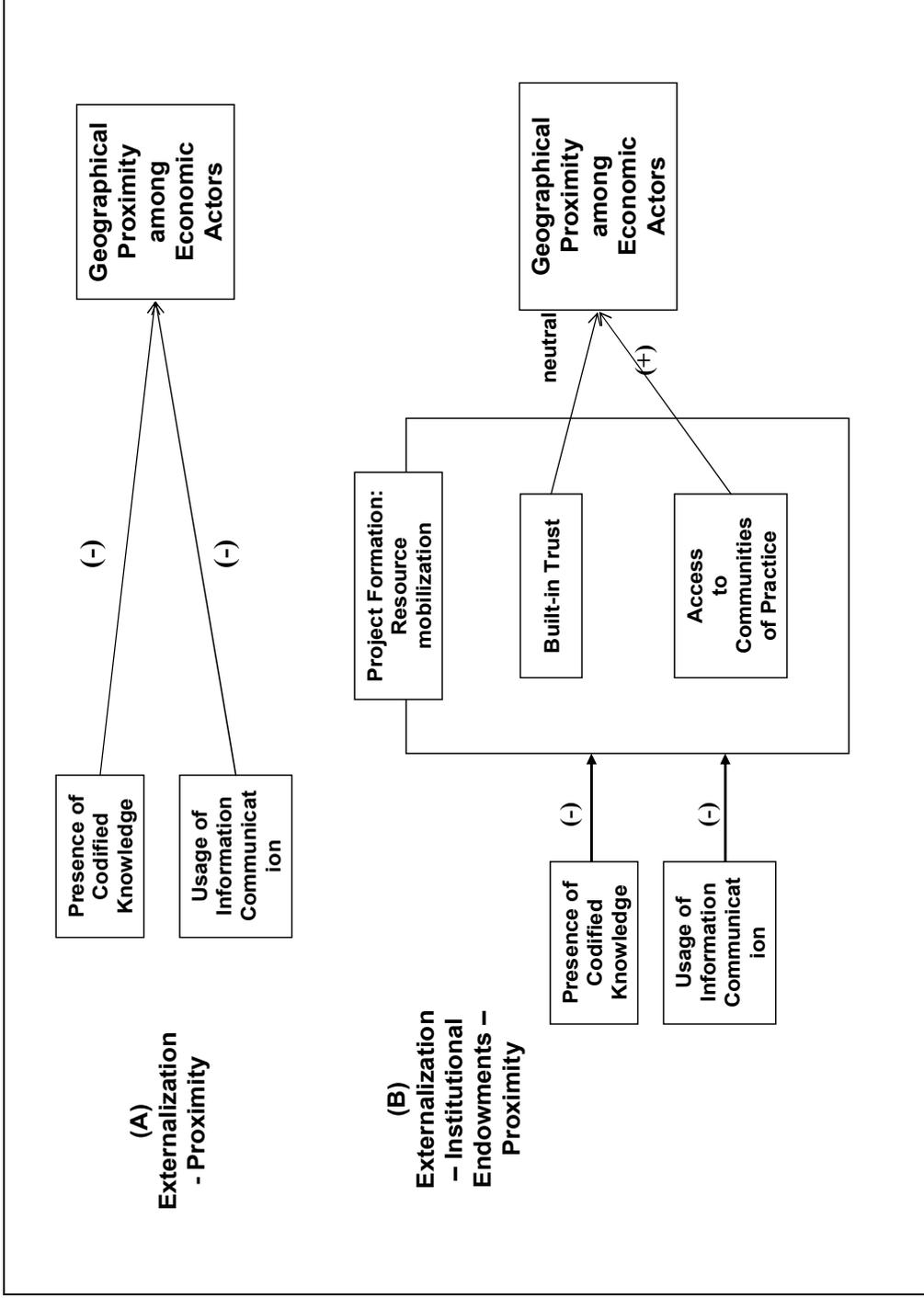


Figure 3.1. A Simple Model without Trust (A) and a Framework of This Research with Trust (B)

3.3 Case Study Areas and Methods

3.3.1 Case Study Areas

Despite the increasing recognition of the importance of a process of combining diverse sources for innovation and the research efforts of some scholars on the analysis of project organization as a means of diversity integration, only a slim body of empirical research on project organizations has been done by western countries and limited industries such as the advertising industry and the publishing industry. This research seeks to contribute to our understanding of the project organization of the game software industry in Korea.

Choice of Industry

The game industry is a hybrid that draws on both the multimedia industry and the cultural industry, and thus, it should integrate different varieties of knowledge to produce a new product. As a multimedia industry, the game industry should deliver sound, video, and graphics simultaneously to customers (Backlund and Sandberg, 2002) and thus hire technicians in the fields of software, hardware, and networking. On the other hand, as a cultural industry, the game industry hires cultural workers such as graphic artists and a sound creator who has a background and talent in the artistic fields. Therefore, the game industry has to connect diverse knowledge from high technology to cultural content.

This research focuses on the game software industry, which is one sub-sector in the game industry, because the focus of the game industry has shifted to software since 2002 (Cooper and Brown, 2002). Particularly, the case industry is the game software

industry, which produces online and mobile games since the Korean game industry shifted from PC games to online and mobile games. This research also excludes arcade games and video games, which require a heavy investment in hardware such as game consoles.

The characteristics of the game industry can be briefly summarized as follows: (1) the market for the game industry is highly volatile, risky in comparison to other durable products; (2) therefore, if a company produces a mega-hit product, the product will more likely be developed into a series (Aoyama and Izushi, 2003); (3) the product of the game industry is highly design-intensive; (4) while the product of the game industry can be easily sold to other countries owing to easiness of language translations, preferred genres vary across country boundaries, reflecting cultural differences.

In 2004, the world market share for game hardware and software totaled \$56.2 billion (Korea Game Development and Promotion Institute, 2005). According to the type of platform, the largest share of the game market was comprised of arcade games (\$30.1 billion, or 55% of the total), followed by video games (\$17.1 billion, or 30% of the total), PC games (\$3.5 billion, or 6.3% of the total), online games (\$3.4 billion, or 6% of the total), and mobile games (\$1.5 billion, or 2.7% of the total) in 2004.

Although online and mobile games comprise only about 9 percent of the world market, these two platforms in the game industry have opened up a new market in the game industry, combined with other information technology such as internet and mobile communication system. From the point of the changes in the market sales all over the world, the online and mobile games have significantly increased over the time between 2002 and 2004. The market sales of online game in 2004 (\$3.4 billion) increase around 2

times as high as that in 2002 (\$1.1 billion) and the market sales of mobile game in 2004 (\$1.5 billion) has grown 1.6 times as much as that in 2002 (\$0.6 billion) (Korea Game Development and Promotion Institute, 2005). In contrast, the market sales of the PC game and video game has been declined over the same period (for PC game \$3.8 billion in 2002 and \$3.5 billion in 2004; for video game, \$21.5 billion and \$17.1 billion respectively). Moreover, online and mobile games are estimated to continue to expand the new market based on their unique technological components and furthermore are expected to influence the traditional game platform such as Arcade, PC and video games regarding their infusions with information communication technology (International Game Developers Association, 2004; 2005a; 2005b)

Choice of Countries

This research examines the East Asian country of Korea (the second most competitive nation in online games). The basic reason for the selection of Korea is based on several challenges presented in the existing literature. Traditionally, the development motors of the economy in Korea have been big conglomerate industrial organizations (*Jaebol*) (Castells, 2000) and aggressive supporters of the Korean government (Porter, Takeuchi, and Sakakibara, 2000). However, most of the major game software companies in Korea¹⁸ grew out of small venture firms, which have flourished without government support (Porter, Takeuchi, and Sakakibara, 2000). However, just recently, it has attracted considerable attention from both the local and the central governments.

¹⁸ Korea's major game software companies, all located in Seoul, are NC Soft, SoftMax, Cinefix, and KOG.

3.3.2 Data and Methodology

This research utilizes a mixed method that collects and analyzes both quantitative and qualitative data. This section will first describe the research design and overall procedures and then describe the procedures of each dataset collection in detail. Finally, it will present the data used in this research and the core variables and statistical methods for hypothesis tests.

3.3.2.1. Research Design

This research utilizes a mixed method to explore game development projects and locational decisions of game companies. After several mixed method approaches were considered, the embedded design (Creswell, 2003; Creswell and Clark, 2007) was chosen since “different research questions need to be answered, and each type of question required different types of data” (Creswell and Clark, 2007: 67). This embedded design is useful for addressing different research questions. Unlike triangulation design, in which qualitative and quantitative data address the same research question in a different form or at a different level, the embedded design includes only one data set that “provides a supportive, secondary role in a study based primarily on the other data type” (Creswell and Clark, 2007: 67). In this research, qualitative data play a secondary role in supporting and interpreting the analysis of quantitative data.

This research examines the relationships of a firm’s resources—diverse employees, purchased cultural contents, and historically accumulated knowledge—with its outsourcing strategy and the impacts of several mediating variables—knowledge codification, trust mechanisms, IT technology—on a firm’s locational decisions (i.e., the

quantitative purpose). This purpose requires quantitative data that measure each independent variable in numeric terms. However, this research has another purpose: to explore what codified knowledge exists and how that codified knowledge is developed at each stage of a project, what organizational conflicts occur, how the conflicts are resolved, and how project members are involved in communities of practice for their career and reputation building (i.e., the qualitative purpose). Therefore, qualitative data are particularly useful because the process of knowledge codification or organizational conflicts and resolutions cannot be easily detected and addressed without interviews.

3.3.2.2. Research Process

The development of a more effective, efficient interview protocol and survey instrument required that I attend several meetings with game developers since I was not familiar with jargon and technical terms in the game industry. I participated in one informal seminar meeting conducted by the Korea Game Marketing Forum. Five of the six other participants in the meeting were currently game developers and planned to change their occupations to marketing. In addition, between March 2005 and January 2006, I attended several informal social gatherings for game developers. Through studying with them and listening to what they said, I learned to recognize the key milestones and the stages of game development projects as well as common jargon. Based on the knowledge I accumulated from the meetings and previous research method studies (Dillman, 2000; Nachmias and Nachmias, 1987; Weiss, 1994), I developed an interview protocol and survey instrument. Consulting with these individuals, I conducted a pilot test for an interview protocol and survey instrument in December 2005.

The purpose of the pilot test was not to gather data but rather to assess how prospective participants would interpret each question. After I clarified the survey questions and rearranged the order of the questions to reduce the duration of the interview (see Appendix B for the survey instrument and C for the interview protocol), I conducted the interviews and questionnaire surveys.

The interview and questionnaire surveys in the embedded design adopted in this research can be done concurrently since the design method handles quantitative and qualitative data for each of the different research questions. Unlike explanatory and exploratory designs, the embedded design does not need to be sequential (Creswell and Clark, 2007). Therefore, in this research, due to time limits, the questionnaire survey and interviews were done within the same time frame after the two surveys were approved by the Georgia Tech Institutional Review Board (IRB) on February 8, 2006 (see Appendix A).

In February, after the IRB approval, I began to contact prospective interviewees—game companies—to ask for their cooperation in responding to the questionnaire survey and scheduled visits. Since this process of collecting the questionnaires took a long time, the interviewing process started before all the company questionnaire surveys were collected. (Interviews took place between February 14 to April 29, 2006, and questionnaires responses came in from March until May.) Thus, this time lapse was due to practical scheduling reasons, not the result of faulty research design.

3.3.2.3. Collection Procedures

Interviews

The participating interviewees in this research were game developers, marketers, sound-making companies, and policy makers in the game industry. Based on previous studies on interview techniques (Weiss, 1994), semi-structured interviews took place with 34 individuals, some of whom had multiple job duties. Interviews were then conducted with six project members who worked with policy issues, 16 with planning and producers; four with graphics; three with sound, including the presidents of two sound-making companies; six with programming; three with operations; and five with marketing.

Interviews were conducted in the two phases. The first group (13 individuals) included those whom I met at the informal meetings, so they responded more rapidly. The informal meetings ranged from weekly seminar groups, sub-groups of the Korea Game Marketing Forum, to regular meetings of the Korea Game Developers Association and other meetings hosted by the Korea Game Development and Promotion Institute. The second group (21 individuals) consisted of companies that responded to the questionnaire survey. Since the first group was comprised of mainly game developers working as planners and programmers, to gather a more comprehensive range of data, I asked the companies of the second group to introduce me to game producers and cultural workers such as graphics and sound creators. The interviews lasted from one to two hours.

□ Questionnaire Survey

Based on previous studies on survey methods (Dillman, 2000; Nachmias and Nachmias, 1987), the goal of this research was to distribute enough of the survey, called the *Game Development Processes in Korea (GDPK)* so that the study would include responses from more than 100 software companies in Korea.

For the GDPK survey, this study obtained the name of the firm from a public source—the website of the Korea Media Rating Board, a public agency that rates game titles, movies, videos, music albums, and all types of cultural media. The research collected game titles rated in 2005 and identified a company by sorting the titles according to the type of company. As a result, the names of 483 companies were obtained. After deleting the 15 companies in the PC game industry, this study identified 468 companies involved in the production of online and mobile games.

However, the Korea Media Rating Board website provides information about the names of companies and their game titles without addresses and contact numbers. Thus, this study used the internal data of a public agency, a venture company-related website, and a publication that lists the phone numbers of 192 companies in the Korea Game Development and Promotion Institute and 139 companies from Venturenet (www.venturenet.or.kr), an organization responsible for approving a firm as a venture company, which includes 121 companies on the *Digital Contents Industry White Paper* (Korea IT Promotion Agency, 2005) and 199 firms from the Business Incubator Network System (www.bi.go.kr). The total number of companies from these four sources was 651. After companies that were listed more than once, those that had no phone number, or those that had moved to other industries were removed, only 429 companies with phone

numbers remained—less than the number of companies recorded in Korean SIC statistics (516).

The 429 firms were then contacted directly by phone. However, 39 of them were not reachable because of wrong numbers. (These 39 firms may have gone out of the business or moved to other regions.) Although contacted, directory assistance could not produce numbers for these companies, which left only 390 businesses contacted directly and asked if they would be willing to participate in the GDPK survey. Those that accepted received either an e-mail response or a visit. Twenty-five companies responded to the questionnaire via email. Since the questionnaire is composed of both general questions about the company and specific questions about the project organization, general managers on non-development teams had to go to project managers on development teams for answers to these questions, and vice versa. Through this process, 104 questionnaires, a response rate of 24 percent, were collected. Responses came from presidents, general managers in either marketing/public relations departments, or development teams responded to the questionnaire.

Table 3.1. Firm Directory and Response Rate

Survey Data Procedures	Number of Companies
Companies collected from the four sources	651
Overlapping, no phone number in the directory	222
Complete lists of companies contacted	429
Companies unreachable due to bad phone number	39
Companies reachable	390
Response	104
Response rate	24.2%

*Response rate = (Number of obtained questionnaires) / (Number of companies reachable) =(104/390)

3.3.2.4 Data

The data for this research came from the interviews with 34 individuals, the GDPK survey, and industrial statistics gathered by the Korean government.

Interview data

The in-depth interviews, conducted to identify the interactions in the project organization in terms of project management, aim to offer plausible explanations of how individual members are locally embedded in communities of practice and to reveal the dynamics of job-seeking and reputation-building activities of cultural workers. Therefore, interview data were composed of project management information, the career- and reputation-building processes of project members, their roles in current projects, and conflicts with other team members. With regard to project management, the interviews explored how the different logics such as business logic (i.e., marketing or strategic planning), technological logic (i.e., software development), and artistic logic (i.e., game design and content development) are revealed and who coordinates them according to the stage of a project. With regard to career- and reputation-building, the interview analyzed how deeply embedded in the local society project members were in terms of their reputation and learning. They were asked how they had entered the game industry, what their previous occupation had been, and what they had actively done to build their careers, as reflected in the positive approval of their performance on past and current projects, and how their performance had affected their reputations. With regard to conflicts with other team members, interviewees were asked about their current activities and any frequent conflicts they had had with other team members.

Questionnaire Data

The GDPK survey data consist of 104 samples from Korean game companies. The survey instrument was constructed as follows: (1) general information, such as the year of establishment, game platforms, game genre, annual sales, and so forth; (2) product development activities; (3) workforce employment and expenditures; and (4) geographical proximity. In particular, product development activity addresses the involvement of external partners, the search patterns for external partners, and the selection process of team members.

Since the survey was distributed to the companies listed in the directory of companies that released at least one game title, the sample companies operate like regular, normal business firms located in an office, not in a warehouse, and they possess a management system to some degree. In 2005, the average number of total employees of the sample companies was 59 (see Tables D.1- D.13 in the Appendix D for the descriptive statistics of the sample companies). The number of the released game titles of the sample companies ranged from 1 to 120 titles. Sixty percent of the companies (62 firms) reported online games and 40 percent (42 firms) mobile games as their main platform.

Government-provided Statistics

The Standard Industrial Classification (SIC) in Korea does not categorize the game industry by platform. The SIC code in Korea is “Manufacturer of Video Games (36943),” and “Game software publishing (72201).” The latter category includes online, mobile, and PC game titles, so it is somewhat relevant to this research. Therefore,

although it includes PC games, this category is used for the aggregate data analysis. Thus, this research relies on data obtained by the questionnaire survey and the interviews conducted in this study. In addition, in its general overview of the Korean game industry, this study will use the SIC data on “Game software publishing.” For aggregate data about the Korean game industry and market trends, this research used the *White Paper: Game Industry*, published by the Korea Game Development and Promotion Institute, a public agency funded by the Ministry of Culture and Tourism of Korea and other secondary sources.

3.3.3 Measures for Core Variables

This research uses statistical as well as qualitative methods. The key variables used to test the hypotheses and statistical methods are discussed in this section. First, this research used the Intercooled STATA 8.2 software to produce descriptive statistics, a t-test, ordinary least squares (OLS) regression, a factor analysis, a probit model, and a Tobit model (Breen, 1996; Frankfort-Nachmias Leon-Guerrero, 2000; Long and Freese, 2003; STATA, 2005a, 2005b, 2005c; Wooldridge, 2000).

The hypotheses are generally divided into the categories of outsourcing decisions and locational decisions. The thesis examines two types of the outsourcing decisions. First, the so-called make-or-buy decision, which determines whether companies used external partners in 2005, was examined. In this case, the dependent variable in the model is a dummy variable denoted by 1 when companies outsourced at least one process of the game title development in 2005; otherwise, it is 0. The second type of outsourcing decision is outsourcing costs, which indicates how actively companies utilized external

partners in order to mobilize external resources. The dependent variable for this model is expenditures on outsourcing in 2005. In the case of outsourcing decisions, since 18 companies were not involved in outsourcing and thus the variable is denoted 0, it implies that the data from the questionnaire survey is truncated at 0 (Breen, 1996). Therefore, this research employs the probit and Tobit models in order to obtain the normal distribution.

In terms of independent variables, this research assumes that outsourcing decisions of companies are dependent on the internal capability of companies (Table 3.2; see Table 5.8 for the detail explanation on the variables). This research examines three types of internal capabilities and produced three hypotheses: the internal workforce hypothesis, the IP purchase hypothesis, and the history hypothesis. For the internal workforce hypothesis, this research uses the number of cultural workers in the companies. In addition, the IP purchase variable is introduced in the model in order to test the IP purchase hypothesis, which is measured by the expenditures on the purchase of intellectual property rights from other cultural industries. The history hypothesis produces two independent variables: the duration of the companies in both the game industry and an initial type of industry whether firms started in the game or non-game business area.

To test the remaining hypotheses on the mediating variables for geographical proximity, this research uses the perceived importance of each locational factor in the company. The questionnaire asked respondents to rank the importance of sixteen locational items on a five-point Likert scale. To reduce the variables, this research uses factor analysis—principal component factors—that integrates the correlated variables into one group. Through this analysis, this research identifies the clustering factor that

represents the importance of geographical proximity to other related economic actors, including business partners, other game companies, other information technology firms, other game-related business service companies, and trade associations. This computed clustering factor is a dependent variable of the last four hypotheses related to the locational decisions of the companies. Since the dependent variables were computed through the mean value of the pertinent variables, this research uses an OLS regression model to test the hypotheses.

In terms of the independent variables in the model, this research uses the four variables corresponding to each of the four hypotheses (Table 3.2; See Table 7.6 for the detail explanation on the variables). For the codification hypothesis, this research determines whether companies shared their manuals with their external partners. For the IT hypothesis, the independent variable is the messenger, which is a dummy variable. When companies used the messenger for primary communication with their external partners, the variable is 1; otherwise, it is 0. To represent the presence of trust, this research uses the searching pattern of the companies seeking external partners. When companies continued to use the same partners, the variable of “built-in trust” is denoted as 1; otherwise, it is 0. If companies found their current external partners through the communities of practice such as recommendations by their employees and other game companies, the “communities” variable is denoted 1; otherwise, it is 0. The “communities” variable includes the access of companies to communities of practice through their employees.

Table 3.2. Variables Related to the Hypotheses

Hypothesis	Explanatory Variable (Product Development Activity)	Dependent Variable
Cultural Worker Hypothesis	The number of cultural workers	-Make-or-buy -Outsourcing costs
IP Purchase Hypothesis	IP purchasing costs	-Make-or-buy -Outsourcing costs
History Hypothesis	-The duration of companies in the game industry -Initial industry	-Make-or-buy -Outsourcing costs
Codification Hypothesis	-Shared manuals	The importance of the clustering factor
IT Hypothesis	-Messengers as a primary communication technology	The importance of the clustering factor
Built-in Hypothesis	Stick to past partners	The importance of the clustering factor
Communities Hypothesis	How to find project members: Reliance on the communities of practice	The importance of the clustering factor

CHAPTER 4

ORGANIZATION OF KOREAN GAME SOFTWARE INDUSTRY

This dissertation deals with the process of new product development in the game industry in Korea. In order to understand the nature of technology and the mobilization of pertinent resources from similar industries, we need to locate the game software industry from a wider industrial perspective. In this section, I explore the game software industry and its relationships with other industries related to complementary inputs for and distribution of a new game title (section 4.1). Section 4.2 addresses the development process of new game titles through exploring the production stages and the roles of employees involved in the process. Section 4.3 addresses the growth and characteristics of the Korean game industry.

4.1 Industrial Scope and Characteristics of the Game Industry

The game software industry is an economic sector that uses multiple disciplines and technologies to develop and deliver game content for the purpose of entertainment and education (Kim et al., 2003, Lee, 2000, Aoyama and Izushi, 2003). It should be noted that the game software industry is considered to be as both a multimedia industry and a cultural industry. The game software industry uses information technology to not only deliver its products to consumers but also to use the technology when it makes media and sounds that can be combined into one CD package, ROM-PACK, and client-software. As a multimedia industry, the game industry should convert the analogue forms of sounds, videos, and graphics into the digital forms (Blacklund and Sandberg, 2002). Therefore,

the operation of the industry requires different kinds of technological knowledge for hardware, software, and recently network because of emerging online game and mobile markets. On the other hand, as a cultural industry, the game industry should be able to produce interesting game stories and structures that allow producers to approach customers easily. For this, the industry needs to interact with other cultural industries such as *manga* (comic books), film, and animation, or create its own cultural contents.

Due to such combinations of information technology and cultural content in the development of a game title, the game industry comprise of sub-industries (see figure 4.1.). Figure 4.1 shows the entire flow of game title from its creation to its distribution to consumers. The game software industry as a focal industry in the entire game industrial sector utilizes and relies on the hardware industries and cultural industries. Game titles are represented in the diverse range of hardware such as computer, mobile phone, handheld such as PDA, and specific game consoles such as Xbox (Microsoft), PlayStation2 (Sony), PlayStation Portable (PSP: Sony). In addition, the game software industry borrows the popular trends of cultural industries such as novels, *manga* (comic books), animation, and movies. Such conversion or imitation is done either indirectly or directly. Employees in the game companies get vague ideas on game content by looking at fads in cultural industries. On the other hand, game companies may directly purchase the graphic images or stories from cultural industries (e.g. The “Lord of the Rings” appeared first as a book, then used in a movie, and finally made into a game by Electronic Arts).

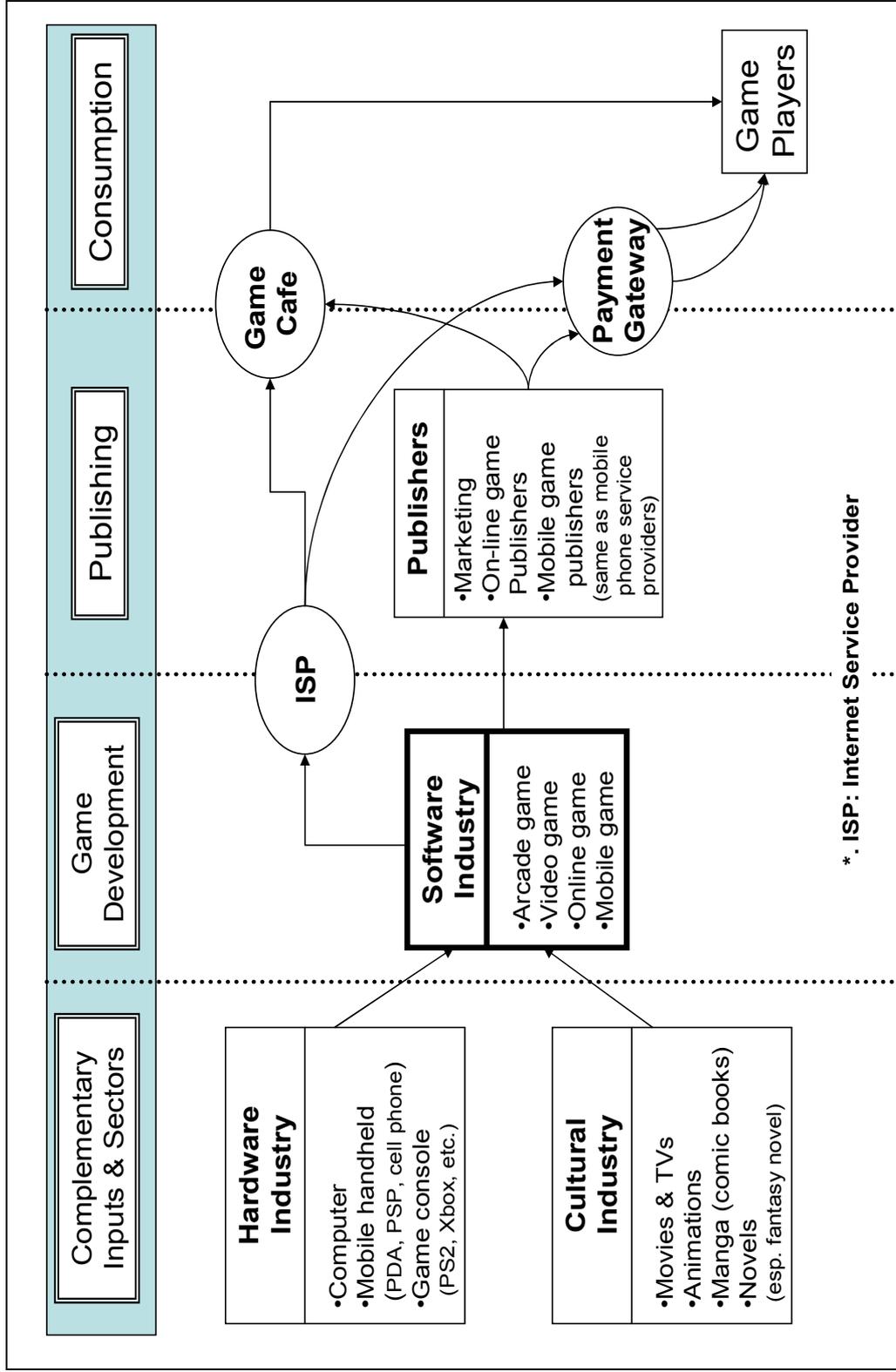


Figure 4.1. Game Industry and Related Industries

Based on the complementary inputs from hardware industries and cultural industries, game software companies initiate their development project teams. Once the software companies successfully complete their projects, publishers are involved in distributing the new game titles. At this stage, publishers are usually in charge of the advertisement about and the distribution of game titles to consumers through multiple channels, as well as the management of consumer service. In addition, the publishers in the game industry are providing consultation and feedback about the quality of game titles to the game software companies.

Another role of publishers is to collect revenues from the “payment gateway company” or “game café” and deliver part of such revenues to the game software companies. In case of online games and mobile games in Korea, the main technology for distribution of game titles is internet. Game players have two options in terms of the site location of game play: home or game cyber café. To play their favorite games at home, game players pay for game content by credit card or cyber money in order to download game software programs through internet¹⁹. At a game café, game players can use computers that are equipped with internet, game software, or game consoles. Payment gateway companies play a crucial role in ensuring the security of consumer credit card information or bank account information. Publishers collect the revenues from the payment gateway companies.

¹⁹ The main distribution technology varies from country to country. For example, and unlike Korea, online game companies in the USA distribute their client software programs mostly through retail stores such as BestBuy. Compared with Koreans, American users seem more reluctant to download software programs through the Internet because of Internet security.

In this process from production to distribution, the key agents are hardware companies, software industries, and publishers that lead the other related companies: internet service providers (ISP), payment gateway companies, and retail/wholesale stores. However, this demarcation should be understood in terms of function, not entities since one company may deal with more than one function. A large company might develop its own game software while publishing game titles of other game companies. Some hardware companies, such as Sony, develop and publish their own game titles. While other companies, usually called third-party developers, concentrate on just the development of game titles.

Among these sub-industries, this research deals with game software industry that produce game titles, regardless of whether they publish game titles or not. This study includes third-party companies and other companies that produce game titles and publish them.

Game software products can be categorized by several criteria. In general, there are two ways to categorize game titles. The first categorization is using a genre: what are the main subjects, procedures and rules used to in the game? Within this category game titles are web-board game such as chess, fighting and action, simulation, role-playing, shooting, sports, and adventure (Kim et al., 2003; Lee, 2000; Shin, 2003).

Today, this genre categorization is becoming blurred. Due to intense competition, companies have attempted to mix previously distinct materials together to differentiate products and attract new customers.

The second categorization for game titles is platform, which is a type of standard and framework that allows middleware software or hardware to run. In this case, platform

is specific hardware that game software is tailored to. Within this category, games are categorized as follows: on-line, mobile, video, computer, and arcade. On-line game users use computer and internet together. Game players download client-programs from companies and use the cyberspace and server-programs that exist in the companies for playing games. Mobile game's platform is the cell phone or a portable handheld such as PlayStation Portable. Video game players use Rom cartridges and game consoles to play while watching game scenes with televisions and game consoles. The arcade game uses game consoles that combines monitors and game consoles.

The online and mobile games that are explored in this study differ from other games in terms of production process and technology focus. Unlike arcade and video games, online and mobile games have more liberty since they use the standard computer and internet/server technology. The usage of the standard technology implies that online and mobile firms can decide firm strategy, market orientation, and production process on their own. Therefore, in this case technological proximity of software companies with hardware companies that Aoyama and H. Izushi (2003) found critical in the Japanese video game industry is not a factor.

In general, the game industry has several characteristics. First, this industry as a multimedia industry does not require huge initial or fixed costs such as large machinery or large R&D laboratories. At the start-up stage, game companies can be operated with just several computers software programs and a small office. Thus, entry into the game industry is relatively easier than into other types of industry. This characteristic may result in the rapid rise of small venture companies and accelerate higher competition. Second, the profitability of companies is not easy to be estimated. The game title market,

as a cultural commodity is highly volatile and risky in comparison to other durable products. There is a greater level of uncertainty in consumer demand, especially as concerns the time frame of production. Game development project lasts for at least one year or more in the case of non-casual games. Occasionally when companies publish game titles, there already exist similar ones on the market or the new ones are already out-dated. This implies that many game companies entering quickly into the industry because of lower initial costs may also quickly disappear. Third, once game players become attracted to a particular game title, they are reluctant to try other game titles: customer grove-in (Lim, 2002; Shin 2003). Customers become loyal to the existing game titles and look forward to the next series of them (Aoyama and Izushi, 2003). In this sense, the game market has high-returns if companies have mega-hit products. A company that succeeds in nurturing an internet club of people who likes its game title (Wi, 2003) can strategically sustain this loyalty to mega-hit.

Such characteristics reveal that game markets are highly risky because of easy start-up and uncertainty of demand. In this condition, game companies should move their title development projects along close interaction with users. Game companies should organize their development projects around consumer cultural needs and promptly catch up with current trends in sounds and graphics. Such market volatility is a reflection of the game industry itself, which is rapidly changing as evidenced by only a few successful companies remaining. This rise and fall of game companies may provoke the turnovers of experienced workers.

4.2 Development Process of the Game Industry

The game development process can be summarized in ten steps: (1) planning, (2) scenario writing, (3) graphics, (4) sounds, (5) programming, (6) synthesis of the graphics, sounds, programming, (7) game testing, (8) debugging, (9) beta test, and (10) publishing (Kim et al., 2003: 5720) (See figure 4.2.).

Planning as a pre-production process is deciding overall orientation of game titles. Overall marketing, design, and technological elements are discussed. The participants in this step address target customer group, current market trends, genres, project time frame, and research and project managements. Once genre and story outline are decided, the second phase of planning is addressed: historical background of the storyline (fantasy world or medieval world) or game rules, subsequent discussion of core features of graphics, sounds, programming, and then a schedule of each process. Ideally, all related persons from other subdivisions (graphics, sounds, programming), other departments (marketing), or outside (publishers) should participate. Planners suggest game development protocol and produce concept reports. Planners initiate and head this process.

²⁰ Game production process is generally discussed in a similar way. For the details, see Kang (2004), Lee and Kim (2003), Park (2006), Aoyama and Izushi (2003), Egan and Saxenian (1999), Korea Game Development and Promotion Institute (2004).

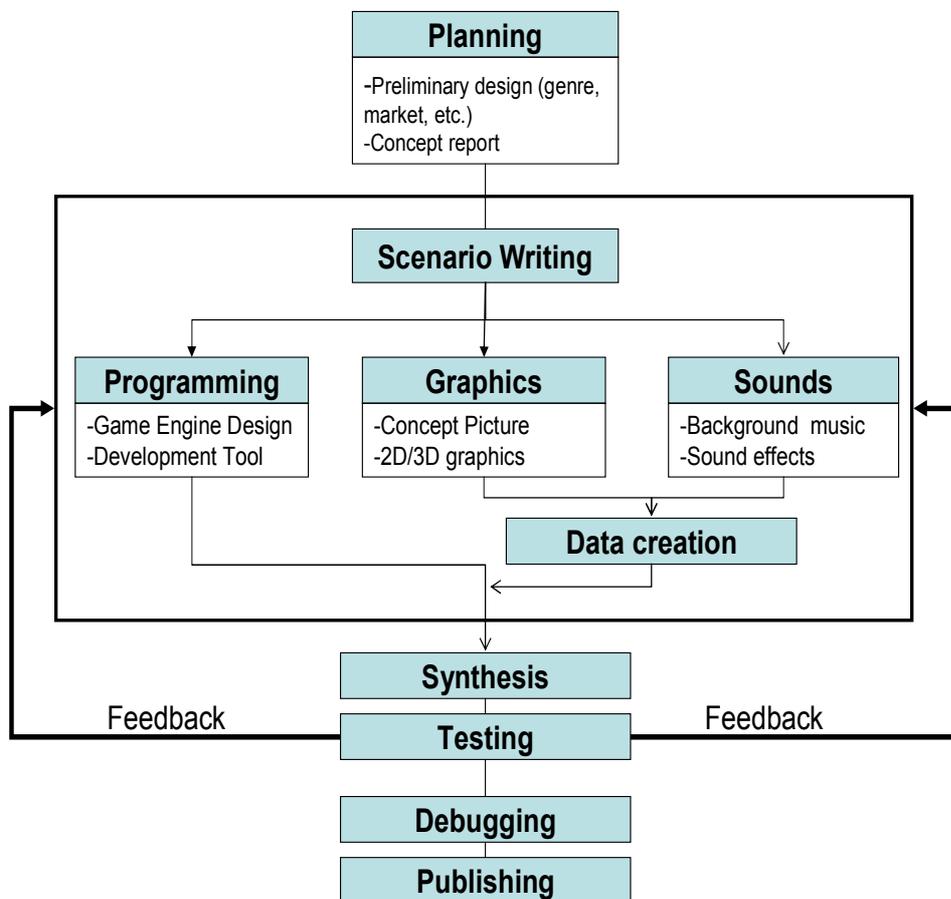


Figure 4.2. Development Process of Game Titles

Based on concept reports that are distributed to and shared with all project members, each subdivision (sound subdivision, graphic subdivision, programming subdivision) works on its tasks at the same time together. Programmers modify game engines²¹ to make them suitable for game titles. Some companies may purchase game engines from software companies and modify them while other companies may create

²¹ The game engine is the core software of the game titles that reduce development time. It provides the fundamental standardized technology and simplifies developments. There are several game engines by function: physics engines that streamline to develop codes for motion and actions; rendering engines (Jang et al., 2004) for 2D, 3D graphics; artificial intelligent game engines, etc.

their own game engines, depending on their technological capability and financial resources (Lee and Kim, 2003). The key role of programmers is to digitize the outcome that graphic and sound subdivisions produce, and create source codes that locate graphics and sounds into game titles. While programmers work on game engines and fundamental codes, graphics and sound designers work on their original pictures that are first sketched onto the drawing paper or background music. When graphic artists convert the original pictures into 2D or 3D graphics in the computer, programmers provide the modified codes for graphic engines (Jang et al., 2004). Therefore, this production process is both parallel and interactive.

Once game titles are produced, they are then tested. This testing includes software stability, graphic quality, motion quality, system overload and entertaining elements. In this step, technological shortcomings are worked out and game rules and level of game is partially altered. Testers can be project team members, other project team members in the same company, IT consulting company, publisher and game players.

It appears that different functional divisions and persons with different knowledge are involved in the production process. Simply summarized by task, there are project manager, game designers, planners, scenario writers, sounds makers, graphic artists, programmers, and testers (Lee, 2002).

The project manager/designer is the person who is in charge of coordination between people in the planning subdivision and other subdivisions or departments, and checks the progress of each task. Conceptually and ideally, a project manager is different from a project designer as the producer in the filmmaking industry is different from its

director. However, one person functions as project manager and designer in small and medium-sized firms (Lee, 2002)²².

Planners propose overall ideas and game rules, and create game characters and items based on scenario and storyline. Planners sometimes work on scenario depending on genres: usually there are no scenario writers in case of casual or sport games unlike role-playing and simulation games. Scenario writers set the worldview of games and dialogues between game characters and story structures.

Graphic artists are in charge of graphics: landscape, characters, items and interface such as internet chat for game players. These graphic artists are divided into original picture sketch artists and 2D or 3D computer graphics. As part of the artistic workers, sound makers should find music genre suitable for the game and create or arrange background music and sound effects.

Programmers are key players who collect all the digitized data from all the subdivisions and embody such data into software. The programmers also work together with server managers and manage security of game titles.

²² There is a conceptual distinction between project manager and project designer (Lee, 2002). Project manager is administrative staff who understands development process with some technological knowledge and teamwork experience and relays work process to presidents CEO or investors.

4.3 Current Korean Game Software Industry

4.3.1 Rapid growth of the Game Industry in Korea

Until the mid 1990s, Korea was a consumer country in the game industry. Korea mainly imported game products from Japan and the USA. At the time, the dominant platforms of the game industry across the world were computer games and video games (Kim, et.al. 2003²³). Although there existed a few Korean computer game companies within the markets, they could not compete with their Japanese and USA competitors and failed to grow due to loss of sales and subsequent investment opportunities caused by unsound distribution structure. Korean game players burned CDs for the illegal versions of Korean computer packages, or purchased pirated versions of Japanese game software that the Korean government bounced for importation. This market structure aggravated the situation of medium-sized computer game companies in Korea. An unstable market and small-scale developments prevented the Korean game companies from producing better game titles to compete with their competitors.

However, in the mid and late 1990s, the Korean game industry grew rapidly and faced the turning point of its industrial history. Table 4.1 and figure 4.3 describe changes in the market shares of each platform in Korea's last decade: from 1995 to 2005. As shown in table 4.1, the sales amount of the game market has been increasing in total since

²³ The first commercialized computer game was designed in 1961 and published in 1962. This game, "Space war" was developed by a MIT student, Steve Russell, and the systems used mini-computer called Programmed Data Processor-1. However, it was the early 1970s that video games become popular when Atari produced "Pong" game. Then, in the late 1980s and the early 1990s, new technology in computers such as VGA graphic card, sound card, CD-Rom storage devices led the developments of large-size computer game that substituted for video game. In these video and computer games, dominant companies were from the USA or Japan: Atari, NEC, SEGA, Nintendo, and Sony.

1995. The first dominant platform in the past was arcade game in game centers. However, online game market share has continued to grow from about \$4 million in 1995 to \$14 billion in 2005 at the average growth rate of 32.6%. Finally, in 2002, online game became the number one platform. The year 2002 is considered as the first year of the online game era (KGDPI, 2003), and not only because of 32% of the online market share. Early in 2002, the existing advanced PC game companies started to focus on online games such as Softmax and Phantagram, while major game distribution companies such as Hanbit Soft and Wizard Soft also started to invest more in online game sectors. While the online game market has rapidly expanded, the PC game market did not change and stayed around \$30 million. Rather, its market share decreased over time from 7% in 1995 to 1% in 2005. Likewise, the video game market also a little expanded from \$76 million in 1995 to \$213 million in 2005, but decreased from 16% to 8% in terms of market share. In the early 21st century, we can see the emerging market of the mobile game.

This growth of online market does not mean only market demand of Korean game players. It also shows the competitive quality of the Korean online game industry. Game product exports have been increased from \$97 million in 1999 to \$397 million in 2004 by 309% for six years (Jung et al., 1999; KGDPI, 2005; Game Industry Strategy Committee, 2006). When we look at exports and imports in the game industry (Figure 4.4), the majority of exports are attributed to online games (74.9%), which have only few imported titles worth of around \$2 hundreds.

Table 4.1. Korean Game Market by Platform

(Million \$)

	1995	1997	1999	2002	2004	2005
Arcade game	373.05	437.50	771.48	368.95	219.43	942.87
	77%	75%	88%	30%	14%	34%
PC game	34.18	34.18	83.98	160.84	52.15	36.82
	7%	6%	10%	13%	3%	1%
Video game	76.17	102.54	3.71	152.54	182.23	213.18
	16%	18%	0%	12%	11%	8%
Online game	3.91	5.47	21.09	441.60	994.73	1405.96
	1%	1%	2%	36%	62%	50%
Mobile game	-	-	-	101.95	157.91	189.36
	-	-	-	8%	10%	7%
Total	487.30	579.69	880.27	1225.88	1606.45	2788.18
	100%	100%	100%	100%	100%	100%

Source: Jung et al. (1999), Lee (2000), Korea Game Development and Promotion Institute (2001, 2005, 2006).

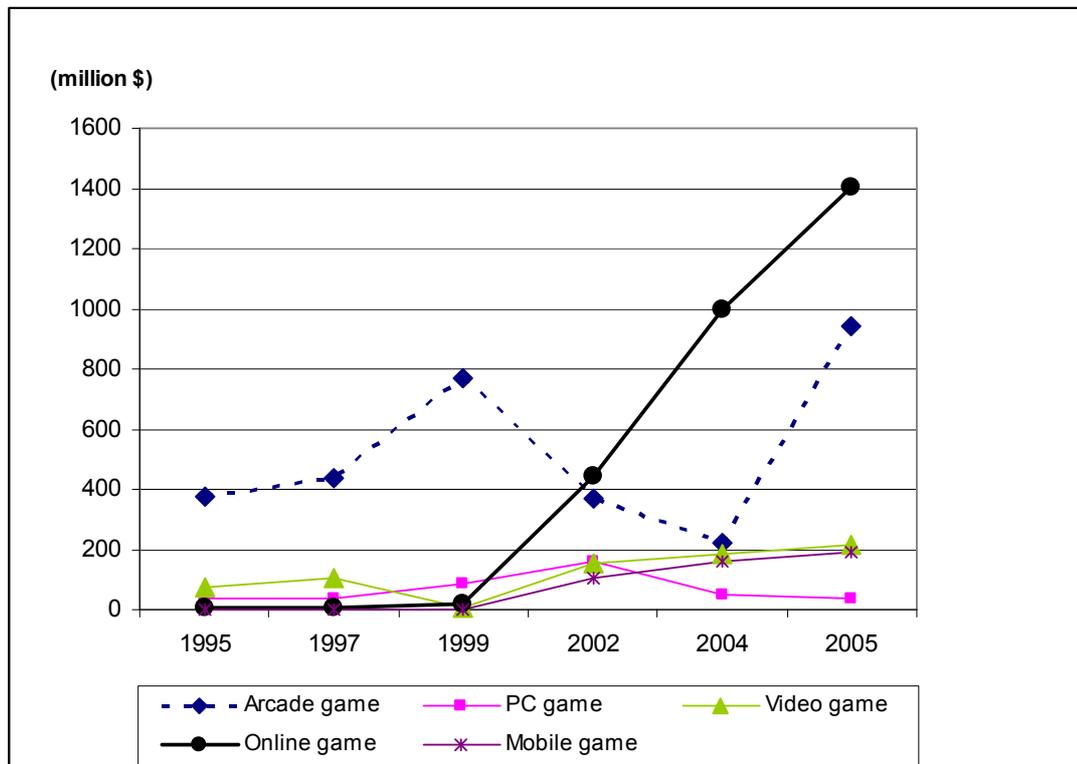


Figure 4.3. Game Market Share by Platforms (Korea)

Source: Jung et al. (1999), Lee (2000), Korea Game Development and Promotion Institute (2001, 2005, 2006).

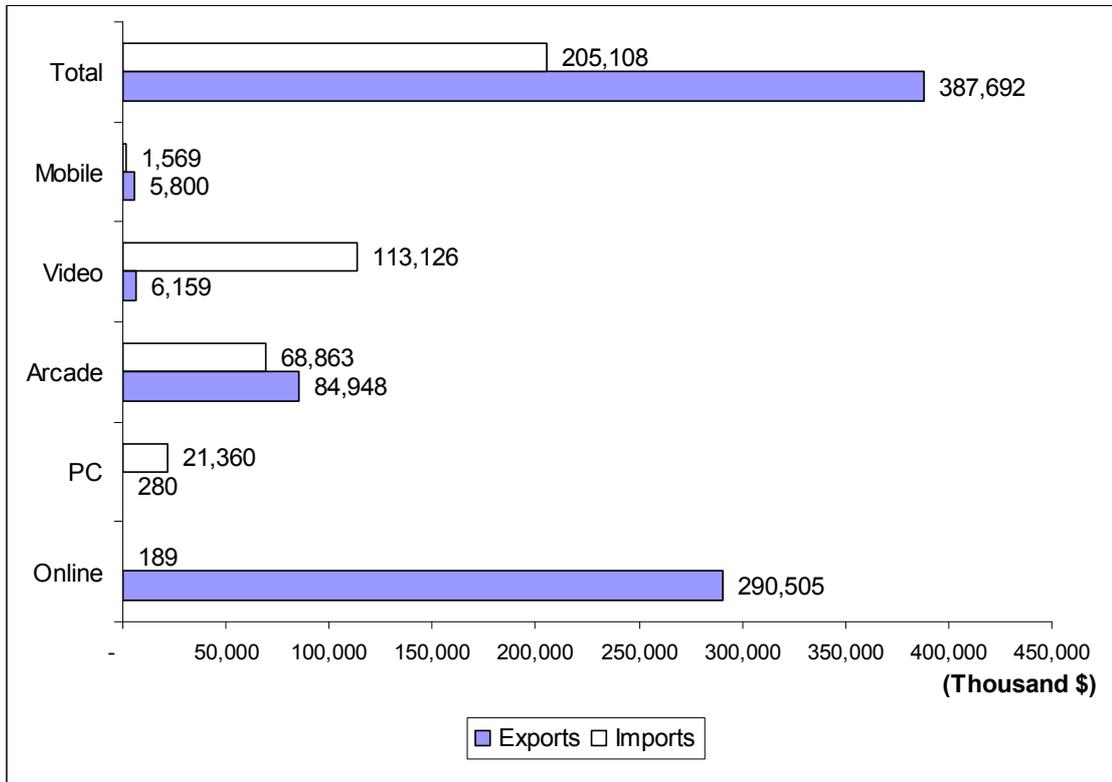


Figure 4.4. Exports and Imports by Platform (2004, Korea)

*: 1 dollar=1,024 won

Source: Korea Game Development and Promotion Institute (2006).

In other words, the rapid growth of the Korean game industry in the mid 90s is due to the rise of the online game industry that has slowly but consistently replaced the arcade game and the computer game industry. Such rapid growth of the Korean game industry is attributed to the rise of online game sector. Korean online games have been rapidly expanded since 1996. The first online game in Korea was “Jurassic Park I” in 1994. Then, several MUD (multiplayer text-based) games were introduced through PC communication network using Modem. In these MUD games, game players could play games with other game players who were not in the same room. It was amazing to play with friends or anonymous people through online. Playing and competing with real

people for victories in the game was more challenging than with non-player characters that computers commanded. However, the release of these game titles does not indicate the advent of the online game era as these were somewhat naïve, and neither user-friendly nor graphic-based; game players were required to type their commands in order to move their characters and could not see the overview of the game world (Kim et al., 2003). In addition, these games were designed based on PC communication via use of a modem. As a result, it was not really an online game and thus restricted the number of participating players in one game. In this situation, a drastic switch was driven by two companies: Nexon and NC soft. Nexon released “The Kingdom of the Winds” in 1996, which was the world’s first graphic Massive Multiplayer Online Role-Playing Game (MMORPG). NCsoft started servicing “Lineage” in 1998 that is still ranked top three in terms of the number of game players and has a second series, “Lineage 2”. The genre of the three titles is MMORPG with a fantasy world or medieval ages of Europe in its setting. MMORPG genre is typically popular in Korea. Table 4.2 shows the popular game titles in the Korean online game, of which most are still MMORPG. In addition, among the top 13 game titles, the two game titles “World of Warcraft” and “FiFa Online” were released by the foreign companies.

However, can the release of better game titles, particularly only two titles, explain the rise of one industry? The success of “Lineage” would be better to think of as one of events or signals of the growth of online game industry. The usage of the online game industry was triggered by the attempt of the game companies to avoid losing money from illegal PC Package programs. However, the favorable environment for the Korean

internet business helped the game companies to successfully achieve their strategic goal: rapid and wide spread internet infrastructure, and the development of diverse payments.

Table 4.2. Current Popular Game Titles in Korea (November 13, 2006)

Ranking	Name of Game Title	Genre	Companies
1	Special Force	Online FPS (shooting)	Dragon Fly
2	Sudden Attack	Online FPS (shooting)	Game Hi
3	Lineage	MMORPG	NC Soft
4	Lineage2	MMORPG	NC Soft
5	World of Warcraft	MMORPG	Blizzard
6	FiFa Online	Sports	Electronic Arts
7	Audition	Casual (Music game)	O2Media
8	Dungeon and Fighter	Online Action	Neople
9	Kart Rider	Racing	Nexon
10	R2 (Reign of Revolution) online	MMORPG	NHN Games
11	Mu online	MMORPG	WebZen
12	Rohan Online	MMORPG	YNK Games
13	Ryl Online	MMORPG	GamaSoft

* FPS: an abbreviation of first-person shooter game, of which game map and landscape is viewed from a first-person perspective.

*Source: extracted from <http://www.gamechart.co.kr> (11.13. 2006)

Several scholars (Shintaku, 2003; Wi, 2002) explain the formation of the online game industry in terms of initial conditions and complementary infrastructures. Initially, the Korean game market was characterized by the following: less development of the video game market; potential users in the computer game; software companies that suffered from illegal duplication of CD-packages. Parents were reluctant to buy game consoles for video games while potential game users got accustomed to playing simple game on computers. In particular, the online game was considered to be one effective solution for illegal duplication of game software since the online game can be operated with both a client-program that game users download into their computers and a host-

program that software companies contain in their server computers. Thus, a majority of software companies began consideration of entering online game sectors.

On the other side, complementary assets around the internet and the computer were changed. First, the widespread popularity of the internet café (called *PC Bang*) was the direct result of the popularity of the game, “Starcraft,” released by Blizzard Entertainment in 1997 and 1998. Starcraft was a network PC game that required game players to play in one place such as *PC Bang*, where computers connected to each other via a network. Through the network, game players were able to organize teams and compete against each other. However, behind the establishment of network systems in *PC Bang* was the rapid diffusion of low-cost ADSL (Asymmetric Digital Subscriber Line; a form of internet DSL technology) exits. In 1997, the Korean government changed communication policy to promote competition in broadband sector. It caused the establishment of other private companies such as Hanaro Telecom to compete with Korea Telecom. This competition resulted in the fixed cost at about \$29 per household and accelerated subscriptions to the internet backbone. In 2004, the number of subscribers to internet service reached 11.9 million people (National Information Society Agency, 2005). Considering that the total population was 48,199 thousand people, it implied that most households had high-speed internet access. According to OECD reports, the number of subscribers per 100 persons in Korea (24.9) was more than twice as high as average of OECD countries (10.2) (Electronic Times news, 2005. 5.30). In addition, payment methods were various to pay for game play in online: credit card, prepaid card, direct deposit from bank, and the fee charged into cell phone bills.

4.3.2 Current Developments and Regional Distribution

We can summarize the features of the game industrial structure in Korea in three aspects. First, the industrial structure is polarized. In 2004, the top eight companies formed about 70 percent of the market share in online games (KGDPI, 2005). Particularly, two companies reach around 46 percent of the Korean game industry: NC Soft made up around 35 percent while reporting \$241 million in sales and Nexon shared 11 percent of the market.²⁴

This trend is also detected from the calculation of aggregate statistics. Unfortunately, Korea maintains no official statistics that report the total sales of game software companies by the type of platform (Table 4.3). However, the Korea National Statistical Office (KNSO) reported the general statistics of game software companies in all kinds of platforms except arcade games, in a category of “72201 Game Software/Publishing.” According to KNSO, only a small number of large companies employ 100 or more individuals. In 2004, only three percent of all game companies (15 firms out of 506 firms) hired more than 100 employees, but they employed 30 percent of the Korean game employees. Considering the fact that online games are the dominant game platform in Korea, this may be considered a trend in the online game industry. In addition, in the same year, out of all the game companies, seven percent of game companies with more than 50 persons (36 firms out of 506 firms) accounted for 45 percent of Korean game employees.

²⁴ Han game reported 8.5% of market share and CJ internet who operates game portal, Net Marble, is 7.3% followed by Gravity 5.7%, Web Zen 5.2%, Neowiz 5.2%, Mgame 1.9%.

The industrial dominance of a few companies would not be considered conspicuous since most industries consist of only a small number of large corporations. This is also true of the game industry. However, one could argue that the Korean game industry is one in which firms come and go like the ebb and flow of the sea—flourishing with small start-up businesses and dying with massive failures,

As seen in Table 4.3, small companies with one to nine employees comprise the majority of Korean game companies. In 2004, 56 percent of the Korean firms employed one to nine people, and 46 percent of the Seoul firms employed from 10-49 people. Most of the small firms can be considered start-up firms, most of which are teetering between success and failure.²⁵ When it first begins business, a game company tends to start with several friends or past business partners who have a concept that they would like to develop into a product. Once their game development projects go beyond the clarification of a concept and the creation of a naïve prototype, the companies start to seek financial support from individual investors, financial institutions, or other game companies. This stage represents the one of the biggest bottlenecks in the process. If a company receives financial support, it might succeed in producing and releasing an original game title, which may lead to economic success in the market. However, most companies seem to fail to gain financing. Therefore, small companies in Korea are more likely to spend more time developing the game title of other game companies. According to the questionnaire

²⁵ If we think of the divisions of labor in the game development process—planning, graphics, sounds, programmers— a minimum number of employees would be required, depending on the game platform, to have a startup company. A number of mobile start-up companies had only three or four employees in 2002 and 2003, when mobile games became popular in the game industry (interview with MSK, Marketing, March 15, 2006). An analysis of the questionnaire survey found that survey responding companies hired an average of 8.5 individuals in their first year (see appendix table 2 for its detail statistics)

survey, eleven percent of small companies with less than ten employees were mainly involved in subcontracted work from other game companies, and 37 percent of small companies worked on their original development project alongside other game companies' that were working on their own projects (Table 4.4).

Table 4.3. Number of Firms and Employees by Firm Size in Korea and Survey Respondents

	Korea		Seoul		Survey Respondents	
	Firm	Employee	Firm	Employee	Firm	Employee
Total	506	8,890	341	7,663	104	6,160
1-9 persons	56%	14%	46%	9%	18%	2%
10-49 person	37%	41%	44%	39%	67%	25%
50-99 person	4%	15%	6%	17%	7%	8%
100 more	3%	30%	5%	35%	8%	65%

*. KNSO statistics reported statistics in 2004 about a category of "72201 Game Software/Publishing"

** . Questionnaire survey was conducted in 2006. However, the survey asked the information about companies as in 2005.

Source: Korea National Statistical Office (KNSO), Questionnaire survey

Table 4.4. Firm Size and Business Focus in 2005

	Number of Employees				
	1-9 persons	10-49 person	50-99 person	100 more	Total
The development of company's own game title development without subcontracted work.	52.6%	54.3%	71.4%	100.0%	58.7%
The development of company's own game title development with subcontracted work.	36.8%	44.3%	28.6%	0.0%	38.5%
Mainly subcontracted work.	10.5%	1.4%	0.0%	0.0%	2.9%
Total	19	70	7	8	104

Pearson $\chi^2(6) = 11.5504$ Pr = 0.073

Source: Questionnaire survey

Second, as the game industry matured, it seemed that divisions of labor have progressed within the industry. By 2002, traditional publishing companies had originated from distributing computer and arcade game companies on the one hand and game development companies on the other hand. However, in the case of online games, game development companies often published their own titles since the distribution path through the internet was relatively easier than other platforms. Therefore, the existing publishers mainly worked together with a small number within the game software industry that could afford higher quality of maintenance. However, as the online market grew and similar genres of game titles were being published, operating and consumer service became more important. So, the divisions of labor between small development companies and publishing companies became more crucial. Moreover, since the second half of 2002, venture capital companies stopped investing in the game industry (KGDPI, 2003)²⁶.

At this point, major big game companies mentioned earlier started to extend their business areas from development into development and publishing in 2004 and 2005. This change was stimulated by the advance of internet portal service companies into game publishing in 2002 and 2003²⁷ (KGDPI, 2003; Park, 2004). In the game industry,

²⁶ The venture capital companies failed to collect their investments because of the risky nature of game products and the lack of investment specialists who have a thorough knowledge of the game industry (interview with Dr. Kim at KGDPI). The venture capital companies did not have persons who could understand the features of game titles when they evaluate protocol or prototypes of game companies.

²⁷ Internet portal companies diversified their business areas are two types: (1) community portal such as Daum, Nate; (2) search portals like Yahoo and Empas. They entered into game sector based on the belief of that their existing subscribers would also join the game services. However, due to their inability to manage server and customer requests, it did not go very well.

publishers are investors too. Once the contract between publishers and game companies was made, publishers also provided financial resources and other marketing advices.

Third, the majority of game companies are located in Seoul. Shin (2004) studied the regional concentration based on Game Company Registration Records. According to him, 1,322 firms out of 1,774 (75%) were located in Seoul in 2002. In 1999, the ratio of Seoul game companies was 77% (321 firms in Seoul; 416 firms in whole country). Such a tendency toward high regional concentration is also shown in the distribution of game companies within Seoul. According to Shin (2004) and Lee (2000), the majority of game companies are located in only five out of twenty-five sub-regions in Seoul called “*Gu*”. In 1999, 67 percent of Seoul game companies were located in these five sub-regions: Jung-gu, Gangnam-gu, Seong-gu, Yeongdeungpo-gu, and Yongsan-gu. In 2002, 69 percent were located in the same five sub-regions.

Figure 4.5 shows the geographical concentration within Seoul. The map was drawn based on the Korea National Statistical Office (KNSO). In 2004, the total number of Seoul game firms was 341. Out of these 341 firms, 99 (with 29% of the total number of Seoul game firms accounting for 39% of the total Seoul game employees) were located in only one Gu, Gangnam-gu. The second most concentrated sub-region was Seocho-gu (with 48 firms accounting for 14% of the total number of game firms and 16% of the total game employees), which is adjacent to Gangnam-gu. Another adjacent sub-region, Gwangjin-gu, was the third most concentrated region (37 firms, accounting for 11% of the total number of game firms and 5% of the total number of Seoul employees). In other words, Seoul game firms are highly concentrated around Gangnam-gu and two adjacent sub-regions.

The difference between the existing studies by Shin (2004) and Lee (2000) and the KNSO study, presented in Figure 4.5, differs not only in the years they were conducted but also in the data sources they used. The statistics from the Game Company Registration Records are somewhat limited since the records are not updated regularly. Once a company registers as a game company in the registration records, it is still listed even after it has gone out of the business. The result of this problem is overestimation. An even more serious problem is that the records includes only companies that produce traditional games such as arcade games whereas the KNSO statistics include companies that are members of only the PC-related game software industry, which excludes the former. Therefore, the KNSO statistics are considered to be better proxy measures for online and mobile games.

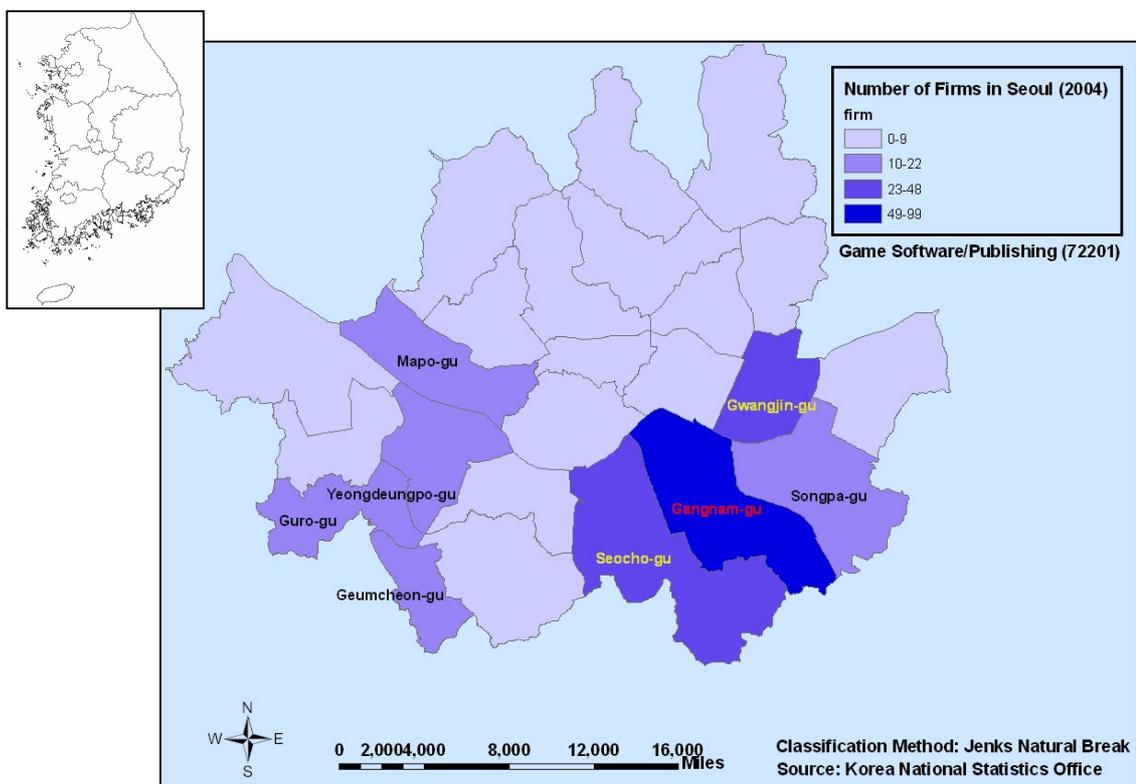


Figure 4.5. Geographical Concentration of Seoul Game Companies

4.4 Summary

This chapter reviewed the features of the game industry and the development process of game titles and explored the characteristics of the Korean game software industry. The game industry is both a multimedia industry and a cultural industry. Therefore, it is related to the developments of the hardware industry, the internet service industry, and other cultural industries as well as publishers that function as both distributors and financial investors. This characteristic also influences the formation of game development projects. A game development project is the integration of diverse knowledge and expertise from technology with artistic components such as story writing, graphics, and sound. Therefore, the organization of a game development project seems to divide into subdivisions according to tasks. However, this integration of technology and cultural elements has been detected in the examination of the rapid growth of the Korean game industry, specifically the online game market, since the mid or late 1990s.. The timely combination of the popularity of a game title “Starcraft” together with the introduction of competitive strategies in internet broadband and infrastructure markets by the Korean government, provided game software companies with opportunities to enter the online game market. Since then, the on-going growth and development of the Korean game industry in the past decade has led to bi-polarization between a few larger, stable companies and a number of small venture start-ups. As a result, the large companies have become publishers due to revenues from the steady sellers of large companies. Another characteristic of the Korean game industry is obvious geographical concentration in certain sub-regions in Seoul such as Gangnam-gu.

CHAPTER 5

PROJECT FORMATION AND DIVERSITY

This chapter explores the composition of project teams and characteristics of the labor market in the game industry. First, the chapter presents the micro-level of searching and recruiting behaviors of employers and employees based on mainly interview surveys and complemented by statistical analysis. In doing so, this research focus on how game companies use informal ways such as recommendations of “communities of practice” (Wenger 1998; Wenger and Snyder, 2000) to hire trustworthy talents. Second, one of the conspicuous characteristics of the labor market in the industry is frequent job-hopping. This section addresses the impact of job-hopping behaviors of the employees in the game industry on power relationships and learning. On the other hand, game companies may rely on the external resources. They might hire freelancers or make a contract with another company to outsource some part of their development process. In section 5.2, the outsourcing strategy of the game companies is discussed. It explores what companies are more likely to outsource their activities and increase the level of outsourcing measured in outsourcing costs.

5.1 Mobilizing Project Members

Game title development is conducted by the members of one project team mobilized in a company. The typical project team is comprised of the so-called developers: planners, artistic workers (e.g., sound specialists, graphic designers), and technicians (e.g., programmers, system integrators). Working alongside the project team

are the managerial/marketing staff, who will support the developers. The success of the projects depends primarily on the ability and capability of the company and project manager²⁸ to mobilize the appropriate team members. Such mobilization is achieved by either hiring new employees or selecting existing employees inside the company. This section focuses on the hiring of new employees since selecting from an existing employee pool is less risky.

5.1.1 Risks in Hiring New Employees and Search Patterns

A prominent feature of the game labor market is that the relationships of formal systems such as education in high school²⁹ or university and a certificate of qualifications with employments are extremely low. Hwang et al. (2005)³⁰ described the survey results that collected the questionnaire from 1,211 employees in the game industry. According to the research, only six percent of employees graduated from game-related majors. The

²⁸ Out of 104 companies, about 48 percent of companies responded “project manager” to the question about the final decision maker to select team members, followed by “president” (19%) and “development executives” (18%). The head of subdivision has the least decision power (14%). However, this question leads the difference by firm size. In the small firms with employees less than 10, presidents were frequently reported. However, as firm size becomes bigger, the percentage of project manager as a final decision maker becomes higher (Appendix table 1.). That is, large game company in the game industry is guaranteeing the autonomy of each of project teams.

²⁹ In Korea, high school is largely divided into two kinds. One is a step to prepare for the university. The other is a step for preparing to get a job. The latter is vocational high school where students study general academic disciplines but it is more focused on training specific fields. Since the last few years when the game industry got into the spotlight, several game-related high schools and universities were established.

³⁰ The survey was conducted in April 2005 as in a subset of the research for *Korea Game White Paper* (Korea Game Development and Promotion Institute, sponsored by Ministry of Culture and Tourism). The survey collected the questionnaire from 356 firms and 1,211 employees.

higher percentage of game-related majors was in the programming, which was only 9.6% although it is a relatively technical field and thus should be related to their majors.

Since 2000, as one of the policies supporting the game industry, Human Resources Development Service of Korea, a public agency of the Korean government, has been administering the exams for several certificates: game planning specialist, game graphic specialist, and game programming specialist. However, the general atmosphere of the game industry was to not consider those qualifications as reliable and sufficient, and sometimes even showed a cynical attitude toward the certificate exams.

When we hang out for drinks, we sometimes joke that there are three conditions for not being able to be a [game] developer. If you have a big apartment, girlfriend, and the certificates, you cannot be a developer. *[Interviewer: why not that certificate?]* Usually, most people who came to the interviews with that certificate do not have portfolio or enough experiences. I don't understand why the government thinks only the game industry needs gaming certificate unlike movie, animation, and broadcasting industry (Interview with JYK, Planner, April 23, 2006).

The game certificates might not be that useful to get a job in this industry. Company is not a university. Those certificates examine basic knowledge that is even sometimes not relevant for the game industry. If someone has great portfolios to present, we consider his certificate a result of diligence. However, if he does not have portfolios, it is just a paper like a driver's license. Rather, we are somewhat suspicious this person is just the "new generation" in the industry. (Interview with MSJ, Project manager, February 14, 2006)

This general atmosphere is related to the pervasive belief that certificates do not show sufficient technical knowledge but also more importantly the awareness of

companies of the so-called “new generation” in the game industry. The new generation is referred to as young entrants into the game labor market who consider developers as simply one of occupations: they look for high-paying jobs in large game companies or temporary jobs in small companies until they finally get jobs in good game companies or other IT industry, and liberal work environments.

With the lack of and distrust about formal system, several risks are involved in hiring new employees whether it is experienced workers or the inexperienced. The risks can be detected in the three aspects: (1) job-related knowledge and capability; (2) social skills related to teamwork; and (3) passion towards game production. At first glance, the last one, passion, seems to be related to only diligence and loyalty to product development and companies, considering the high instability of companies: for example, delayed payment of wages. Also, it is not just about the homogenous culture³¹ that might facilitate the friendly, coherence of teamwork from the same orientation: they are the only group that shows great affection towards game, no matter how much society put negative stigma on game titles: for example, action or shooting game have children more violent. Moreover, it is deeply related to the cognitive aspects and is somehow overlapped to the knowledge capability. When project team members communicate with

³¹ The first generation –also current “real” game developers- of the game industry may be sort of troublesome children who did not study for university exam and spent most of the time on playing, talking about, and sometimes even reverse-engineering game titles. Some persons who authors interviewed talked about their childhoods that they fought against their parents or complained why the society does not consider a game good. One interviewee remembering his high school days and said, “one day when I came back home from the school, I found my game packages [*which were really expensive*] all gone. I retrieved them from the trash bins and hid them in my secret place... finally, my parents had them burned in front of me” (Interview: Jung-yoon Kim, previously worked at Neoact, April 23, 2006).

each other, they usually use the examples of the existing games and animations³². In other words, that ability to understand what other project team members talk about is not easily and quickly achieved. This passion provides opportunities to get information about the past game history and some intuition and insights.

When I worked in the previous company, the communication problem was severe. There were several persons in graphics and programming who didn't know the basics in game. For example, when I asked them to revise NPC [*non-player character: it is a program-generated character given to players*], they changed players' characters, not NPC.... They were not familiar with the common rules of game. So they didn't recognize newness or attractiveness when "new", "unconventional" rules of games were suggested. Then I should keep explaining how they should highlight that. (Interview with SMK, Planner, April 27, 2006. Italics author added)

In the initial stage of the game industry, it was simple to find congenial persons just as finding members for underground music bands. The possible members were limited, they knew each other closely, and had a very coherent value system and passions. The possible search pattern was limited but it was not problematic in terms of risk and trust. At the time, game developers established venture companies in garages of low-rent districts with other persons they met in retail stores and clusters of computer hardware(H/W) and software (S/W)—for example, Yongsan Electronic Market in Seoul- (interview with WSL, President and former game developer, March 20, 2006), they met

³² Hwang et al (2005: 182) shows the motives for getting a job in the game industry. Out of 1,211 respondents, about thirty percent selected a bright prospect of the industry. However, twenty one percent responded "game passion", seventeen percent "has been enjoying game play since childhoods", and nine percent "started from game as a hobby". In fact, game passion-related motive are bigger than prospect factors.

in the same university club, or online community in the era of PC communication (Interview: MSJ, Project manager, February 14, 2006). However, since the industry has grown, the traditional way is not enough to meet the increased labor demand of companies. The search boundary of companies should be expanded while the search behavior should be ensuring to hire trustworthy persons.

Table 5.1 describes the analysis results of the questionnaire survey (see Tables D.14-D.28 in the Appendix D for the detailed responses on the questionnaire). The primary method that companies used to hire experienced employees in 2005 was either open announcement through newspaper/online or recommendation by employees depending upon the type of a job duty. The responding companies hired the experienced workers through “communities of practice” such as recommendations by their employees or by other game companies for planners (50%) and programmers (48%). Meanwhile, the companies used internet and newspapers as a primary method for job announcements in graphics (48%), H/W, network managers (50%), and system engineers (48%). However, considering the low cost of posting on the websites such as game-related online communities, the importance of the formal announcements should not be overemphasized. The more important fact is that the official announcement through the website is indirectly using the communities of practice because they posted their job announcements on the online communities of planners, graphic artists, and programmers. In addition, more than 85 companies out of 104 companies reported they also used the secondary method to hire people (Table 5.2). The reliance of companies on the communities of practice is more obvious when we look at the second method of hiring experienced

employees. With regard to the secondary method, the majority of companies responded that they used recommendations of other people in the industry.

Table 5.1. Primary Hiring Method for Experienced Employee (frequency, %)

	Planners	Graphics	Programmers	H/W, network	System engineer
Job posting on newspapers, internet	46	50	46	52	49
	(44.2)	(48.1)	(44.2)	(50.0)	(47.6)
Recommendations by past/current business partners	3	4	3	2	2
	(2.9)	(3.9)	(2.9)	(1.9)	(1.9)
Recommendations by employees and other gaming companies	52	47	50	47	47
	(50.0)	(45.2)	(48.1)	(45.2)	(45.6)
Recommendation of employees	46	45	48	44	45
	(44.2)	(43.3)	(46.2)	(42.3)	(43.7)
Others	3	3	5	3	5
	(2.9)	(2.9)	(4.8)	(2.9)	(4.9)
Total	104	104	104	104	103
	(100)	(100)	(100)	(100)	(100)

*Value of percentage in parentheses

Source: Questionnaire survey

Table 5.2. Secondary Hiring Method for Experienced Employee (frequency, %)

	Planners	Graphics	Programmers	H/W, network	System engineer
Job posting on newspapers, internet	19	22	23	20	22
	(22.4)	(25.6)	(25.8)	(22.5)	(24.7)
Recommendations by past/current business partners	5	2	3	2	4
	(5.9)	(2.3)	(3.4)	(2.3)	(4.5)
Recommendations by employees and other gaming companies	51	53	51	54	50
	(60.0)	(61.6)	(57.3)	(60.7)	(56.2)
Recommendation of employees	34	35	30	35	32
	(40.0)	(40.7)	(33.7)	(39.3)	(36.0)
Others	10	9	12	13	13
	(11.8)	(10.5)	(13.5)	(14.6)	(14.6)
Total	85	86	89	89	89
	(100)	(100)	(100)	(100)	(100)

*Value of percentage in parentheses, Source: Questionnaire survey

Table 5.3. Primary Hiring Method for Inexperienced Employee (frequency, %)

	Planners	Graphics	Program mers	H/W, network	System engineer
Job posting on newspapers, internet	69	64	67	65	63
	(73.4)	(68.8)	(70.5)	(68.4)	(67.7)
Recommendations by past/current business partners	0	1	0	0	0
	(0.0)	(1.1)	(0.0)	(0.0)	(0.0)
Recommendations by employees and other gaming companies	21	23	24	25	25
	(22.3)	(24.7)	(25.3)	(26.3)	(26.9)
Recommendation by employees	21	22	23	25	25
	(22.3)	(23.7)	(24.2)	(26.3)	(26.9)
Others	4	5	4	5	5
	(4.3)	(5.4)	(4.2)	(5.3)	(5.4)
Total	94	93	95	95	93
	(100)	(100)	(100)	(100)	(100)

*Value of percentage in parentheses

Source: Questionnaire survey

However, the game companies rarely used the recommendations of the past and current business partners—built-in trust-. In addition, as for the primary method, none of companies took the recommendations of investors, publishers, or trade associations to hire employees. It implies that the game companies relied on the communities of practice that the internal employees of companies are engaged in more than the recommendations of their business partners.

The importance of informal search pattern for the experienced becomes much clearer when we compare it with the hiring pattern for the inexperienced (Table 5.3). In 2005, companies used formal hiring announcements for the inexperienced more than that for the experienced. In general, more than 68 percent of companies relied on the newspaper and online job announcements. Only 22 percent to 26 percent of companies inquired of their employees or of other people about the inexperienced.

5.1.2 Risk Reductions and Communities of Practice

The tables above suggest that there is enormous reliance of companies on game community, that is, the communities of practice, when they recruit new employees. Such reliance is more obvious in hiring experienced workers, particularly planners and programmers. In that case, the person who is in charge of hiring people (usually project manager or head of subdivision) contacts the persons that job-seekers worked with before or met through the vocational institute, online community, same university or same club³³. Conversely, job-seekers also get information about job announcements and scout contacts from other persons.

Despite the higher percentage of informal search patterns, formal announcements were still higher. The results are surprising when the importance of social skills related to teamwork and the weakness of the formal system are considered. Therefore, how did companies minimize the risks of hiring appropriate persons? This research suggests that several buffers to that risk exist and these buffers are also supported by the reputations and activities in the communities of practice.

No matter whether it is through a formal way or informal ways, job interviewees should submit their résumés and their own planning draft for planners or portfolio for graphic artists. Project managers and the head of relevant subdivisions evaluate their portfolios. What should be noted is that job-seekers should not submit portfolios or

³³ In some cases, companies do not ask their employees to recommend their friends for new employees. One interviewee said a company did not want a factional strife between team members (Hae-ran Lee, graphic team head, Mobilse, on April 6, 2006). Another reason that companies did not use the recommendations of their employees is to preserve the diversity (Bo-mi Kim, Strategic planning manger, Sevens Entertainment, March 30, 2006). According to Kim, hiring people from same vocational institute might make the progress of project faster owing to same technological backgrounds or same jargons. However, it might cause the situation of continuing to use same graphics or technology.

planning draft that they made for other game titles. In other words, the experienced workers should submit their works that are not released. Sometimes if an interviewee is a person who just completed game-related vocational institute³⁴, the portfolio might be a result of school projects done by a group. In that case, the requests that another portfolio given theme or topic to be submitted. Therefore, persons who want to get a job in the industry always should be prepared to submit new original portfolios. In order to submit better work, job seekers also get feedback from their friends and persons they have known for a long time from communities of practice such as online community.

When I was looking for a job in another company, I always worked on my concept reports to be submitted after regular office hours. I met some persons that I knew from schools and from informal meetings. These persons should be trustworthy in the sense that they will not use my concept report for themselves. (Interview SJK, Marketing manager and formerly planners, April 21, 2006)

Sometimes, such an examination process on portfolios extends to looking at their other activities in homepages or internet blogs of the interviewees (Interview with SMK, Planner, April 27, 2006). Most cases of graphic artists have a tendency to operate their blogs in order to connect to other graphic artists. Particularly, graphic artists who desire to enter the game industry actively use internet to achieve “Net *yun* (connection)”.

However, the examination of portfolios is not enough since companies need to determine interviewee familiar with its conventions of the industry. The key point is the

³⁴ Due to the rapid growth of game industry and the existence of the certificates, there are a lot of private vocational institutes. Among these, the typical one is “Game Academy” that is sponsored by the Korean government.

knowledge of interviewees about other subdivision activities and social skills required of team members.

For example, a graphic artist should know or at least get a sense of the flow of game production processes such as how his/her picture should be converted into digital data sources for integrating into one program. Also, a graphic artist should know how to negotiate his/her artistic preferences with game orientations. That is, they are required to have “loyalties to game titles” (Interview with WHP, Strategic Producer, April 12, 2006). In addition, planners should also understand technical terms of programmers to some degree or at least should have some intuition as to what game they can make with this level of programmers for the number of months of project period (Interview with BMK, Manager in Strategic Planning and Marketing, March 30, 2006). In particular, an essential virtue for planners is the recognition about technical possibility. Without this, planners cannot negotiate with programmers who sometimes oppose ideas of planners with technical constraint.

In other words, the knowledge and capability required of game workers is not one dimension that is confined by their field. Such knowledge includes the understanding of what next step will be needed to integrate their own work into other divisions’ work. More importantly, this kind of knowledge that cannot be completely and clearly documented can be achieved only through learning by doing and learning by seeing, not through books or courses. Developers learned these above through participation in the game production process or projects in their engaged online communities. Thus, it is “development experiences” that companies consider to approximately measuring the knowledge of interviewees. In addition, this developmental experience is also a kind of

proxy measure for companies to figure out the personality of interviewees. This check with developmental experiences reduces the risk of companies for hiring experienced workers. If it is the inexperienced, school projects or club projects are important.

When I looked for an art director to be scouted, my first question was whether that guy was from the start of projects to the end. The commitment for an entire period of a project is very important. It shows not only knowledge of that person but also social skills and personality. (Interview with CHJ, Producer, April, 20, 2006)

Along with this development experiences items, the critical procedures to reduce the risks of hiring new persons is a “reference check”. Once the interviewees are considered to be candidates for new employment, companies (specifically, the project team members) contact the persons who worked with interviewees previously. At this stage, companies confirm the experiences, skills, personalities, and social skills of interviewees.

In other words, communities of practice function as the fundamental grounds or channels for verifying trustworthiness of job-seekers. Therefore, the human resource department in the company does not intervene in this process since qualifying processes are based on specialized knowledge and its knowledge community. The activeness of communities of practice and the selection by developers does not need the intervention of human resource departments. The only job of the human resource department for new employees is that of salary: investigation of previous job’s annual salary and negotiation of salary with currently hiring companies.

The practices and conventions in the game industry are quite different from those in other industries that I worked for eight years. Most of personnel managements are done inside of development teams. The main role of human resource department is check with other companies in terms of welfare system of other companies and collects the complaints from developers just in case that those complaints are not solved within development teams. (Interview with JJH, Head of Human Resource Department, March 29, 2006)

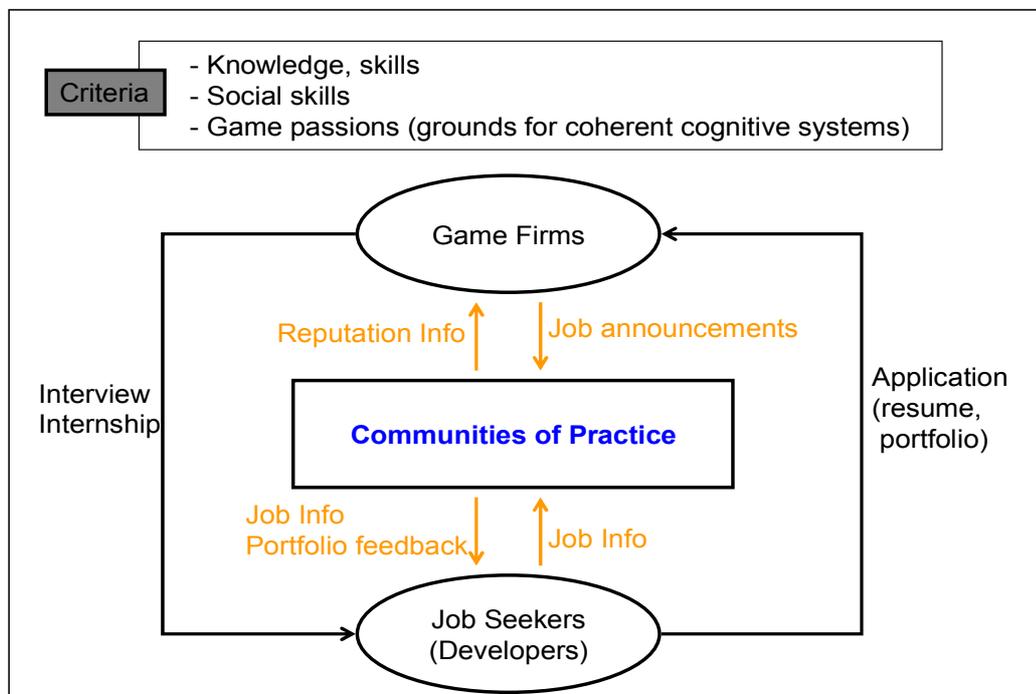


Figure 5.1. Communities of Practice: Search Pattern and Hiring Procedures

However, this qualification and hiring process does not apply to all the companies. There is a significant difference between small firms and large firms in the ability to get the reference check done. Companies access communities of practice via their employees. Small companies have fewer of employees, specifically fewer of the experienced workers,

which weaken their positions in the network of the game industry. As a result, the accessibility of small companies to communities of practice might be lower than big companies.

There is no contact point with firms, particularly large firms. Sometimes, I called the previous project team of an interviewee in order to know how that person was. But they did not say anything important and usually kept silent to important questions. Probably they did it for solidarity (Interview with BSK, Development CEO, April 27, 2006).

Consequently, small and medium-sized companies should usually rely on the accessibility of their employees to other members in online communities or education. However, compared to large firms or stable firms, it is not usually that easy for small and medium-sized firms to hire experienced workers who have much broader connections with other people in the game industry and who have been deeply involved in the communities of practice. Therefore, the last resort for small and medium-sized companies is to introduce internship or apprenticeship before formally hiring newly employed persons. This internship/apprenticeship customarily lasts one month. For this one month companies were able to check new hires' social skills, basic skills, and potentials for learning.

For small firms like us, we don't have any choice. Large firms such as NC soft and Nexon, have tried to competitively retain talented game developers³⁵. So, we usually hire the interns after one month by 99%

³⁵ Due to the rapid growth of the game industry, labor supply is not sufficient to labor demand of companies. Moreover, what makes the situation of companies worse is that

unless their personality is really problematic or their skills are beneath entry level (Interview with SHK, Strategic planning manger, March 31, 2006).

However, this convention of tradition is also still observed in a large firm too. It implies that recommendations by people in the game community do not guarantee the stability one hundred percent. Table 5.4 shows that out of 104 companies, 73 percent of companies (76 firms) reported apprenticeship or internship for a while before employing officially (Table 5.4). The highest percentage to use temporary employment is shown in the firm with the number of employment between 10 and 49 persons, while 74 percent of small firms with less than 10 employees (14 firms), and 75 percent of large firms with more than 100 employees were using the temporary employment contracts. However, it is not slightly significant at 0.05 level.

Table 5.4. Employment Contract by Firm size

	1-9	10-49	50-99	100 +	Total
Regular contract	5 (26.3)	16 (22.9)	5 (71.4)	2 (25.0)	28 (26.9)
Regular contract after certain period of apprenticeship	14 (73.7)	54 (77.1)	2 (28.6)	6 (75.0)	76 (73.1)
Total	19 (100.0)	70 (100.0)	7 (100.0)	8 (100.0)	104 (100.0)

*. Pearson $\chi^2(3) = 7.6540$ Pr = 0.054

** .Value of percentage in parentheses

the aggressive efforts of large companies, which bring about many pros and cons. In 2005, large firms or stable, well-known third-party development companies started to hire very openly and even go over to the university to find a good developer (Electronic Times, 12.12. 2005)

5.1.3 Job-hopping and Power Relationships

Another characteristic of the game industry is higher job mobility and project-based employment³⁶. Frequent job-hopping is partly due to instability of companies: closedown or reduction of employees. Companies adjust their employees depending on the success of their projects. If the recently released game titles are successful to attract more investors to update and patch, they would rather hire more employees. Among companies interviewed, one company recently increased its employees owing to its successful open beta testing³⁷: 28 employees in April, 2006 persons to 60 employees in June 2006. If it is not the case, companies do not have any choice but to cut their employees remaining the core employees for a new project. Or, companies shut up their businesses.

However, frequent job-hopping is also mostly attributed to internal characteristics of the labor market. One of the important references for hiring and being hired is “developmental experiences” along with social skills. Therefore, developers are very concerned about their career management. Due to the short time of being developers, they pay relatively much more attention to have a good record as soon as possible compared to other workers in other industries.

³⁶ According to the survey results of Hwang et al. (2005), the average length of service in the company was about 40 months while the average length of service in the current company was 26 months. For planners, the average length in the industry was 42 months while that of current company was 27 months. For graphics the former is 34 months and the latter 19 months while the former of programmers was 34 months and the latter 22 months.

³⁷ Online game companies test their new game titles two times. In a closed test, their employees and publishers evaluate the titles, while an open beta test is open to any game players. This open beta test is the opportunity for firms to evaluate their title in terms of satisfaction and like/dislike of consumers. If consumers give good evaluation on a game title although the title is not completely developed, the game title’s reputation helps companies to attract more investors.

The game industry has some implicit restriction on age in working as developers. It is not easy to imagine developers in the mid or late 30s. We should make a good record when we are young [*to be development executive, project manager, and higher rank of marketing/strategic planning.*]. It is almost impossible to get a job in other industries. (Interview with JSC, Consumer Service and Public Relations, March 17, 2006, Italics author added)

They utilize different strategies depending on their career length. Inexperienced workers usually started working for small venture game companies to learn real industry-specific skills and convention. They learn from the existing experienced workers through learning by doing or seeing or through completing their assignments of which some are considered homework. Sometimes, rookies in the industry are asked to submit the reverse-planning report (interview with DGK, Chief of Executive Office, Korea Game Developers Association, April 7, 2006). This is similar to reverse engineering with the purpose of training and learning. The reverse-planning report is a draft that describes what items and characters are created and how the work flow of all the subdivisions in a game project should be organized under certain marketing purpose. When they do, famous game titles in genres that companies are interested are given. Graphic artists and programmers are required to complete similar assignments. In that case, their assignments are graphics and programming sources that is currently used or developed in the company. While they are accumulating their knowledge, they decide either to stay at current companies or move to others. If it is the latter, the interns keep contacting their friends in other companies and finally move to the friends' companies after they obtain

certain required job experiences. In this case, they are usually treated as inexperienced workers in terms of salary and job tasks.

For experienced workers, the number of project titles that they have completed and been involved in is very important. They should include as many project experiences “per year” as possible in their résumés, where preferably they used different knowledge and skills. However, most game companies’ situations do not allow developers to connect to new projects immediately following other project completion. Except for some companies that are financially stable or developed projects financed by publishers, most companies have a resting period between projects. Even when recent game titles are successful, developers should wait for several months to allow companies to recoup revenue to clear off past debts and arrange seed money for new projects. These several months are critical to experienced workers. If they believe that it will take more than 6 months (that is half a year) for new projects to take off, developers start to look for other jobs (Interview with JYK, Planner, April 13, 2007). And, even in the middle of a project, if they feel that the ongoing project seems to be miscarried, they try to move into other companies (Interview with JSC, Consumer Service and Public Relations, March 17, 2006).

Conversely, even when there is no intention by workers to leave company, some companies try to scout experienced workers. And the scout offer is not easily ignored. Since salaries is not going up until the completion of projects³⁸ and that scout offer comes

³⁸ The average salary in the game industry is lower than that of other IT industries. Although the salary has been increasing, the survey of Human Resources Development Service said that among the IT-related occupations, game graphic designers’ salary was the lowest one (Kumin newspaper, 1/18/2002). In 2005, in the online game, the monthly salary was 1,553 dollars for planners, 1,722 dollars for graphic artists, and 1,681 dollars

from their friends or previous colleagues, there are little risks involved from the perspective of developers. Such a scout offer is taken in the form of a collective scout since it sometimes goes to several developers at one time as a subdivision similar to buying one game studio or subdivision. The transfer of one developer to another company causes a chain reaction: the remaining employees move to that company following the first transferred person.

In the literature on Silicon Valley or other regions' research (Saxenian, 1996), the freedom of job mobility and frequent job-hopping have been considered to have positive impact on high-tech industry. It would be true at the industrial level. But it has different meaning at individual firm level. It might hurt most companies except large companies because of the frequent drain of project team members. If programmers move to another company in the middle of projects, the schedule of the project is delayed because each programmer has his/her own way to write sources and comments³⁹. New project members or even existing programmers cannot understand the sources and comments. However, without the actual turnovers of employees, the higher chances of job-hopping behavior also has significant impacts on the power relationships between companies –or project manager - and project members. In short, companies have relatively less negotiation power with team members. This situation empowers the developers in making important decisions for product developments and reduces the power of

for programmers (Hwang et al. 2005). In the mobile game industry, it was respectively 1,759 dollars, 1,426 dollars, and 1,555 dollars. Planners' salary in the online game industry was lower than that in the mobile game industry and the salary of programmers in the online game industry was higher than that in the mobile game industry.

³⁹ Bomi Kim (Sevens Entertainment, March 30, 2006) said, "on one occasion, we had to change the way of writing sources and comments seven times because of programmers' turnover.

managerial staffs that have managerial mind set. The company should give more freedom to developers. This lessened empowerment on managerial staff is also deepened by the selection mechanism mentioned earlier: developers are selected by the development team itself. In the game company, managerial staff is somewhat isolated by the groups of developers –from planners to programmers- and even sometimes the presidents who were formerly developers for a long time.

This power relationship –developers-oriented relationship- also can be detected in the relationships between managers in the development team and ordinary team members. First, consensus of developers are important. Because the quality and attractiveness of game content depends on the idea and extra efforts of team members, the project manager should get agreement from all team members. The project manager should have authority that comes from team members. Therefore, when one developer receive a company offer of promotion to project manager in the middle of a project, that person sometimes talks to every team member in every division to get agreements about that (interview with DHK, Project Manager and formerly graphic artist, April 14, 2006). In the situation of decision made after long debate, project manager and the heads of subdivision also try to persuade their members. Second, if the conflicts are not resolved, companies sometimes decide to dismiss the head of subdivision of a current project in order to switch with another person.

Once, I managed to scout one art director who was highly recommended by several people. Although this person's ability was excellent, his manner of managing the graphic team was not liked by the graphic artists. I do not mean that the management was bad, rather it was not what the team members expected or accepted. I, as a producer, tried to mediate them and persuade the art director to change the way. Finally, every member in

graphics and concept artists handed in resignation letters. There was no alternative but to dismiss that art director in order to keep coherence of the team (Chulhwa Jeong, CJ Internet GameStudio, April 20, 2006).

5.2 Mobilizing External Resources

Game companies sometimes outsource their work to mobilize external resources of a different knowledge set or to reduce the project period. Most of the jobs outsourced in the game industry are related to the cultural parts, particularly graphics and sounds. Since this type of outsourced work is not easily standardized or since the quality of final product is not certain before the actual product come out, game companies utilize the recommendations of other persons in the game industry or use previous partners again. Forty two percent of the responding companies reported they continued using the same partners and only 10 percent of the responding companies used newspaper or online announcements (Table D.29 in the Appendix D). Similarly, when they hired freelancers, only 6 percent of companies used formal way and 49 percent of companies relied on the recommendations of their employees (Table D.30 in the Appendix D). In other words, similar to hiring new employees, companies reduce any risks from outsourcing work through using trustworthy people. This section explores the decisions of firms on outsourcing their activities to external partners such as freelancers and other firms.

5.2.1 Description of Outsourcing Companies

Companies in the sample tend to outsource graphics and sound to external partners. Out of 104 companies, eighty-six companies (82.7%) outsourced the parts of

new product developments. Table 5.5 describes the number of outsourcing companies by production process. Seventy four percent of companies (77 companies) reported outsourcing sounds, followed by graphics (47 companies, 45%). Programming outsourcing was done by only eight companies and planning and scenario outsourcing were done by only one company respectively.

Table 5.5. The Number of Companies that Outsourced in 2005

	Plan.	Scen ario	Graphics		Sounds		Programming	
	Partia l*	Parti al*	Partial *	Comp lete*	Partial*	Comple te*	Partial*	Comple te*
# of firms	1	1	45	2	21	56	7	1
%	1.0	1.0	43.3	1.9	20.2	53.9	6.7	1.0

*. “Partial” means companies outsourced only part of each production process whereas “complete” means companies outsourced entire part of each production process.

**.: Total respondents: 104 companies

Most of the contract work was concentrated on the cultural process such as graphics and sounds. Although the scenario part is ideally artistic tasks that should be done with hiring writers, the reality in Korea is that scenario writing jobs are not a course independent of other areas. It would be due partly to the nature of scenario writing itself.

In the interview with Mr. WSS (April 29, 2006), he said,

Scenario writing in Korea is not that sophisticated a job as far as I am aware. I don't know if it's because of the nature of the Korean game company. But I believe that most game titles except large-scale RPG fantasy and simulation games do not need good writers of general sense. Even in my company –*which is the top 2 company*–, whether to hire a scenario writer depends on the game title. The importance of game

scenario lies in the logical flows of game story and its attractiveness of material for game titles. It is not in usage of words or writing style. We use spoken language daily as used in the characters' dialogues or prologues of game titles. Thus, there is no need to hire writers..... although writers are hired from time to time, it is usually temporary project-based hiring. (Italics added by the author)

In short, game scenario writing tasks do not necessarily require knowledge and good foundation in language and literature itself. The core of writing is logical or attractive developments of the story. The person who creates a game story should be accustomed to game rules. Thus, scenario work is mostly done by one or two planners in the planning division with the added job duty of making concept reports.⁴⁰ And once a company needs to use specialized scenario writers, it is preferable to hire them on a project base either internally (temporary worker) or externally (freelancer). That is why only one company hires external scenario writers.

As mentioned earlier, the main outsourced works are sounds and graphics. Eighty seven companies outsourced both graphics and sounds or either of them, in addition to any one of planning, scenario and programming. Tables 5.2 and 5.3 show the difference of outsourcing companies and non-outsourcing companies. At first, there is no significant difference among platforms that represent different technology. A majority of companies in both online and mobile games, which is more than 80 percent of the responding companies, outsourced their activities to external partners.

⁴⁰ Although hiring decision on specialized scenario writers depends on genre of game, it appears to be also associated with firm size. If firms are capable to hire more employees - that indicates the availability of financial resources-, they would hire scenario writers if it is needed. In the sample, only eight company (7.7%) hired scenario writers in 2005. However, it is statistically significant that larger companies tend to hire scenario writers (Appendix D table 1).

With regard to companies' historical characteristics, there are some conflicting findings. Companies that started their business in the game sector tend to use outsourcing less than the other companies (Table 5.6). That difference is statistically significant. It can be understood that companies whose core business was initially the game industry have been developing and accumulating their internal resources enough to avoid outsourcing although there might be higher chances of finding suitable external partners. However, we should be very careful about drawing that conclusion. Table 5.6 is the comparison table that does not control other factors. Less outsourcing might be due to firms' inability to mobilize external resources such as financial inability. Initial-game-business companies in the sample are smaller in employee size and invested less on product development in 2005 (Table D.32 in the Appendix D). The average size of the initial-game-business companies was 54.1, while that of the rest of companies was 73.2. Moreover, the averages of total investments on development projects in initial-game-business companies were \$782 thousand while the other companies spent \$2.14 million per year on average by 2.7 times more.

Table 5.7 shows the result of t-test on duration of firms in the industry, sales revenue, and new product development expenditures. T-test here is describing the difference between the two means of outsourcing companies and non-outsourcing companies and whether that difference can also be inferred to the population. The results show that all the variables except sales revenue and IP purchase expenditures are statistically significant.

The duration of firms in the game industry became statistically significant. Outsourcing companies have been operating their business in the game industry for 3.9

years, which is longer than non-outsourcing companies (2.8 years) by 1.2 years. In addition, compared with non-outsourcing companies, the outsourcing companies tend to be bigger, spend more on product developments, and employ more. Total employees of outsourcing companies were 69, more than non-outsourcing companies. Surprisingly, outsourcing companies had retained more cultural workers in their companies than non-outsourcing companies, although most outsourced works were the cultural activities.

Table 5.6. Comparison between Outsourcing and Non-Outsourcing Firms (I)

	Initial Industry*				Main platform**			
	Game industry		Non-game industry		Online		Mobile	
	# of firms	%	# of firms	%	# of firms	%	# of firms	%
Outsourcing	59	77.6	27	96.4	51	82.3	35	83.3
Non- Outsourcing	17	22.4	1	3.6	11	17.7	7	16.7
Total	76	100	28	100	62	100	42	100

*. Pearson chi2(1) = 5.0514 Pr = 0.025

** . Pearson chi2(1) = 0.0202 Pr = 0.887

Table 5.7. Comparison between Outsourcing and Non-Outsourcing Firms (II)

	Outsourcing (Mean)	No Outsourcing (Mean)	Mean difference
Years in the game industry	3.9	2.8	1.2*
Sales revenue in 2005 (000 dollars)	7,463	2,113	5,350
Total employees in 2005	69	15	54**
Number of cultural workers in 2005	14	5	9**
Total expenditures in 2005 (000 dollars)	1,305	430	876*
IP purchase expenditures (000 dollars)	14.5	12.2	2.3
Observation	86	18	

* P<0.10; **P<0.05. \$1 = ~~W~~1,024.

In addition, outsourcing companies in the sample have larger sales revenue in 2005 which is about \$7.5 million on average. It is higher than non-outsourcing companies (\$2.1 million) by \$5.3 million, although that difference is not significant. Companies that

outsourced their cultural work also purchased more existing cultural contents such as scenario, graphics, and sounds, although it also does not differ from non-outsourcing companies. Outsourcing companies spent \$14.5 thousand while the rest of the companies purchased existing contents worthy of \$12.2 thousand.

In summary, outsourcing companies are likely to have more resources in terms of financing and employees than non-outsourcing companies. In other words, outsourcing companies seem to mobilize actively the internal and external resources together at the same time.

5.2.2 Hypotheses Test on Outsourcing Decisions

In this section, I analyze the questionnaire data using Probit and Tobit analysis to test the first three outsourcing hypotheses. The three hypotheses relate to the internal employee resources of, purchased internal capabilities of, and the cumulated knowledge assets of companies. If companies embrace more cultural workers (internal workforces), retain the intellectual rights of cultural content purchased from the cultural industries, and has been cumulated their knowledge over a long history in the game industry or had more knowledge asset in the beginning, they do not need to outsource the cultural parts of development process since they have enough capacity.

This research analyzes the outsourcing decisions of companies in two stages. First, firms should decide whether they outsource their activities. Second, once companies choose an outsourcing strategy, they should think of the extent to how much they outsource. This research measures the degree of outsourcing by monetary terms: how much they spend on outsourcing activities. Therefore, the three hypotheses are analyzed

in the two steps: the decisions of companies on make-or-buy and their decisions about outsourcing costs

Variables

Table 5.8 shows the variables for the hypotheses tests. This research analyzes several variables that represent organizational capability, technology capability, firm characteristics, and technology group. Because this research deals with two different decisions of firms, it has two different dependent variables: whether to outsource or not (make-or-buy decision) and how much percentage outsourcing costs in total expenditures (outsourcing costs). The rationale for each variable added in the models is addressed as follows.

With regard to the internal capabilities of companies, this research uses three variables: (1) the number of cultural workers, (2) initial industry, (3) game years and the square form of game years. Cultural worker is measured as the number of employees in scenario, graphics, and sounds in 2005.

Initial industry is a dummy variable. It is 1 if initial industry was the game industry, otherwise it is 0⁴¹. It represents the starting points of each company in learning curves. I add this variable because initial industry might have impacts on cumulating their current technological capabilities. If a company started its business in the game industry, it would have more advantage in learning quickly since its employees might be more likely to have experiences in the game industry. In addition, if it is the case, the company

⁴¹ Game companies generally have three origins: game companies; other IT companies; other cultural industries such as animation. In the sample, 76 companies started their business in game industry, while 21 companies did in other IT industry and 7 companies did in other industries.

already had some connections with other game companies and people engaged in the game industry from its start. This starting point would be important when we consider the diverse range of employees and different tasks for the development process in the company. Game company is composed of technicians and artists. If we think of a firm that entered the game industry from system integration (SI) industry, then this firm should learn several things: how game title development project should be organized; what personnel, particularly in graphics and sounds division, is appropriate to hire; how they hire artistic workers; and so on. Conversely, if a firm started as an animation company, they know about graphic designers and their works. However, they should learn technical components from programming to servers and planning components. Therefore, if companies established their businesses in the game industry, their learning behaviors and accumulation of knowledge might be faster than other companies that entered the industry from other industries such as other information technology industry or cultural industries.

The third variables represented internal capabilities is “game years and gameyears^2 (the square form of game years)”. Game years is how many years the companies produce their game titles, which is measured by months. The variable added is based on the belief that companies learned over time in terms of organizational and technological capabilities⁴². Long history means accumulation of knowledge inside of the

⁴² Mr. Kim at J-Interactive who is a strategic and planning manager addressed the accumulation of knowledge in company (interview date: 4/28/2006). He said, “my company can produce game titles quickly and in a more efficient way. We have been using the same configuration for each game. Although several employees always come and go, as seen generally in the game industry, there are several employees that still remain in the company for several years. These core workers who know how to work it

companies and thus, it can be interpreted that companies have more organizational capability and technological capability. Organizational capability counteracts the management costs of handling external partners since they have the existing partners or others that they can surely trust. Technological capability can function in the opposite direction. If companies have enough technological capability inside, they do not need to outsource some activities. However, if companies decide focus on specific knowledge sets, which in this case are technical domain such as programming other than cultural, they will still outsource non-core activities. In addition, there is possibility that the learning and accumulation of knowledge has curvilinear relationship with time. Organizational inertia might prohibit and decelerate the learning. Companies might accumulate their knowledge rapidly at certain levels, and then the learning speed might decrease.

Another variable in the models is “IP purchase”. This variable represents the purchased internal capabilities. A company might have purchased the existing cultural content from other cultural industries in order to substitute for the lack of internal capability instead of deciding to outsource some activities. IP purchase is measured as how much companies spent to purchase the intellectual properties rights from the cultural industries in 2005. This is strictly restricted to the cultural contents such as music, sound sources, scenario, novels, and graphics like cartoons. IP purchase is one way to use external resources. However, once a company licenses those, they would become internal resources that every member in the organization can access. These purchase costs might decrease the demand for cultural workers.

teach and facilitate other employees to organize their work in an efficient way. So, our profit is 1.5 times or 1.3 times bigger than others’ per game title”.

Table 5.8. Definition of Variables

Variable name		Definitions
Dependent variables	Outsource	Whether to outsource or not (make-or-buy)
	Out_costs	Percent of outsourcing costs in total expenditures in 2005
Independent variables	Cultural workers	Number of cultural workers (scenario, graphic, sounds)
	IP purchase	Dollars spent for royalty in 2005
	Initial	Dummy variable it is 1 if initial industry was game, otherwise=0
	Gameyears	Years of company has been producing game software.
	Gameyearsq	The square of game years
Control Variables	Online(Platform)	Dummy variable online game=1, otherwise=0
	Pub-type	Dummy variable Publishing other company's game =1, otherwise=0
	Expenditure	total expenditures on product development except marketing

This research employs several control variables: online, expenditure, and pub-type. “Online” is introduced to control different technology. It is a dummy variable, which is 1 when a company reports online as their primary core platform. It is 0 if the core platform is mobile. This variable will control differences in product characteristics and thus different inputs in products depending on platform. Since platform itself decides the game content, it would be a very important factor in explaining the composition of cultural workers and use of external partners. The mobile game industry is technically more restricted compared to the online game industry. The size of mobile game titles should be smaller than online game titles and the graphic pixels that cellular phone or other portable devices except game-specific portable devices can support technically are

not as good as computers. Therefore, a mobile game title is a shorter game story, less quality of graphics, and more simple sounds and music.

Expenditure, as another control variable, is measured in total expenditures on product development except marketing and office operating costs in 2005. It would be comparable to R&D expenditures in other industries. The expenditure variable represents the financial resources of companies. Expenditure would be either internal financial resources based on sales revenue in the past or the ability to mobilize finance from outside through publishers or investors.

The last control variable is “pub-type”, which is a dummy variable. It is 1 if company publishes the game titles of other game companies. Otherwise, it is 0. Please note that companies that publish their game titles on their own are counted as 0. Since an online game title is easily published online, publishing itself is very simple although it does not mean marketing is done easily.

Determinants on Outsourcing Decisions: make-or-buy

Table 5.9 provides the results of the probit analysis for make-or-buy decisions of companies: the determinants about whether or not companies outsource. In this paper, I used several models to diagnose the isolated and controlled effects of each variable. In other words, this research in this section tests three hypotheses that can be analyzed separately and together. Model 1 is about the Internal Workforce hypothesis and tests the impacts of the number of cultural workers as internal capacity on make-or-buy decisions. Model 2 related to the IP purchase hypothesis and is analyzing the spending on IP purchase as purchased internal capability. Models 3 and 4, the History hypotheses, are

examining whether companies' longer history in the same field –that increase chances to cumulate organizational and technological knowledge inside- will influence the decisions on make-or-buy decisions. Then, models 5 and 6 examine partial/full impacts of related variables.

Overall, all the variables except for the duration of companies (gameyears) appear to show consistent relationships with make-or-buy decisions across the six models in terms of positive and negative directions. In case of gameyears, in contrast to Models 3, 4, and 5, the coefficient of gameyear variables in model 6 has become negative.

The obvious finding is that the IP purchase spending (IP purchase) appears to be negatively associated with make-or-buy decisions, which confirms the IP purchase hypothesis. It indicates that companies that spend more on intellectual property rights– companies that purchased novels, graphics, sounds, or other types of cultural contents from other cultural industries–are less likely to use external partners than other companies that spend less, holding all the other variables constant. The former seem to conduct the work of graphics and sounds on their own. Companies that spend more than average by one-half standard deviation, are less likely to use external partners than other companies that spend less than average spending by one-half standard deviation. (See Table E.1 in Appendix E for the predicted probability change calculated from the Model 6.)

Table 5.9. Probit Analysis for Make-or-Buy decision

(Dependent variable: outsourcing=1; no outsourcing=0)

Independent var.	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	
Cultural workers	0.042 (1.52)				0.04 (1.41)	0.016 (0.36)	
IP purchase		-0.001 (-0.21)			-0.017* (-2.02)	-0.025* (2.46)	
Initial			-1.166* (-2.32)	-1.17* (-2.35)	-1.331* (-2.51)	-1.368* (2.51)	
Gameyears			0.15* (2.03)	0.046 (0.19)	0.095 (1.17)	-0.001 (0.00)	
Gameyearsq				0.014 (0.44)		0.008 (0.24)	
Online						-0.177 (-0.46)	
Expenditure						0.001 (1.62)	
Pub-type						0.146 (0.24)	
Constant	0.625** (2.82)	0.944** (6.23)	1.402** (2.81)	1.535** (2.67)	1.588** (2.84)	3.76 (0.01)	
Model Summary	Observations	102	103	104	104	102	102
	Log Likelihood	-45.3	-47.7	-42.324	-42.2	-38.96	-36.99
	Degree of freedom	1	1	2	3	4	8
	Pseudo R2	0.0469	0.0004	0.1167	0.1192	0.1803	0.2218

Value of Z statistics in parentheses

+ significant at 10%; * significant at 5%; ** significant at 1%

The initial industry of companies (initial) appears to be statistically significant over the models. Initial variable has negative impacts on the make-or-buy decisions. If companies' initial industry is the game industry, they are less likely to use external partners by 9.8 percent (see Table E.1 in Appendix E). This result confirms the History

hypothesis: initial-game-business companies have different starting points on the learning curve. If a company started their business in the game industry, this company would do with more expertise than the other companies would. Such different starting points might have different speed in accumulating their knowledge assets and nurturing their capabilities, holding all other conditions constant.

As another independent variable related to the History hypothesis, the duration of companies in the game industry (*gameyears*, *gameyearsq*) has shown a positive impact on make-or-buy decisions. Since a longer duration in the same industry might guarantee the accumulation of knowledge assets in companies, companies with a longer duration were expected to have fewer external partners. However, such companies appear to use external partners more than other companies with a shorter duration in the model, which may be because an older company might have more access to information about potential external partners or already have partners that they can trust, which reduces the cost of problems related to managing external partners. However, the variables (*gameyears*, *gameyearsq*) are not statistically significant.

However, the cultural workers variable does not seem to support the Internal Workforce hypothesis. The cultural worker variable is positively related to the make-or-buy decisions of companies because They have more cultural workers are thus, are more likely to use external resources, which is quite the opposite direction.

According to the coefficient of the online variable, online game companies are less likely to use external partners than mobile game companies, holding all else constant. The other two control variables—*expenditure* and *pub-type*—have positive coefficients. However, all none of the three control variables is statistically significant.

In summation, companies that hired more internal cultural workers, staying longer in the game industry, matching larger investments on product development projects, and publishing other companies' game titles, outsourced more actively, compared to their counterparts respectively. On the other hand, companies that are in the online game industry, starting as game companies and purchasing more external resources from the existing cultural industry, are less prone to outsource their activities.

Determinants on Outsourcing Decisions: how much spending

This research conducts Tobit analysis in order to examine the key factors of outsourcing costs of cultural activities. The six Tobit models in Table 5.10 indicate the relationship of each variable in different models. Each model has the same arrangements with the probit models about make-or-buy decisions in Table 5.9.

Before getting into other aspects, let us look at the Table 5.10 alone. Only the cultural workers variable has slightly different relationships with spending decisions, compared to coefficients in each model; all the other variables continue to show the same direction. The number of cultural workers was positively related to companies' outsourcing spending in model 5 that controls IP purchasing costs, initial industry, and the duration of company. Companies with more cultural employees seemed to call for another additional spending on outsourcing. However, the number of cultural workers became negatively associated with the outsourcing spending in model 6. Model 6 has an expenditure variable. It indicates that companies hiring more cultural workers spent less money on outsourcing than companies hiring fewer cultural workers under the same financial conditions.

Table 5.10. Tobit Analysis for Outsourcing Costs**(Dependent variable: outsourcing costs, \$)**

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	
Cultural workers	-0.025				0.024	-0.357*	
	(0.62)				(0.27)	(-2.29)	
IP purchase		-0.028			-0.052	-0.193*	
		(-0.98)			(-0.83)	(-2.50)	
Initial			-3.45	-3.431	-4.187	-5.686+	
			(-1.13)	(-1.12)	(-1.34)	(-1.87)	
Gameyears			0.294	1.255	0.317	1.915	
			(0.51)	(0.79)	(0.52)	(1.25)	
Gameyearsq				-0.1		-0.243	
				(-0.65)		(-1.61)	
Online						5.535+	
						(1.83)	
Expenditure						0.004**	
						(2.77)	
Pub-type						8.442*	
						(2.15)	
Constant	5.42**	5.44**	6.453*	4.837	7.24*	4.121	
	(3.63)	(3.81)	(1.99)	(1.18)	(2.19)	(1.02)	
Model Summary	Observations	102	103	103	103	102	102
	Log Likelihood	-353.99	-357.26	-357	-356.79	-	-346.83
	DoF	1	1	2	3	4	8
	Pseudo R2	0.0005	0.0013	0.002	0.0026	0.0043	0.0208

Value of t statistics in parentheses

+ significant at 10%; * significant at 5%; ** significant at 1%

In Table 5.10, the number of cultural workers, IP purchasing costs, initial industry, and the length of company have negative relationships with outsourcing costs. That is, companies were not actively engaged in outsourcing activities as long as they hired more cultural workers, purchased more external cultural contents, established as game companies in the first place, and have stayed longer in game business area than the other

comparable counterparts. Please note that the game years take quadratic form.

Calculating the total effects of the duration of companies give us the increased and decreased outsourcing costs dependent on the years. Young companies less than six years increased their outsourcing costs over time, while older companies that have done game business at sixth years started decreasing their outsourcing spending and became vertically integrated more. Regarding outsourcing costs - the extent of outsourcing activities-, this result confirms the first three hypotheses. However, the initial industry variable is significant at 0.10 level and game years is not statistically significant, while the other variables –cultural worker and IP purchase costs- are significant at 0.05 level.

The variables that have positive relationships with outsourcing costs are online, expenditure, and publisher status. Online companies spent larger outsourcing costs than the mobile game companies holding all constant. Companies that have more financial resources outsourced more. It means that companies tried to outcompete against other companies to hire more external partners under the same conditions in technological, organizational capability and same type of products. Also, companies that are engaged in both development and publishing also utilized external partners more than other companies. All of these three factors are statistically significant. In particular, the total expenditure variable is significant at 0.01 level.

If we put the models in Tables 5.5 and 5.6 together, all the factors influenced the two decisions –make-or-buy decision and outsourcing costs- in the same way, except two factors: the number of cultural workers and platform. The number of cultural workers has positive impacts on make-or-buy decision, while it has negative impact on outsourcing

costs. Also, the online game companies have less probability to outsource their cultural works whereas they spent more on outsourcing once they decided to outsource.

5.3 Summary

This chapter explored the searching and hiring patterns of the game companies for new employees and external partners in order to reduce several risks and hire trustworthy people. In addition, the three hypotheses related to the outsourcing decisions of companies were tested.

Searching and hiring patterns

Companies in the game industry encounter several risks when they hire new employees and external partners: (1) job-related knowledge and capability due to the distrust of the formal training system; (2) social skills related to teamwork; and (3) passions towards game production.

In case of the experienced planners and the experienced programmers, the primary searching method of the companies in the sample are the recommendations of employees and other game companies, which represent the high reliance of the companies on the “communities of practice” in the game industry: 50% and 48% respectively. However, for graphics and H/W, network manager, and system engineer, companies utilized official, open announcements through internet and newspaper: 48%, 50%, and 48% respectively. In the secondary searching method of the responding companies for the experienced workers, the majority of companies used the communities of practice. On the other hand, the majority of the companies use formal ways to

announce job postings through the internet and newspapers, irrespective of the job tasks. Also, the companies do not inquire their past and current business partners for new employees. However, a majority of the responding companies (42%) outsource the same companies that they had contracts with before.

Despite the heavy reliance of the game companies on informal ways, the usage of the formal ways to search for new employees -job announcements through internet and newspaper- seems to be higher than expected. However, we should be cautious about this result since for game companies it is not costly to post the announcements on the internet. In addition, the website on which they post include the online communities of the game workers such as graphics associations, which can be considered a cyber place of communities of practice. In addition, game companies eventually check the reputations of potential employees through the network in the communities of practice: 'reference check'. Yet, at this stage, small and medium-sized companies that have less connection with large companies or with communities of practice cannot easily do the reference check. A final option for them is the introduction of internships.

Job-seekers also rely on the communities of practice. Employees, as labor suppliers, also utilize heavily the connection of communities of practice. Job-seekers consult with their friends and members whom they met at informal and formal associations or previously work together, since job-seekers believe they will not reveal their ideas and techniques.

The role of communities of practice has several impacts on the composition of employee and power relationships of the companies. Since a developer recommend another developer into his project manager, companies will have common skills of people

in each division such as graphic division or can enjoy easy communication among team members. However, it may harm companies because the scout offer to one employee may lead to a collective turnover of the employees. This hurts the negotiation power of companies even including project managers against their own team members.

Outsourcing decisions

This research uses the number of cultural workers, IP purchase costs, initial industry, and game years and its squared form to test the hypotheses related to outsourcing decisions. These variables indicate the internal capability of companies in general. With regard to the make-or-buy decision, cultural workers have positive relationships with the adoption of outsourcing strategy, interestingly. This result seems to reject the first hypothesis, although it is not statistically significant. However, the model shows that companies with fewer IP purchases are more likely to outsource their cultural works in the developmental process. Therefore, the second hypothesis is confirmed and it is statistically significant. In terms of knowledge accumulation, companies that started their businesses in the game industry and thus had different starting points on the learning curve are less likely to outsource their cultural works. This confirms the third hypotheses since initial-game-industry companies that were in higher position in terms of learning curve have relatively more capability so that they do not need to outsource. Similarly, game years and its squared term, another variable related to the third hypothesis, have positive relationships with the possibility of the presence of the outsourcing, which partly rejects the third hypothesis. However, it is not statistically significant.

In addition to the make-or-buy decision, the Tobit model is used to test the three hypotheses in terms of the degree of outsourcing. The degree of outsourcing is measured in the outsourcing costs of companies in 2005. The positive or significant relationships of all the independent variables except cultural workers in the Tobit model are similar to those in the probit model for the make-or-buy decision model. In case of the spending on outsourcing, the number of cultural workers is negatively related to the outsourcing costs. This confirms the first hypothesis and is statistically significant. The IP purchase variable is negatively associated with the outsourcing costs. In other words, companies with more intellectual rights purchased in the field of cultural industries are less likely to outsource. This is also statistically significant and confirms the second hypothesis. The variables related to the accumulation of knowledge over time or from the start seem to confirm the third hypothesis. However, game years and its squared form are not statistically significant.

CHAPTER 6

DYNAMICS AND MANAGERIALS OF PROJECT ORGANIZATIONS

The interactions among team members include (1) the exchange of knowledge and the integration of knowledge into one product and (2) a decision-making process on critical situations and agenda. That is, it involves in both a cognitive aspect and power relationships. If knowledge exists in implicit and tacit knowledge forms and if team members in a development project have quite different mindsets and orientations, it would not be easy to interact successfully in recognition of knowledge and to reach an agreement on crucial decisions.

This chapter explores how a game development team develops the codified form of knowledge –concept report and details plan in the initial stage of a project, prototype and manuals in the production stage of a project- to provide some guideline and references to every team member. In doing so, this research addresses organizational conflicts mainly between a development team and a marketing department, and how external actors such as publishers and users contribute to the decision-making of a game company to enhance the market orientation of a game title beyond the reflection of the development team.

6.1 Communication Channels among Project Members

Although companies consider social skills and interdisciplinary knowledge capacity as two of the important elements in the hiring process, compromise and

communication among team members in the game industry are not smoothly achieved. Considering the different composition of the project team mentioned, we could imagine some degree of difficulty in communicating among different divisions. In addition, different ethos and mindsets that team members possess might exacerbate the problem. If one were to meet individuals working in the game industry and ask why they had made one decision over another, he or she would always hear the words “instinct,” “feeling,” and “intuition.” It seems rather chaotic trying to organize some type of work flow among a diverse range of individuals from planners and technicians to artists (graphic and sounds artists). It is not easy to transfer the thoughts and ideas of one individual to another. Therefore, face-to-face interaction might be assumed to be the main communication method, which is one way to communicate tacit knowledge. However, Table 6.1 presents various observations of communication in the game industry.

Sixty-two percent of responding companies in the sample used face-to-face interaction as a primary communication channel. Thirty-one percent of the companies reported a chat program such as Windows messenger or AOL instant messenger (hereafter, all kinds of web chat programs are referred to as “messenger”) as a primary channel of communication among their project team members. If we include all the IT-related communication channels, or all the channels except face-to-face and phone, 38 percent of the companies primarily utilized IT information technology. With regard to the second most frequently used communication channel, 56 percent of the companies answered messenger and 24 percent of the companies chose face-to-face interaction. It is somewhat surprising that the employees in about 40 percent of the companies used IT technology instead of face-to-face interactions, even if the team members worked in the

same office or same building. This tendency is much clearer in communication channels with subcontractors and freelancers (Table 6.2). Forty-eight percent of the companies responded that messenger was the most frequent communication method, and only nine percent of these companies chose face-to-face interaction. With regard to secondary channels, 33 percent of the companies used telephone and 24 percent of the companies used messenger. Only 20 percent of the companies reported face-to-face interactions as a secondary communication channel.

Table 6.1. Communication Channels among Team Members

	Primary channel		Secondary channel	
	Number of firms	%	Number of firms	%
Face-to-face	64	61.5	25	24.3
Phone	1	1.0	6	5.8
Messenger	32	30.8	58	56.3
Email	3	2.9	12	11.7
Secured website	4	3.9	2	1.9
Total	104	100	103	100

Source: questionnaire survey

Table 6.2. Communication Channels with External Partners

	Primary channel		Secondary channel	
	Number of firms	%	Number of firms	%
Face-to-face	8	9.3	16	19.5
Phone	27	31.4	27	33.0
Messenger	41	47.7	20	24.4
Email	9	10.5	16	19.5
Secured website	1	1.16	3	3.7
Total	86	100	82	100

Source: questionnaire survey

The reason for the highest percentage using messenger comes from the nature of messenger communication technology. Messenger communication guarantees instant responses, the transmission of a large-scale file, the capture function of talk, and freedom from geographical constraints. The main use of messenger communication evolves from a simple chat among friends to a business-related talk among staff and colleagues. After turning on messenger, one knows that his friends and colleagues listed in the address book are reachable, and vice versa. Such mutuality allows people to get a response from other people instantly via messenger, unlike email. It is cost-efficient and relaxes geographical constraints. In addition, in case of important communications with external partners, game companies can capture and save conversations in an image file (Interview with KYS who previously worked in an international marketing department, on April 26, 2006). A graphic team head (Interview with HRL on April 6, 2006) mentioned a good reason for using messenger in communicating with her graphic team members. According to Lee, it allows for private conversations, thus eliminating the need to go to some conference room. More importantly, contacts through messenger do not hinder work flow. Her team members do not need to answer immediately when a graphic team member draws the image on the computer if her request for talk is not urgent. Phone calls or face-to-face interactions would be very intrusive to programmers who are in the middle of long code-writing work. Messenger allows a person to receive an instant response from another person without interruption. Another feature of the messenger is that the transmission of large-size files is enabled right away in the middle of a talk through messenger.

The use of messenger and its functions in the game industry are quite broad and pervasive even when new employees are being scouted. A game producer (interview with CHJ, Producer, April 20, 2006) used messenger to scout a team member. Via messenger, once he had listed the potential future employees in his address book, the interviewee could talk to him anytime. He finally succeeded in persuading him to join the team without meeting him in person. When he tried to scout another person as an art director, he contacted him on a messenger because he was in another country. He also uses messenger to manage his team members. Every morning, he checks each team member's messenger nickname. According to him, the "young generation always changes their messenger nickname depending on their feelings and moods. If I found a word related to "gloomy," "boredom," or "frustration" in the messenger nickname of a member, I asked the sub-division team to take care of him. I, as a producer, am afraid that he would leave the company."

However, the convenient and useful features of messenger technology alone do not lead to frequent use in the game industry. Rather, the use of messenger is conducive to the transmitting the significant amount of codified knowledge or materials that team members refer to when they talk on the messenger. A president of sounds-making company (interview with YHN, President, March 22, 2006), said that communication takes place using messenger except in the first concept meeting and two or three subsequent meetings. Once sound-makers in his company complete the preliminary version of the sound track, the music files are sent to their contractors through messenger, and discussions with game companies ensue over messenger while both are listening to

the music files. Conversely, game companies also send newly produced graphic files to deliver the image of their game titles to the sound-makers.

In the game industry, typical forms of codified knowledge are the concept report - subsequently detailed plans, manuals, and prototypes. These materialized forms are produced by game companies and the project team and shared with all project members. Such documents function as a guideline to follow the original plan of game titles as well as provide a reference for the members as a basis on which they can communicate with each other. More importantly, producing these documents promotes communication among different divisions and development teams and other managerial personnel. In addition, this also facilitates intra-division discussions such as those between the graphic team head (i.e., the art director) and graphic team members, and it subsequently directs at least awareness and understanding by every member of pertinent aspects of the game development project.

6.2 Interactions and Conflicts during the Project Stage

6.2.1 Project formation: Pre-production stage

6.2.1.1 Concept report

The outset of a project is driven by planning teams or individual planners. Planners prepare a concept report based on their ideas about new game titles. This concept report is similar to a proposal that describes fundamental ideas and target groups of the proposed game titles and contains the following items (Kim et al., 2003).

- Outline of a proposed game title
- Target group based on market trends and predictions

- Game genre
- Game rules: how to play, game's goals
- Platforms and required technological specifications –the capacity of users' computers, server capacity, or mobile platforms
- Attractiveness, amusing points in the game

The construction of a concept report involves several actors of different cognitive structure and ethos. Diverse actors become involved in the selection of the game genre and consequently the target game players, determined in the top-down or bottom-up process. The top-down method occurs in small venture companies that have only one online game project or multiple small-scale mobile games. CEOs in such companies select the genre based on market trends or information gained from other game companies and through planning team about the matter. Then, given genre and target game players, planning team works on concept reports focusing on game story and rules itself. This happens mainly because either the CEO also functions as a project manager due to the existence of only one project, limited finances, or time constraints in the decision-making process of the planning teams. In case of the latter, a decision is mainly based on the preferred genre of the publishers. One interviewee (Mr. Yoon, April 7, 2006) emphasized the importance of publishers that become investors in the middle of project stages:

We could make a living day to day from minimal money before we found investors for a game title in proceeding (interview with DJK, Strategic/Marketing Manager, April 28, 2006)

We are neither a big company nor a so-called big hit company that can sustain their development costs with a continuous cash flow from managing existing game titles. We do not have the luxury to accept the opinions or wishes of the development team. Especially, we need to abide by publishers' opinions. If publishers think that the RPG genre is not any longer profitable, we simply remove that option from the genre. Then, we focus on casual game [*casual game: a game title that has a short, simple storyline and usually targets females and kids*] that, we hope, will help us to contact more potential publishers (interview with SHK, Head of Marketing Team, formerly planners, March 31, 2006; Italics added by the author)

What we should note is that the publisher of the interviewee mentioned does not mean the actual publisher, but rather the dominant opinions of publishers as a whole. Generally, publishers do not make contracts with developing companies at the project initiation. They show up at the middle or sometimes end of project schedules. Doing so, publishers can avoid the risk of project abortion to some degree and select game titles suitable to the demand of current users. Therefore, the greatest risk from market uncertainty is still carried by game development companies. Publishers can change their strategic field within one year according to market changes, whereas development companies cannot suddenly stop their projects.

In contrast to this limited search and passive decisions regarding publishers, other companies are enabled to rely on their internal decisions, which is the bottom-up approach. In this case, the planning team has relative autonomy in deciding game genre. It can be frequently seen in companies as follows: (1) company has one successful title that is currently released; (2) companies have several development teams running at the

same time that are having continuous game titles. In a company that has had only one development team, if the recently released game title makes revenue, the company divides the planning team into two in order to keep the current titles attractive to users. That is, the company starts expanding in terms of the number of employees. One of planning teams continue adding additional elements to the released game title such as characters, different map, and a place in the same game world and making the game story evolved. Additional contents called patch and update is crucial to particularly online game titles to retain their customers⁴³. In this patch planning team, companies intentionally keep the existing planners a little bit in order to preserve the original ideas of game content, while recruiting new planners or giving an opportunity to the existing employees in other divisions who wants to become planner (interview with JYK, Planner, April 23, 2006). On the other side, the newly organized planning team starts working on a new game title with the proposal of a concept report. When the new planning team searches for ideas new game, the company allows for broad and random search activities with a 'let-them-be' policy:

In our company, once game title is released, planning teams can take workbreak to refresh their minds. Planners need to move back into the real

⁴³ Kwang-taek Kim, a journalist at one of the game web magazines, ThisIsGame, explained the importance of updating. "The consumption speed of Korean consumers on digital contents is faster than that of others. Updating of character, items, quest, and maps are particularly important to Korean game play users. If you look at the example of EverQuest (produced by Sony Interactive Studios America in 1999; 3D fantasy massive multiplayer; approximately 450 thousand players in 2004), you would easily understand. The reason that EverQuest vanished quickly after their success from the start in Korea is that the patch and update was less sufficient to Korean players. Those updates contained the contents for one month's play, but Korean players conquered the game, in fact, within twenty days. During the last ten days, Korean game players moved on to another similar online game" (Interview on March 24, 2006).

world. During the time period of producing the released game, planners lived just in either the game world or a less than real world of the past one or two years old [*when project was started*]. Being lost in the game world, they also lost their sense for the real, particularly the sense for the real game market. During that workbreak, the planners are only required to come to the office, where they usually look through the game magazines, novels, and movies, play current games or surf the internet. Seeking new potential game content. After freely talking with each other and agreeing upon one good new idea, then the planning team can start writing the draft of a new concept report. (Interview with MSJ, Project Manager, February 14, 2006; Italics added by the author)

However, this ‘let-them-be’ policy does not mean real relaxation and take-off from their duties. It gives planning teams a chance to grasp some sense of current fads and popular themes in not only the game industry but also outside game trends and promising new areas. Through this process, they can select a particular game world (medieval, futuristic, or fantasy world), the graphic (2D or (full) 3D), and so on.

The next step involves evaluation and feedback on the concept report. It is conducted by outside development teams. Marketing departments and development executives, and CEOs are involved in evaluating and giving feedback to development teams -planning teams. Typically, conflicts arise between marketing persons and development teams as it is not easy for either group to persuade or convince its opinions to the other. They rely on different disciplines to look at the market trends. The following shows different perspectives from development teams and marketing persons:

When a planning team selects game genre and stories, it usually looks through popular books, novels, movies, and other foreign game titles in order to determine which graphics and stories are popular. In addition, they

research active internet communities in graphics or animation, yet rarely look at the statistics because popular genres either online or offline seem to be selected based on planners' interests and instincts. Perhaps a bit subjective.... But developers have lived in the game industry world for a long time. I believe their intuitions and instincts are better than just marketing persons" (Interview with WSL, President and formerly game developer, March 20, 2006)

"We do not believe in the opinion of marketing persons [*in this case, it is publishers*]. They usually bring some numbers when they come to the meeting. At the previous meeting, they showed the survey results. It is only 100-200 samples. How can we believe in sampling and results as a planner? They think that numbers tell everything although they cannot understand what we are going to do (Interview with SMK, Head of Planning Team, April 27, 2006)

Whenever I show the revenue for current markets by genre, developers always reply that is "current", while questioning why I believe that current trends will last for two years. Sometimes, I make reference to past misjudgments of development teams when I am in the meeting with developers. However, they also do the same to me. (Interview with SYC, Marketing CEO, April 14, 2006)

That difference –marketing people rely on current trends while game planners look at online communities in certain field to some extent – is aggravated by the nature of market trends as well. Nobody can be sure about what game title will succeed. Also, due to short history of the industry which is approximately ten years old, there are few statistics to predict the demands of game users. In this situation, when different departments argue over game genre, the development executive or CEO makes the final decision. In most cases the decisions go in favor of the development team. This pattern may result from organizational inertia and power relationships. In the early history of the

industry, there were only small venture companies composed of a development team and only one assistant person. At the time, marketing was considered to be public relations: how can they advertise their game titles? It is only in recent years that companies started establishing strategic marketing departments. Yet still, the major role of marketing departments is contacting and managing publishers in Korea and other countries.

6.2.1.2 Details plans

Once the concept report is approved for next game developments, each division starts working on detail plans. Within the planning team itself, the game story becomes enriched and more sophisticated. Actual scenario writing is commenced. Through this process, concrete levels of game steps are identified. The game rules for players to advance to the next level are made clearer: different ability of characters; number of players; special items such as swords, clothes, and prize money; and the means for achieving interim goals to advance to each next step.

Then, the other persons in charge of other subdivisions (graphic team head, program team head) begin engaged in producing detail plans for game titles. The detail plans include general work processes including schedules, amount of work to be done, man-hour controls, and also detailed lists of work sounds, graphics, and programming. For example, the graphic-related work list contains the animation lists, several possible maps, visual effects check list, items check list, non-player game list, etc.

All the detail plans for each subdivision are prepared by each division. These detail plans go through planning teams in order to determine whether the plans are consistent with the proposed concepts. However, it is not a one-way relationship. It is

reciprocal. When the planning develops make the game story and rules in the form of detail plans, planners also get feedback from the head of graphics and programming divisions. Usually, the feedback from other divisions to planners is based on technological constraints. Occasionally, planners ask for too much in graphics that cannot be stably transferred to the computers of game players. Planners unknowingly request a mobile platform that has too little capacity to contain the number of images and colors (Interview with HRL, Head of Graphic Team, April 6, 2006). Such technical feedback usually comes from the programming division, through sometimes from the graphic division.

There is slow change in the relationship between the marketing and development teams. In the past, the criterion for evaluating the concept report was focused on the quality of the game: a 'good game' that attracts players with graphics and game story, and technically supports the races and battles of multi-players simultaneously. Today, criteria convert more monetary terms. The industry recognized the difference between game success and financial success, that a larger number of game players does not necessarily mean a larger sales revenue. There is a significant difference between these two criteria in the online game industry, while there is less significance within the mobile game industry. It is due to the different systems of pricing mechanisms. The pricing system of the mobile game industry involves downloading the game into mobile devices. Consumers should pay for the games when downloading them. However, in the case of the online game industry, there is always open beta testing that game players can enjoy for a while. Once a game becomes officially released with a fee charged, game users go on to another game. Of course, it would not be a problem if the game title were to attract

hard-core users, but in reality, there are many similar games. Thus, a game company now considers a partial fee charging system as a prominent way to get sales revenue⁴⁴. That partial charge system retains the game players and allows game companies to earn some revenue from selling the items.

That recognition of the differences and the introduction of a new business model leave room for marketing people to challenge the concept report and detail plans⁴⁵. Marketing persons analyze the profit factor in game titles and propose several items for a fee charge. The planning team sometimes reflects the suggestions of marketing divisions. However, there are sometimes serious arguments over chargeable items. A typical example is the suggestion that the marketing division may waive the whole system of a game story. The marketing division usually suggests specific sword or acceleration of engine speed chargeable items. In this case, this would not only be fair to game players who do not pay for those items but also break game rules or balances. In this case, again the project manager intervenes for coordination. However, it is not easy for the project manager or even CEOs to handle the complaints from game planners about shifting whole story; game developers tend to become attached to game titles: they consider their game titles as their own children (Lee, 2005). If the complaint is severe, occasionally planners just leave the company. As mentioned earlier, most CEOs and project managers

⁴⁴ There are several ways to collect investments on game titles (Kang, 2004). First, some games charge a monthly fee to game players. It is appropriate for games that have enough numbers of hard-core users. Second, companies may rely on advertising revenues from on-site sponsors. Third, companies get revenues from ISP providers that try to attract subscribers for their internet service. Fourth, companies get revenues from partially charged game content. Game players sometimes spend money on buying items such as clothes, battle weapons, or life-giving water that help players to win the game.

⁴⁵ In Korea, generally a large-scale RPG game and a simulation game are charged at a fixed rate per month and other games adopt the partial credit game.

entered as developers into the game industry such that they share similar thoughts and principles on game in small and medium-sized companies. Usually they are on developers' side.

The marketing department always asks for something weird, by insisting that the critical key item should be charged. If that item is charged, who is going to play the game? Money? It is important. But if the game is really good, then game players will stay in the game while buying the items to decorate their characters. (Interview with SL, Project manager and formerly graphic artist, March 22, 2006).

At the outset of the project, we argued that the B item should be charged, but it was rejected by planners and the president of the company. Instead, the A item *[that was the original suggestion from planners]* is now being charged, but it is not frequently demanded after release. So now we are still, again, asking reconsideration of the item. When they learn the lesson from market, they will accept our suggestions. (Interview with KHL, Head of Marketing Team, April 17, 2006) (Italics author added)

6.2.2 Production Stage

6.2.2.1 Prototype

Until detail plans are established, project teams are usually composed of few people. The basic number of an initial project team usually starts at six or seven team members (interview with JYK, Planner, April 13, 2006): three or four planners for initiating game concepts, then an art director (graphic team head) and a head of programming division joined us. Thus, from the start of a project, people from every division join together to propose a concept report. However, once the actual production

starts, each functional division is constructed under each division based on the concept report and detail plans.

At this step, the key milestone is producing a prototype. Prototype is a “first full-scale and usually functional form of a new type or design of a construction” (Britannica Online, 2006). When companies launch an experimental project, they are not sure if that design will actually produce an outcome that is sought. In the game industry, companies cannot be sure their game content will be as well-represented as hoped for due to complex technology for adding graphics and proposed number of players in certain technical environments. Therefore, before producing massive graphics and sounds, they test the technological stability.

Throughout the history of the game industry, the definition and roles of prototype has been expanded. In the early days, the industry had produced a coarse prototype that had only a basic framework: one or two characters with only bone structure (interview with BSK, Development CEO, April 27, 2006). Sometimes, it did not include network features⁴⁶. However, the role of prototype has been expanded to as follows (Kim et al., 2003: 79):

- Communication instruments for game vision
- Solutions to technological problems
- Debugging in terms of game design
- Confirmation of project pipelines

⁴⁶ One development CEO explained one reason for the failures of small and medium-sized companies due to the lack of prototype. He said, “Some venture companies still do not have a prototype with network function. Publishers are not convinced by that prototype when they look at a stand-alone prototype. Then, without enough money, they are in a hurry to make any game titles”(Won-hee Park, Development CEO at NextPlay Co, April 12, 2006)

Among the nature of prototype above, the current change is concentrated on the first one: prototype as a communication instrument. As the history of the game industry lengthens, companies learn it is easier to communicate with team members based in a tangible prototype. Particularly, it is easier to explain the concepts and features of a game title to marketing persons and publishers. With that recognition, game companies have been producing more complete prototypes that are equivalent to being preliminary versions of game titles. This includes critical graphic elements, interfaces of game players, and network stability.

However, the production of such a prototype as this is a big challenge to team members although with that prototype they can move on smoothly and harmoniously to the next step.

The first crisis in the development process might be the process of making prototype. There is no visible outcome and there is only confusion among team members before prototypes, creating physical and emotional exhaustion. However, the competition of prototype-making gets team members more motivated and increases trust among members (Cholhwa Jeong, Project director at CJ Internet Game Studio, April 20, 2006)

In order to produce prototype, the project team should (1) produce basic graphics, (2) provide technical support to produce graphic source data, and (3) modify or create game engines. The programming division conducts the second one and the third one. However, graphic division is also involved in the second one since the division is creating original graphics. However, basic graphics is critical and more problematic.

This work demands intensive interaction between artists and planners. The first graphic artists engaged in this interaction are concept artists. Concept artists are people who convert the concepts and stories of game title into the visual presentation form to other team members. They create the original picture (concept art) of characters and drawing the game world –map that shows all the geographical features and infrastructures. In doing so, the concept artists interact with planners first, not with other graphic artists or art directors.

In order to facilitate such interactions, the game industry has been utilizing several methods. First, there is the organizational dimension. Concept artists are assigned to the planning team in general. Such an assignment is intended to facilitate face-to-face interaction between illustrators and planners every day (Interview with DHK, Project manager and formerly Graphic Artist, April 14, 2006)⁴⁷. Second, when planners and concept artists discuss concept arts and models, they also refer existing graphics in conjunction with less clarified dialogues. In other words, they use a material form to exchange their thoughts. Sometimes planners bring a few existing pictures, animations, or movies to the illustrators to demonstrate suitable ideas for their game title. In other words, to communicate with illustrators planners use existing materials since they cannot always explicitly express the imagined situation. Without this method, planners can only make requests to the artists by saying “cute character, or pastel color tone” (interview with MSJ,

⁴⁷ Companies sometimes change the physical configuration in the office for promoting interaction and learning. A development CEO (interview with WHP, Development CEO, April 12, 2006) said, “the first thing I did in the company is an office restructuring. The office did not have a very good conference room. Some persons’ discussion bothered others. I arranged the desk of each sub head close to the other sub head. Also, inexperienced employees were moved adjacent to the experienced, so that they can learn by seeing others’ work”

Project Manager, February 14, 2006). Sometimes, planners expect the artists to show their ideas since planners are not sure what kind of graphics are the current fad (Interview with JBH, Planner, April 25, 2006).

With method of this interaction, illustrators continue dialogue with planners and to determine planner preferences based on existing pictures as well as their own illustrations until they find the right picture for their game title. With repeated interactions, boundary limits of the search can be made based on the kind of graphic trend, and create their own designs through correcting the existing features. Such graphics are the result of the externalization process: tacit knowledge or ideas becoming codified.

In the first place, it is not easy for me [a graphic artist] to understand what planners want. Sometimes, they seem to be confused how the graphics they brought to me are a little bit different. At times, they are unable to distinguish Japanese-style animation from even European-style. Then, I brought several pictures captured from animation or painting to show planners, asking what they prefer. Then, I started to draw the picture (Interview with HRL, Head of Graphic Team, April 6, 2006)

This codified form facilitates efficient communications of planning teams with graphic artists on graphic teams⁴⁸. During interactions between planning and graphic

⁴⁸ The contribution of a portfolio is also observed in the relationships between game companies and external partners. When game companies collaborate with musicians, usually their outsourcing activities begin in earnest after creating at least portfolio or just before testing. Yonghyun Na (President, Cong Sound Studio, Interview on March 22, 2006) explained the difficulty in working with a game company that did not have prior outsourcing experience: “that company just sent the concept report. When we asked for at least the prototype, that game company did not understand and feared an information leak. Finally, when the work did not progress very well, it sent the prototype”.

teams, the important role of concept artists should not be ignored. The role of concept artists does not end with the illustrations. They as members of planning team play a role as a broker between planning team and graphic team. Second-picture graphic artists⁴⁹ in graphic team receive the concept pictures/models from planning teams and convert them into 2D or 3D graphics with occasional need to consult with the original inventors – concept artists and even their head of the subdivision.

6.2.2.2 Manuals

Usage of manuals

Companies also use codebooks usually called manuals as another material form to precede their projects. This codebook contains by concept, shortened words to technical instructions, which helps team members to maintain consistency in their work and also provide a common knowledge base for channeling their work to and communicating with other divisions.

This section analyzes what companies use the characteristics of companies that used manuals in 2005. Despite the usefulness of manuals, surprisingly, only 56 percent of the companies (58 firms out of 104 firms) used the manuals while 44 percent of the companies (46 firms out of 104 firms) conducted the development projects without manuals (Table D.33 in Appendix D). With regard to the nature of manuals (Table D.34), manuals were updated over time in the most companies in the sample (50 firms out of 58

⁴⁹ Graphic artists are assigned to different divisions depending on their roles. Usually, illustrators are assigned to the planning team, while other graphic artists including a second picture artist are on graphic team. The role of a second picture artist is convert to original illustrations into the pictures for the front, the back, and the side (Interview with DHK, Project Manager and formerly graphic artist, April 14, 2006).

firms that used the manuals, 86 percent) and 86 percent of the companies (50 firms out of 58 firms, 86 percent) used project-specific manuals. However, in most cases, the manuals were not shared with their external partners. Only 35 percent of the companies (16 firms out of 46 firms that outsourced their activities and had manuals) shared their manuals with external partners.

Table 6.3 provides the results of a comparison between companies that adopted manuals and the others that did not. The variable of initial industry shows that 57 percent of the companies of which the initial industry was the game industry used manuals while 54 percent of the companies from other industries used manuals. That is not a big difference, and the difference is not statistically significant. However, there is some difference between the online game and the mobile game companies although it is not statistically significant. Sixty one percent of the online game companies had been using manuals while only 48 percent of the mobile game companies did. This is because the online game industry has more large-scale, longer term of projects. In addition, non-outsourcing companies (12 firms, 67 percent) were using manuals more than outsourcing companies (46 firms, 54 percent). However, such difference between outsourcing companies and non-outsourcing companies is not statistically significant. Therefore, we cannot say that the introduction of outsourcing strategy make difference in using manuals.

Table 6.4 describes the mean difference between companies that had manuals in 2005 and other companies that did not have manuals as categorized by game years, sales revenue, several variables of employees, and total expenditures. The game years variable shows that companies that have stayed longer in the game industry seem to have fewer manuals than other companies, although that difference is not statistically supported.

Companies using manuals have produced larger sales in 2005 than companies without manuals. The average sales amount of companies that used manuals were \$11.5 million while the average sales of the other companies were only \$2.8 million in 2005. This might imply that manuals led to the higher performance, but we cannot be sure of that because performance is the result of various factors. More importantly, the sales revenue here is for only one year. Also, manual-using companies invested more expenditure on game development projects than the rest of the companies in the sample. The average spending of manual-using companies on their developments was \$1.5 million while that of other companies was \$722 thousands.

What show statistically significance in the difference of means are employee-related variables. The variable of total employees shows that manual-using companies employed 85 persons on the average while that of others were about 27 persons. This variable is significant at 0.01 level. Similarly, the number of developers that include planners, artists, and programmers shows the same trend. The average size of manual-using companies was 46 persons, which is higher than the other companies (average size: 22 persons) by 24 persons. However, the variable of the percentage of developers in total employees shows the opposite directions. The average percentage of developers in manual-using companies is 79 percent, which is lower than companies without manuals (84.8%) by 6.4 percent.

As mentioned earlier, most of the companies that owned manuals usually updated their manuals over projects and use different manuals for each project. However, the online game companies (37 firms, 97 percent) updated their manuals more than the mobile game companies (Table D.36). This difference is statically significant.

Table 6.3. Comparison between Companies with/without Manuals (I)

	Total Mean	Manuals (Mean)	No manuals (Mean)	Mean difference
Game years	3.74	3.60	3.91	-0.31
Sales revenue in 2005 (000 dollars)	7,686	11,553	2,810	8,743
Total employees in 2005	59.2	85.1	26.6	58.5**
Number of developers in 2005	35.7	46.3	22.3	24.0+
Percentage of developers	81.3%	78.5%	84.8%	-6.4%*
Total expenditures in 2005 (000 dollars)	1,152	1,500	722	778
Observation	104	58	46	

+ significant at 10%; * significant at 5%; ** significant at 1%
 \$1 = ₩1,024.

Table 6.4. Comparison between Companies with/without manuals (II)

Firms that used	Initial Industry*		Main platform**		Outsourcing***	
	Game industry	Non-game industry	Online	Mobile	Yes	No
	# of firms, %	# of firms, %	# of firms, %	# of firms, %	# of firms, %	# of firms, %
Manuals	43	15	38	20	46	12
	56.6%	53.6%	61.3%	47.6%	53.5%	66.7%
No manuals	33	13	24	22	40	6
	43.4%	46.4%	38.7%	52.4%	46.5%	33.3%
Total	76	28	62	42	86	18
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

*Pearson chi2(1) = 0.0750 Pr = 0.784

**Pearson chi2(1) = 1.8972 Pr = 0.168

***Pearson chi2(1) = 1.0479 Pr = 0.306

Similarly, the online game companies used project-specific manuals more than the mobile game companies. Among the online game companies that used manuals, only two companies used company-wide manuals, while the other thirty-six of the online game companies (95 percent) relied on project-specific manuals. However, the mobile companies that used project-specific manuals were only 70 percent of the companies that

had manuals in 2005. This difference in the presence of project-specific manuals by platform is also statistically significant.

Creating manuals

The results from the descriptive analysis above need to be confirmed by regression analyses. In order to do this, this section investigates the impact of the several variables on the presence of manuals. Table 6.5 shows the result of the probit model. The dependent variable is the usage of manuals in 2005. This research used the variables that were used in previous section – total employees, percent of developers, sales revenue, expenditure on product development, game years, outsourcing, online, and initial industry. However, the variable of sales revenue in 2005 is removed because it is the result of the production process while the squared term of the game years is added presuming the possibility of its curvilinear relationship with the existence of manuals. And one new variable is added in the model: the type of firm. This variable is a dummy variable and is 1 if a company is a third-party company and otherwise is 0.

The distinction between the first-party and third-party developers originated from the video game industry. In the video game industry, a first-party developer is a developer who produces game consoles such as Nintendo (Gameboy), Sony (PlayStation), and Microsoft (Xbox). A third-party developer organically referred to a developer who was independent from the first-party and develops game title software. As some third-party companies became larger, they started to publish the titles of other firms that were small and independent. Today, only firms concentrating on the development of game title

are called third-party developers. Big companies such as Electronic Arts are called publishers although they also develop games internally.

Third-party developer in this study is referred to a company that only develops their own game titles without working for other game company as subcontractor. Their business area is confined to the developments of their own titles, which can be considered as a pure game development company. Also, this concept eliminates a small, vulnerable company that should mobilize its project costs from subcontracting works that should be conducted during the period of their own project so that it sometimes hinder consistent progress of their own. Therefore, a third-party developer gets all the employees intensively work on the project without being interrupted from subcontracted works with other game companies. So, it is expected to have higher chances to build up their own manuals.

In the sample, the average number of employees of third-party developers were 29 persons, which is less than that of other companies (89 persons) by 60 persons (Appendix Table D.38). However, the median value of third-party developers (20 persons) is similar to that of other companies (19 persons) because the big number in non-third-party developers is due to the existence of several big publishers (Appendix Table D.37). Therefore, that difference in the number of developers between third-party developers and the rest of them was reduced to 27 persons: 22 persons in third-party and 49 persons in the remainder. Rather, the percentage of developers in company is slightly higher among third-party developers (81.8%) as compared to the rest (80.8%) although it is only 1 percent different. In addition, we can find the third-party developers more in the

online game industry, in the group whose initial industry was game, and in the group who did not outsource in the sample (Appendix Table D.39).

Table 6.5. Probit Analysis for the Development of Manuals
(Dependent variable: manuals/codebooks=1; no manuals =0)

	Model 1	Model 2	Model 3	Model 4	Model 5	
Third-party	0.474+	0.545*	0.506+	0.465+	0.507+	
	(1.80)	(2.03)	(1.93)	(1.72)	(1.87)	
Online	0.264	0.193	0.225	0.398	0.318	
	(0.95)	(0.69)	(0.82)	(1.40)	(1.09)	
Game years	-0.371*	-0.422**	-0.094	-0.399**	-0.417**	
	(-2.35)	(-2.61)	(-1.55)	(-2.59)	(-2.62)	
Gameyearsq	0.031*	0.035*		0.029+	0.030+	
	(1.97)	(2.16)		(1.93)	(1.88)	
Initial industry	-0.026	-0.04	-0.012	-0.14	-0.092	
	(-0.09)	(-0.13)	(-0.04)	(-0.45)	(-0.29)	
Outsourcing	-0.306	-0.372	-0.367	-0.53	-0.526	
	(-0.85)	(-1.02)	(-1.02)	(-1.41)	(-1.40)	
Expenditure	0.00010					
	(0.59)					
Employee		0.005	0.005		0.003	
		(1.47)	(1.32)		-0.82	
Percent of developers in total employees				-3.401**	-2.706**	
				(-2.86)	(-2.04)	
Constant	0.703	0.803	0.233	3.916**	3.277**	
	(-1.33)	(1.49)	-0.51	(3.20)	(2.47)	
Model Summary	Observations	103	104	104	104	
	Log Likelihood	-64.16	-62	-64.6	-60.79	-59.78
	DoF	7	7	6	7	8
	Pseudo R2	0.09	0.13	0.1	0.15	0.16

Absolute value of z statistics in parentheses

+ significant at 10%; * significant at 5%; ** significant at 1%

Based on these variables, several models were constructed. Since total employees of companies in 2005 is highly correlated with total expenditure on product development

in 2005 (correlation: 0.8366 significant at 0.01 level), either of the two variables was selected for each model comparing the different impact of the two variables on model.

In general, the probit models in Table 6.5 appear to confirm the same relationship as that found in the descriptive analysis. In the descriptive analysis, we traced some trends in the existence of manuals. Use of manuals is more frequently found in the online game industry, younger companies in terms of game history, and less frequently in outsourcing companies, companies spending more on product development, larger companies in terms of employee size, and companies with a lower percentage of developers.

Third-party developers appear to have positive relationship with the use of manuals in the game development project. They are 19.5% more likely to have manuals than other companies (see Table E.2 in Appendix E for the predicted probability change calculated from the Model 6). This variable consistent shows statistical significance in all the models.

Other statistically significant variables are “gameyears” and “gameyearsq,” which represent the duration of a company in the game industry. However, since gameyearsq has a positive coefficient and gameyears has a negative coefficient, the quadratic form of the duration variable suggests a likelihood that manual use will decrease over time at certain levels and then again increase. In the 8th year, the probability to have manuals inside companies starts increasing as the “pvalue” command (see Table E.3 in Appendix E) decreases.

The initial variable is a variable that shows different trends in the descriptive statistics and the probit models. In the probit models that control other variables,

companies that were initially in the game industry are 3.6% less likely to use manuals than companies that were initially in other industries (see Table E.2 in Appendix E), with other variables held constant. This finding implies that initial-game-business companies relied on tacit or unwritten signals and dialogues to interact with each other. They did not codify their knowledge less, a surprising result considering the fact that initial game business companies may have begun with stronger knowledge and skills related to game projects and thus it was not as costly to create the manuals. This assumption can be interpreted in two ways: (1) such initial game business companies do not need such formalized knowledge because all the knowledge is already embodied in the organizational members; or (2) such companies run their businesses in much the same way as they had been from the start, when it was an inefficient, less organized small venture business. If the latter is the case, great organizational inertia could have hindered the adoption of manuals in an effort to streamline interactions.

The developer proportion variable produced quite confusing results: more developers in the company and fewer manuals. This implies that companies with a higher percentage of developers were equipped with some type of substitutes, perhaps organizational. For example, companies might hire organizational brokers who intervene in the communication among subdivisions and members with diverse knowledge and promote mutual understandings of project members with diverse knowledge.

6.2.3 Interactions with External Sources in All Stages

The game development project is not conducted only within companies. Project goals can be successfully achieved through interactions with external agents: publishers and consumers. The infusion of external opinions has significant impact on the

development project itself and interaction among team members. This may contribute to resolution of conflicts within development teams and between development and marketing teams. Second, this also may direct developers to be more market-oriented since external opinions come from users and publishers who are favorable to the market. Thus, such interventions are intentionally triggered by the game company itself in order to keep the balance between the ideas of developers and the opinions of marketers.

The interactions with game players were observed at the critical point in the middle of product development from time to time and typically observed during the testing period. For example, when a development team discusses about concept arts or graphic pictures, it decides to survey potential game players based on the target marketing group addressed in its concept report (Interview with MSK, Marketing Manager, March 16, 2006). In that case, they surveyed consumers' preferences with several tentative graphics and followed the most preferred one.

However, the great participation of consumers typically occurs in the testing stage⁵⁰. As mentioned earlier, the online game industry has an open beta testing stage in its development process. In that stage, a new game is open to any game players without charge. In the early days of the game industry, the main purpose of open beta testing was to reduce development costs and to attract customers with free games. The online game testing requires massive numbers of players at the same time to play a game to test the

⁵⁰ Massive participation in testing period is nowadays limited to online game. Compared to the mobile game, the online game has a more sophisticated and complicated game story. Thus, testing procedure differs across the platform. Testing of the mobile game is mainly done by publishers and game companies while game players are also participating in the online game testing.

stability of the server or the programming⁵¹. Therefore, game companies substitute game players for hired testers after they do closed testing with a smaller number of testers for a while. However, game companies have been emphasizing recently ways to attract consumers for testing purposes as well as get reviews and feedback from users. Thus, this open beta testing stage began lasting longer: from two or three months to sometimes six or seven months.

The development process of an online game is really different from that of a PC package game. The online game development is 'ongoing, a never-ending game project'. Your revenue depends on how many hours game players stay on your game website, unlike package games that are one time events. Therefore, you should revise and update game content over time because consumer preference also keeps changing over time (Wonseok Shin, Nexon, on April 29, 2006).

The open alpha version game is just 30-40 percent of our planned games. Although we are conducting additional developments, female users are successfully attracted by visually charming elements and decoration items. Quest, guild, and village will be more developed to stabilize entire system and enhance the amusing elements of the game title (Game Journal, 07/08/2006)

During the period of open beta testing, game companies receive technical 'bug' reports from consumers, and determine which items are popular as well as consumer dislike about a new game. Thus, at this point consumers themselves are called 'testers'. Companies get feedbacks in two ways. First, they take a close look at what and how

⁵¹ The server may shut down due to system overload caused by more frequent interactions among game players. Sometimes, programming encounters bugs in dealing with different, diverse paths to achieve the game goals.

game players do on the game. Through the open beta testing period, game companies analyze the site visits, play mode, playtime in each of the maps, popular items to find the preferences of target consumers. Then, identified features are supplemented and added.

Second, companies create bulletin boards on the homepages of the pertinent game where consumers deliver their opinions. The bulletin board is generally composed of two sub-boards: idea suggestion boards and bug report boards. This separation of idea suggestion boards started in 2004 when a *Pangya*, a golf online game, which has been exported to several Asian countries, did its open alpha testing (Interview with KHS, Executive Producer, April 20, 2006). Today, most online game companies operate separate bulletin boards. This separation sounds simple but provides huge benefits with companies in terms of customers feedback. Without mixed with game players' complaint, game players can state their suggestions and original ideas that are useful to improve a game title in terms of technological stability and attractiveness of game content. Game players sometimes discuss with other game players over the game up to the level that even some users suggest detail solutions to present the suggested ideas in terms of programming or graphics.

Despite positive results of open beta testing, it also produces negative impacts on companies. If a game title shows too much technical instability or lacks interest to impress users, this game title would be unsuccessful because bad review would be floated among game-related websites and online communities of game players. This results in producing the so-called "beta species" who are just looking for free games. Because of this risk, game companies are encouraging users to also participate in closed beta testing. In this closed beta testing, game companies openly invite limited number of users to their

closed beta testing. Since it is a closed beta testing, participating game players postpone their final evaluations and are more likely to act as consultants. Through this closed beta testing, companies can get feedback from users while avoiding bad reviews among the online communities.

Publishers are a major external source who provides advices to developers regarding the selection of genre, items for charge, business models for game titles, and sometimes technical details. They may be involved in the first stage of development project when medium-sized or large company contact publishers informally⁵². However, serious interaction with publishers is begun at the portfolio stage either formally or informally, because lack of a portfolio severely hinders the delivery of game concept to publishers. The relationship between publishers and development companies can be categorized in to three types. The first relationship is similar to that of contractors and subcontractors. In this case, the publishers are more powerful and development companies merely develop game titles according to the desires of the publishers. Second, game companies can use publishers to oppose separate investors not of the game-related industry, submitting different opinions from publishers to investors. Third, publishers can play a crucial role in giving advice as another external source to game companies.

In the third relationship, publishers are actively engaged in the closed beta system that is about to take the lead in testing: arranging testers. Also, as publishing companies absorb former developers with much experience in the game industry, publishers become

⁵² In the situation of no explicit contract, the consultations with publishers might be risky in terms of information leaks. However, publishers are not competitors. Moreover, initial contacts with publishers reveal little information since the game story presented cannot say much about the actual completed game title. For this reason, publishers do not usually enter into legal contracts until the product development project is being finalized.

able to give more detailed advice such as the angle changes that overview game world maps since the target game players are female who is familiar with 45 degree quarter view (Interview with DHK, Project Manager, April 14, 2006). Or, from the previous experience, publishers learn how game titles should be revised to enhance entertainment elements. For example, publishers noticed that the waiting time was too long for a game player to get enough players for a group match. So to decrease it they advised the company to change the required number of players. Also, publishers sometimes introduce other game developers of different companies to the current company, when publishers are not familiar with the type of game title in question.

6.3 Organizational Settings for the Integration of Diversity

This section summarizes previous sections focusing on the diversity integration strategies of game companies. Game companies usually integrate diversity through (1) the preservation of diverse knowledge embodied in employees within the organization, (2) the usage of communication brokers or the distribution of codified knowledge in documented forms, or (3) access to external sources and reliance on external consultations.

Figure 6.1 represents the interactions in the game industry. The first building block of interactions within the game industry is an organizational structure surrounding the development team. The organizational structure of the game companies is a mixed form of functional organization and matrix organization. The project manager takes full responsibility for a game development project in Figure 6.1. Under the development team's project manager, each diverse group is organized into a subdivision such as

planning team, programming team, and graphic team. For example, graphic artists belong to graphic teams and they report their work progress or problems to their functional manager, who in this case is a graphic team head who in turn reports to his project manager. In this way, game companies can maintain diverse range of persons with different expertise within one subdivision, while simultaneously facilitate the circulation of “specialized” knowledge and skills to accelerate work progress. The graphic artists work on their expertise area -2D or 3D graphic works-. The graphic team head or seniors assign, train, and evaluate other graphic members on their assigned work. In addition, members are taught about different styles of the work from Japan, Europe, and other countries and provide them with the external sources such as books, online communities, and materials (Interview with HRL, Head of Graphic Team, April 6, 2006). In each division of different expertise, the members acquire knowledge and skills through learning by doing (apprenticeship) or learning by seeing. This divisional setting within a development team helps to develop similar cognitive frameworks among members in each division while ironically it continues to increase the differences between subdivisions.

In contrast, a marketing person does not belong to a development team. A marketing person belongs to the marketing department while he works on a marketing plan and provides feedback on a game title. The marketing department head assigns him to a project. The marketer delivers his work to both the general manager of the marketing department and the project manager. Along with the advantage of learning from other marketing persons, this organizational configuration ensures a certain distancing between

marketers and a development team. The marketing person can play the role of a reflective broker while analyzing current market trends and checking a game title.

If a marketer belonged to a development team, he would probably also live in an imaginary world and indulge in fantasies much like other developers. Finally, that marketer would lose a critical view on game titles by believing in everything in a game title is fascinating. (Interview with JSC, Customer Service and Public Relations, March 17, 2006).

The second building block of organizing diversity relates to the nature and characteristics of communication between a development team and a marketing department, as well as among team members. Game companies arrange “internal organizational brokers” and try to produce a type of codified knowledge for easy communication. An internal broker is a person who understands the different (tacit) knowledge and can translate the ideas of one subdivision to another subdivision using different technical terms. A marketer functions as an internal broker between the marketing department and development team. Within the development teams, concept artists play the same role as the marketer, who translates the ideas and concepts of planning teams to the graphic teams. Concept artists translate game concepts into basic concept art and assist with the conversion process of 2D or 3D digitization.

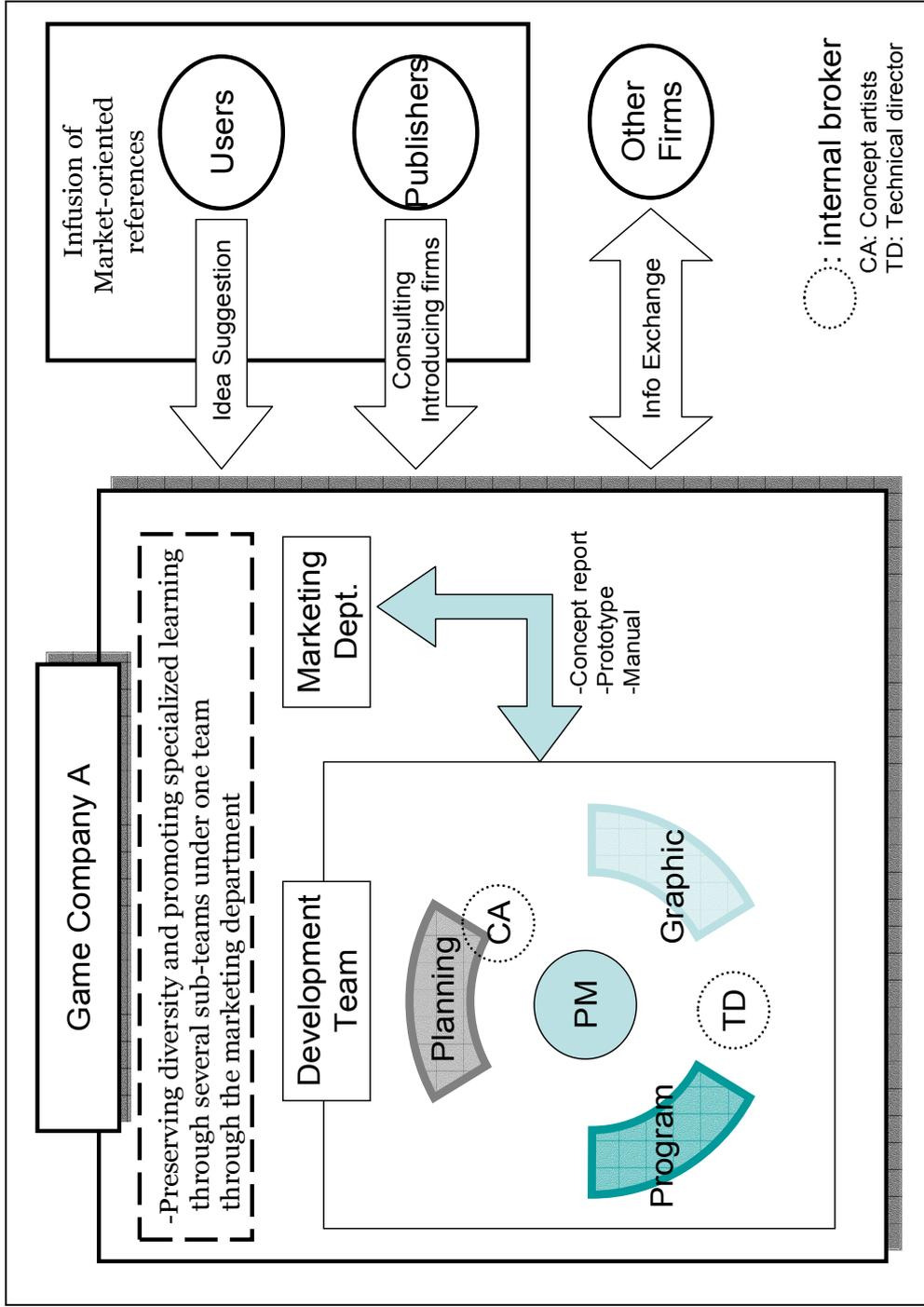


Figure 6.1. Interactions for Game Development

Similarly, the technical director (TD) plays the role of another internal broker between graphic teams and programming teams (Interview with JBH, Planner, April 25, 2006). The TD is a person who is knowledgeable about graphic image data and programming and thus is able to convert image data source into the file form required by programmers. However, it is typical that only large firms have enough financial resources to hire a TD. In addition, game companies must also develop a concept report, portfolio, and manuals. The developed codified form of knowledge that serve as an interim product of a project also clarifies the goal of a game title, technical terms and jargon, and procedures of work. This clarification along with distribution of the codified form among team members assures that the work of each subdivision is operating on common grounds. As seen in Figure 6.1, these codified forms are also circulated to the marketing department.

The third building block is external agents. As mentioned in Chapter 5 and Section 6.1, one of the major features of a development team is the relatively strong power of developers. Such a power relationship is reinforced by the hiring patterns of game companies: companies hire a new employee recommended by current workers; other departments including the human resources department are not involved in hiring developers. In this situation, it is not easy to maintain a balance between development and marketing departments in terms of a power relationship. In most cases, organizational conflicts are resolved in favor of the development team. However, the integration of external sources from publishers and users in the developmental process contribute to achieving a balanced integration of market information, trends, and developmental ideas. Game companies survey users when a dissenting opinion is not resolved: for example,

companies ask target users to select a preferred graphic image. The participation of users in the development process is large scale and widely conducted during open beta testing. During that period, users leave their suggestions and feedback on the webpage of the game title. Publishers play a similar role to users by infusing market-oriented ideas.

6.4 Summary

This chapter presented the knowledge conversion process and discussed the main conflicts and coordination between the actors involved in game development. The first obvious finding is that the internet communication technology “messenger” is the main communication method inside and outside of companies. Its popularity is due to the progress of externalization of tacit knowledge and usage of an organizational broker.

Figure 6.2 shows how game companies codify tacit knowledge embodied in individual actors through the duration of a project. The figure illustrates the interaction and communication in a game development process. The horizontal axis in the figure indicates the level of codification. As the project progresses, team members begin using a codified form of knowledge from the concept report, the prototype, and the manual in the test-version of a game title. Depending on the degree of knowledge codification, project members utilize different communication channels and companies utilize different organizational settings. For example, compared with the prototype, the concept report is not visual, but still in document form. Therefore, while the project team shifts from the concept report to the next stage of the project, the prototype, project members interact frequently through face-to-face interaction while the game company attempts to alleviate any difficulty in communication by adopting organizational brokers (e.g., concept artists,

technical directors) to facilitate communication between the different sub-divisions (e.g., the graphics team, the planning team).

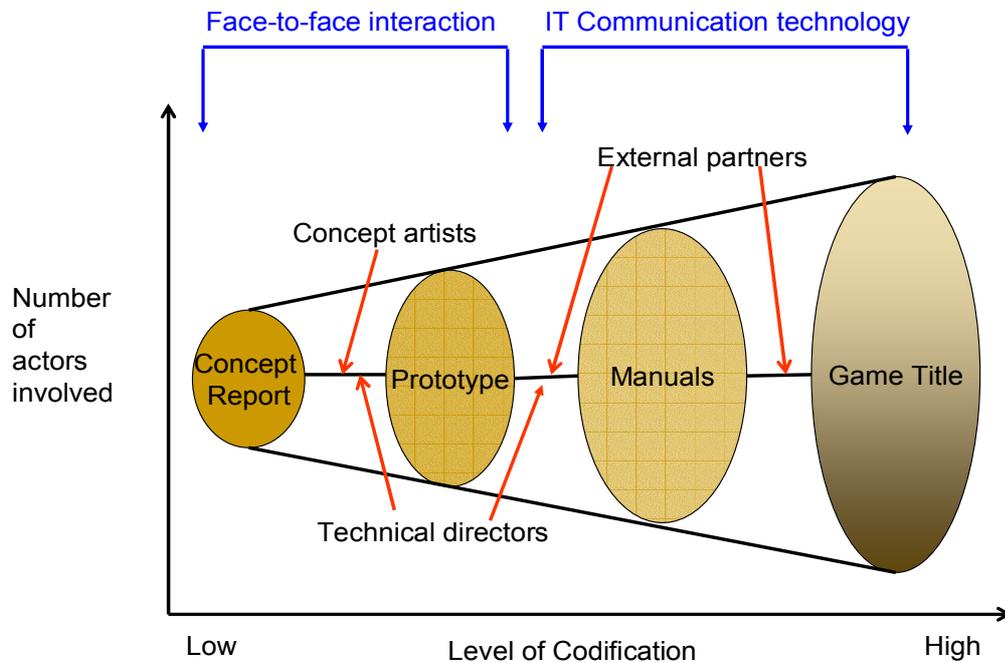


Figure 6.2 Knowledge Conversion and Communication in the Game Industry

In addition, this research detected the following typical conflicts between the marketing division and the development team and among the subdivisions: selection of genres, identification of target consumers, the concept of the business model of the former; ideas about graphic images for the latter. Such different opinions and conflicts are not always bad, as they indicate the presence of diversity in company. Rather, a company intentionally detaches a marketing person from the development team by assigning the person to an independent marketing department. In addition, the company may successfully suppress severe organizational conflicts by referencing the opinions of publishers and game players.

CHAPTER 7

LOCATIONAL DECISIONS OF COMPANIES

This chapter presents the locational decisions of the game companies and examines what companies perceive as important when they decide on their current locations. Section 7.1 addresses the locational factors in all companies and explores the difference between outsourcing companies that utilized external partners in 2005 and non-outsourcing companies. In this section, the geographical proximity and accessibility to game-related agencies and industries such as other game companies, publishers, and game players are more important to outsourcing companies when they decide on a current location than they are to non-outsourcing companies. Section 7.2 examines the four hypotheses related to the impact of several mediating factors on the locational decisions of the companies. These factors represent the sharing of codified knowledge, communication channels, and the search patterns of the game companies seeking external partners.

7.1 Differences in Location Decisions

7.1.1 General Characteristics

The importance of locational variables is measured by a five-point Likert scale (1=least important, 5=very important). In a questionnaire regarding the locational decisions of firms, we asked them about sixteen variables that were designed from several categories: clustering indicators, which represent their accessibility to economic

actors related to the operation of game industries; the local labor factor; the physical environment factor; characteristics of the place; and information sharing.

Table 7.1 provides the results of the questionnaire survey regarding locational decisions and mean differences in locational variables between outsourcing companies and non-outsourcing companies. Overall, variables related to physical environment are more important in locational decisions. In the sample, the most important was “convenient transportation” (4.17) to all the other firms, followed by “affordable transportation” (3.30).

While the two most important locational variables are related to the physical environment, the third one, “accessibility to dynamic cultures,” is not (3.23). The importance of this factor to the game companies might explain why they have not relocated to other provinces outside of Seoul, where they could find inexpensive but network-equipped, intelligent buildings. While this factor is not related to the orientation to close proximity to game players, it is partly driven by the demands and desires of the employees in the game industry. When game companies attempted to relocate to culturally undeveloped areas in Seoul or other cities, they encountered the resistance of game players and feared employee turnover. One large company that provided favorable work conditions and welfare relocated to the suburbs near Seoul. However, it had to move back to Seoul to retain its employees (interview with Minkyu Kim of the Korea Game Development and Promotion Institute, February 14, 2006), as the game players in the company felt isolated and disconnected from the creative and dynamic cultural environment of Seoul. That is, the problem was not a matter of physical distance, but psychological distance.

Table 7.1. Importance of Locational Determinants

Locational Determinants	Total Mean	Firms outsourced in 2005?		
		Yes	No	Mean difference
Hiring: Experienced workers	3.223	3.318	2.778	0.540
Hiring: Inexperienced workers	2.903	2.988	2.500	0.488
Business partners (past/current)	3.214	3.259	3.000	0.259
Other game firms	3.058	3.153	2.611	0.542*
Other IT firms	2.777	2.871	2.333	0.537*
Business service firms (consulting, marketing firms)	2.272	2.365	1.833	0.531*
Trade associations, public agencies	2.437	2.518	2.056	0.462
Accessibility to publishers	2.942	3.059	2.389	0.670*
Accessibility to investors	2.883	2.906	2.778	0.128
Accessibility to informal meetings	2.495	2.565	2.167	0.398
Accessibility to game expos, events	2.408	2.506	1.944	0.561*
Accessibility to game players	2.058	2.165	1.556	0.609*
Accessibility to dynamic cultures	3.233	3.271	3.056	0.215
Place images	3.155	3.329	2.333	0.996*
Affordable office	3.301	3.282	3.389	-0.107
Convenient transportation	4.165	4.247	3.778	0.469

* Significant at 5%

Source: Questionnaire Survey. 103 firms responding

The fourth most important variable in the locational decisions of companies is another labor factor, “experienced workers” (3.22), and the fifth is geographical proximity to past and current business partners (3.21). Among the variables related to the proximity to business partners, other (non-) game companies and business partners have a relatively large impact on decisions about current locations. However, considering the fact that a score of three on the scale of one to five indicates that it is neither “important” nor “not important,” this proximity variable appears to be more neutral and does not have as strong an impact on the locational decisions of firms. Furthermore, with regard to the clustering comprised of economic factors related to a certain industry, these variables were considered to be less important than the physical and cultural environments. On the

other hand, game companies consider geographical proximity to publishers (2.94) and investors (2.88) to be more important than proximity to other IT firms (2.77) and consulting and marketing firms (2.27), while geographic proximity to other game companies (3.06) is more important than that to publishers.

The least important locational determinant in terms of the perception of game companies is accessibility to game players (2.06). Since game companies interact with their customers through game homepages and other online communities of users, geographical proximity to game players does not seem to be an important factor in locational decisions.

With regard to the difference between outsourcing companies and non-outsourcing companies, outsourcing companies reported higher value than non-outsourcing companies in all the locational determinants except “affordable office” (Table 7.1). In other words, outsourcing companies rely more on the geographical environment derived from city infrastructures and other industries. The biggest difference in outsourcing and non-outsourcing companies is “place images” (with a mean difference of 0.9961), followed by “publishers” (0.670), “game players” (0.609), and “game expos and events” (0.561). The mean difference in “other game firms” (0.541) is higher than that in “business partners” (0.259). However, the mean difference in business partners is not statistically significant while that of other game firms is significant. Statistically significant differences can be found in geographic proximity to “other game firms,” “other IT firms” and “business service firms,” accessibility to “publishers,” “game expos, events,” and “game players,” and “place images” as those well-known in the high-tech and producer-service industries.

7.1.2 Differences in Locational Decisions by Characteristics of a Firm

In analyzing clustering orientations of game companies, this research utilizes factor analysis to reduce the number of variables – principal component factors. Table 7.2 provides the rotated factor loadings in each factor after the Varimax rotation. Factor analysis produces five factors for which the eigenvalue, a common selection method, is greater than 1. Moreover, each of the five factors matches the category usually addressed in the literature.

Despite the good match between the calculated factors and the categories, the position of the publisher variable is relatively confusing. If we purely follow factor loadings, the publisher variable should also be included in the same group as factor one. In Table 7.2, the publisher variable has shown higher factor loading in both factor one and factor four. The loading value of a publisher (0.536) is even higher than that of other game firms (0.509) in factor one. The multiple roles of the publisher might have caused this problem. In the game industry, a publisher is not merely a distributor of game titles that companies deliver consumers. In the game industry, the publisher also works as a business service firm that provides consulting and marketing services to the game industry. Moreover, the publisher plays a role as an investor that can decide whether or not to fund a game development project based on the presentations and prototypes of game companies in the middle of a project or even in the initial stage of a project. Therefore, the integration of the publisher variable into either factor one or factor four might make sense. This research employs Cronbach's alpha test in order to identify the factor that includes the publisher variable.

Table 7.2. Rotated Factor Loadings of Locational Determinants

Variable	I	II	III	IV	V	Unique ness
Hiring: Experienced workers	0.081	0.874	-0.029	0.141	-0.006	0.209
Hiring: Inexperienced workers	0.026	0.883	-0.001	0.050	-0.058	0.214
Business Partners (past/current)	0.626	0.148	-0.443	0.299	-0.025	0.301
Other game firms	0.509	0.318	-0.026	0.486	-0.099	0.393
Other IT firms	0.822	0.125	0.006	0.314	0.002	0.210
Business service firms(consulting, marketing firms)	0.755	0.023	-0.016	-0.043	-0.472	0.204
Trade associations, public agencies	0.731	-0.061	0.180	0.017	-0.400	0.270
Accessibility to publishers	0.536	0.129	-0.026	0.632	0.005	0.296
Accessibility to investors	0.331	-0.139	0.003	0.704	-0.037	0.374
Accessibility to informal meetings	0.209	0.195	0.133	0.425	-0.579	0.385
Accessibility to game expos, events	0.294	-0.005	-0.050	0.456	-0.658	0.270
Accessibility to game players	0.126	0.031	-0.053	0.073	-0.833	0.280
Accessibility to dynamic cultures	-0.037	0.216	0.104	0.787	-0.313	0.224
Place images	0.130	0.229	-0.336	0.634	-0.182	0.383
Affordable office	-0.051	-0.071	0.908	-0.011	0.027	0.166
Convenient transportation	0.282	0.450	0.614	0.099	-0.072	0.326
Model summary	Eigenvalue	5.601	1.840	1.643	1.284	1.127
	Difference	3.760	0.198	0.359	0.157	0.244
	Proportion	0.350	0.115	0.103	0.080	0.070
	Cronbach's alpha	0.828	0.908	0.710	0.773	0.741

*Responding: 103 firms

Source: Questionnaire Survey (2005)

The results of Cronbach's alpha test show changes in the reliability of the integration of several items into one group, that is, one factor. If an additional variable caused an increase in the alpha value, it is better to add that variable. If not, it is better to omit it. When the publisher variable is added into factor one, the alpha increases from 0.8278 to 0.8464, indicating an increase in reliability and explanatory power. However,

adding a publisher variable increases the reliability of the factor more with factor four, from 0.6891 to 0.7733, than with factor one. Therefore, this research will combine the publisher variable with factor four.

Factor one (the clustering factor) represents clustering components, a combined variable of the accessibilities to other game-related partners such as business partners (past/current), other game firms, IT firms, business service firms (consulting and marketing firms), and trade associations. In this factor, the items of publishers and investors are not included.

Factor two (the labor factor) is a combined variable of the easiness of hiring inexperienced workers and experience workers. Factor three (the physical environment factor) is a combined variable of affordable office and transportation, which represents physical environments. Factor four (general attributes of place) is an integrated variable of dynamic cultures, place images, publishers, and investors, representing the “general attributes of places.” Finally, factor five (information sharing) is an integrated variable of informal meetings, formal game expos, and game players, which represent information sharing and circulation. Since the accessibility of game players implies the accessibility of market information, factor five can be said to embrace market and technological information. In this research, the mean of each variable within each factor is calculated.

Overall, the analysis about the locational decisions by factor shows similar patterns to those discussed in the previous section. The physical environment factor (3.73) is considered the most important factor in the locational decisions of companies, followed by a labor factor (3.06), general attributes of a place (3.05), the clustering factor (2.75), and information sharing (2.32). In all these five factors, except the physical

environment factor, outsourcing companies have a higher mean than non-outsourcing companies, the mean differences of which are statistically significant (Table 7.3).

Table 7.3. Locational Factors by Outsourcing

Locational Factors	Total Mean	Firms Outsourced in 2005?		
		Yes	No	Mean difference
Clustering factor	2.7515	2.8329	2.3667	0.4663*
Labor factor	3.0631	3.1529	2.6389	0.5141*
Physical environment factor	3.7330	3.7647	3.5833	0.1814
General attributes of place	3.0534	3.1412	2.6389	0.5023*
Information sharing factor	2.3204	2.4118	1.8889	0.5229*

* Significant at 5%

**Responding: 103 firms. Source: Questionnaire Survey (2005)

Table 7.4. Locational Factors by Firm Type

Locational Factors	Total Mean	Third-party Developers?		
		Yes	No	Mean difference
Clustering factor	2.7515	2.7800	2.7245	0.0555
Labor factor	3.0631	2.9600	3.1604	-0.2004
Physical environment factor	3.7330	3.6800	3.7830	-0.1030
General attributes of place	3.0534	3.0900	3.0189	0.0711
Information sharing factor	2.3204	2.3733	2.2704	0.1029

* Significant at 5%

**Responding: 103 firms. Source: Questionnaire Survey (2005)

Table 7.5. Locational Factors by Firm Size

Locational Factors	Freq.	Clustering Factor	Labor Factor	Physical Environment Factor	General attributes of place	Information Sharing
1-9	19	2.4736842	2.6053	4.0526	2.8026	2.0351
10-49	69	2.8116	3.1594	3.6884	3.0507	2.3575
50-99	7	2.7143	3.3571	3.7143	3.2500	2.4762
100 +	8	2.9250	3.0625	3.3750	3.5000	2.5417
Total	103	2.7515	3.0631	3.7330	3.0534	2.3204

*Responding: 103 firms. Source: Questionnaire Survey (2005)

Outsourcing companies, when compared to non-outsourcing companies, have a tendency to emphasize the importance of the clustering factor, although the value of the clustering factor is less than three. In addition, the most significant differences between outsourcing and non-outsourcing companies are found in the labor, general attributes of place, and information sharing factors.

The business type of companies, whether third-party developers or not, does not exhibit statistically significant mean differences in any of the locational factors. Nevertheless, third-party developers in the sample seem to consider the clustering factor more seriously than other developers. Such locational decisions may depend on the size of a firm. Table 7.5 describes how companies made different locational decisions according to firm size. Surprisingly, larger companies tend to value clustering and labor factors more than smaller companies, which may suffer from a weaker financial situation. Companies with more than fifty employees, which may successfully release at least one game title in the market and subsequently earn revenue, or companies that move from other IT or cultural industries to the game industry, do not suffer as acutely as those with less than fifty employees. These companies are either companies that have just started up or those that have few sources of revenue. Thus, this type of company must sacrifice closeness to other companies for affordability. Such a difference between larger companies and smaller companies is also true in the general attributes of the place and information-sharing factor. In only the physical environment factor, smaller companies report a higher number than bigger companies.

7.2 Hypotheses Tests on Clustering

One of the goals in this research is to examine the impact of the searching pattern for and interaction patterns with external partners of game companies on their locational decisions. As mentioned earlier (section 5.1), a majority of companies utilized informal recommendations of those engaged in the game industry to search for and hire external partners in 2005. In addition, eighty-three percent of the game companies in the sample reported that they outsourced some activities in graphics and sounds in 2005. The higher reliance of the game companies on the recommendations of other people in the industry might make the companies more embedded and clustered in a certain region. However, the principal communication method used during the project period was messenger, and game companies highly codify their knowledge into written form and share them with team members. These variables might free firms from the imperative of clustering.

In this research, the hypotheses related to clustering are suggested as follows. First, the development and frequent usage of codified knowledge reduces the importance of geographical proximity to related economic actors and industry [H4: codification hypothesis]. Second, if game companies use information technology to overcome the geographical barriers to interactions with their external partners, the importance of geographical proximity to the related agents will decrease [H5: IT hypothesis]. Third, if companies keep using the same partners over time, they do not need to be concerned about the geographical proximity based on repeated job tasks and built-in trust [H6: built-in trust]. Finally, if companies rely on the “communities of practice” to search for their external partners and check their reputation, geographical proximity to other firms and people in the game industry would become more important.

In order to test these hypotheses, this research employs OLS regression model to test the hypotheses that examine the relationship between the locational decisions of outsourcing companies and search and communication patterns. In doing so, this research uses three different independent variables in the model to explore the geographical proximity in multiple dimensions: the importance of proximity to business partners, the importance of other gaming companies, and the importance of the clustering factor.

This research uses (1) the “manualout” variable as a product of the externalization process, (2) messengers as non-geographical communication, (3) built-in trust, and (4) communities of practice. This variable is related to the “codification hypothesis.” The presence of a manual is a proxy measure for the successful efforts of the companies to codify their knowledge that facilitate relatively easy communication. However, the presence of manuals does not guarantee easy communication with external partners since manuals sometimes reside only inside companies. Forty-six companies (representing 53%) of outsourcing companies in 2005 used manuals. However, among them, only sixteen (19%) shared their manuals with outsourcing companies. Therefore, in the questionnaire survey, we asked companies if they shared manuals. If companies shared their manuals with their external partners, manualout was a dummy variable of 1; otherwise, it was 0.

To test the “IT hypothesis,” this research uses “messengers,” is a dummy variable. If the companies reported messengers as the primary communication with external partners, messenger variable is denoted 1. For testing the “built-in trust hypothesis,” this research has created a built-in trust variable. In the questionnaire survey, companies were asked how they searched for their external partners if given several choices. If companies

chose “the selection of the existing partners” or “the recommendations of the past partners,” then the built-in trust variable was denoted 1. If companies selected the current external partners through the recommendations of their employees and other game companies, the communities of the practice variable was 1.

Table 7.6. Variables Related to Proximity Hypotheses

Variable Name		Definitions	Related Hypotheses
Independent Variable	Manualout	-Dummy variable. -Sharing of manuals with external partners	Codification hypothesis
	Messenger	-Dummy variable -Primary communication	IT hypothesis
	Built-in trust	-Dummy variable -Searching for current partner: Same partners or the recommendations of pervious partners	Built-in trust hypothesis
	Communities of practice	-Dummy variable -Searching for current partner: through recommendations of their employees and other game companies	Communities hypothesis
Control Variable	Trustcheck	-The degree of the accessibility to the communities of practice -Minimum: 0; Maximum: 5	
	Third-party	-Dummy variable -Third-party developers or not	

This research uses two control variables added: trustcheck and third-party. The trustcheck variable indicates the accessibility to information used to find and evaluate the reputation of potential external partners. This control variable is introduced to figure out how the built-in trust and communities of practice variables affect the locational decision of companies. In other words, the introduction of this control variable allows an evaluation of whether a company that uses the recommendations of other people when

searching for external partners is more likely to prefer proximity to other game companies than one that does not use recommendations but that has the same accessibility to information. In the questionnaire survey, companies were asked to rank on a five-point Likert scale (1=least important 5=very important), for each of the freelancers and companies, the following question: “It is easy to learn about how contractors behaved in their previous relationships with other firms”. The calculation for trustcheck is done in this way: If companies used either freelancers or a company, the value of trustcheck was adopted without modification. However, if companies used both freelancers and external firms, I averaged them.

The other control variable is the type of firm: third-party developers or not. Since third-party developers in this study are referred to as companies that are not subcontracting and publishing the game titles of other companies, the status of a third-party might influence locational decisions. Because they do not need to bid for subcontracting work from other game companies, they might not need to cluster with other companies. However, they might also need to get market and technological information from publishers and other companies.

Table 7.7 provides the output of the OLS regression. In model 1, the dependent variable is the importance of proximity to business partners, measured from 1 to 5. The dependent variable in the second model is the importance of proximity to other game companies, while the dependent variable in the third one is the importance of the clustering factor, which is a mean value of the importance in the proximity to business partners, other game firms, IT firms, business service firms, and trade associations.

Table 7.7. Location Decision in Relation to Trust and the Degree of Codification
(OLS regression)

		Model 1	Model 2	Model 3
Manualout		-0.122	-0.085	-0.085
		(-0.41)	(-0.31)	(-0.41)
Messenger		-0.444+	0.060	-0.335*
		(-1.91)	0.28	(-2.11)
Built-in trust		1.021**	0.682*	0.558*
		(3.12)	(2.26)	(2.49)
Communities of practice		0.774*	0.686*	0.436*
		(2.45)	(2.35)	(2.02)
Trustcheck		0.101	-0.086	0.025
		(0.88)	(-0.81)	(0.32)
Third-party		0.186	0.337	0.124
		(0.78)	(1.53)	(0.76)
Constant		2.115	2.556	2.342
		(4.04)	(5.29)	(6.54)
Model Summary	Observation	84	84	84
	R-squared	0.138	0.095	0.108
	Adj R-squared	0.071	0.025	0.039

Dependent Variable:

Model 1: The importance of proximity to business partners

Model 2: The importance of proximity to other game companies

Model 3: The importance of proximity to the clustering factor

Value of t statistics in parentheses

+ significant at 10%; * significant at 5%; ** significant at 1%

Overall, in all the models, the coefficient of built-in trust is the highest in models 1 and 3 and the second highest in model 2. On the other hand, the coefficient of the communities of practice is the second highest in models 1 and 3, and the highest in model 2. This finding implies that the searching pattern of external partners related to trust and affinitive capabilities and knowledge have a significant impact on the locational decisions of game companies. In addition, all of the coefficients of these two variables are positive in the three models. That is, if companies use the recommendations of their employees and other game companies, that is, if companies rely on the communities of practice, they

are more likely to prefer to locate close to their partners, that is, other game companies, and to others in the game industry such as business partners and business service firms. These findings confirm the “communities of practice” hypothesis.

Likewise, the coefficients of built-in trust are all positive in the three models. Thus, it is reasonable that if companies continue to use the same partner, they do not need to be located near external partners. However, despite their dependence on information technology to communicate with their external partners, companies that rely on built-in trust prefer locating near their partners compared to the other companies that have a different searching pattern.

Although the statistical significance of the messenger variable is unstable, the IT hypothesis appears to be partly confirmed. The coefficients of the messenger variable in models 1 and 3 are negative and statistically significant at the 0.10 and 0.05 levels, respectively. That is, companies who primarily communicate with external partners using messenger are less likely to locate close to their partners and less concerned about clustering than other companies, holding other variables constant. However, companies using messenger prefer to locate near other game companies more than other companies. However, this variable in model 2 is not statistically significant.

Finally, the coefficients of manualout related to the codification hypothesis are all negative in the three models, confirming the codification hypothesis. If companies share their manuals with external partners, they are less likely to be concerned about their geographical proximity to any of them. However, this manualout variable is not statistically significant in the three models.

In spite of the negative coefficient values of manulout and messenger, the larger value in the coefficient of the communities of practice and built-in trust might imply that the two trust-related variables are relatively critical in the locational decisions of companies, and its importance is not compensated by a bulk of investments in information technology for communication and codification efforts.

7.3 Summary

In this chapter, I presented locational determinants of the game companies and tested the four hypothesis related to the four mediating variables. A reduction method of factor analysis produced the five locational factors: clustering factor, labor factor, physical environment factor, general attributes of place, and information sharing factor. Overall, clustering factor was relatively less significant compared to the other locational factors. However, companies that outsourced valued the clustering factor more than other companies that did not.

As the results of the hypothesis tests indicate, all the locational hypotheses except codification hypothesis appear to show statistical significances. The variable, “messenger”, related to the IT hypothesis – more frequent use of IT communication technology, less important geographical cluster – has a statistically significant negative coefficient, which confirmed the IT hypothesis. In addition, the variable, “communities of practice”, has a positive relationship with the clustering factor and thus it confirms the Communities hypothesis. Therefore, companies that relied on one of trust mechanisms, “communities of practice”, in searching for external partners, are more cluster-oriented. Similarly, the other trust mechanisms, “built-in trust”, appears to contribute to the

importance of geographical cluster since its coefficient is positive. However, the codification hypothesis – more codified form of knowledge, less important geographical cluster – does not appear to be confirmed. The variable, “manualout” that represented the existence of codified knowledge in a company, has a negative relationship, but it is not statistically significant. In summation, IT technology and trust mechanisms have influenced the decisions of game companies on geographical clusters but we cannot say the impacts of knowledge codification on clustering yet.

With regard to the origin of clustering analysis, one question might be raised: firms that cluster might decide to collaborate with other companies due to easiness of communication rather than firms might be cluster-oriented to pursue the collaboration or tacit knowledge. This egg and chicken problem has always been problematic in regional clustering study. Theoretically, clustering would be developed with a few companies to search for talents, university, better transportation and physical infrastructure, and so on except clustering. In this stage, the region of co-location cannot be considered a clustering. That region is just co-location of cluster without collaboration. Then, once the number of companies reaches up to some level and if a technological aspect of their products requires the collaboration, other companies would start to relocate from outside to exploit the learned assets of the first stage of companies that resided in earlier phases of the development of the region. After this stage, it would be quite difficult to assess the reason why companies relocate: mainly either to pursue other regional assets or regional, collective learning.

However, this research does not examine whether collaborative firms cluster or whether clustering leads to collaboration of firms. What this research examines through

the OLS regression result is which factors among several features of the collaboration firms that conducted the cultural works, have significant impacts on the clustering orientations. For example, the usages of IT technology in outsourcing companies reduce the clustering orientations of the outsourcing companies, while the heavy reliance of outsourcing companies on trust mechanisms increases their clustering orientations.

CHAPTER 8

CONCLUSIONS

This research set out to examine how the Korean game companies integrate diverse knowledge in project organization to produce a new game title in the three dimensions: how and when game companies mobilize the diverse group of people through employments and outsourcing strategy (mobilization), how game companies organize their knowledge process regarding externalization and organizational arrangements (organization), and how the mediating variables derived from mobilization and organization has intervened the locational decisions of the game companies (clustering).

Regarding outsourcing strategy (i.e. external mobilization) and clustering, this research tested the seven hypotheses. In order to further understand the thee dimensions, particularly the aspect of organization, I examined the knowledge conversion based on qualitative study and descriptive statistics.

This chapter summarizes the main findings of this research (section 8.1) and discusses implications for the theoretical background (section 8.2) and for policy and practice (section 8.3). Finally, this chapter addresses the limitations of this research and possible areas for future research (section 8.4).

8.1 Summary of Findings

8.1.1 Hypotheses Tests

Regarding the outsourcing decisions, the three hypotheses were tested. Why do companies outsource if they value a similar and coherent cognitive framework? This research posited that companies have a tendency to use external partners to supplement lower capability inside of them. Since the research focus is diversity, this research considers the outsourcing in cultural works – graphics and sounds – to mobilize cultural workers in the game industry.

Hypothesis 1 was that game companies employing more cultural workers are less likely to utilize external partners such as external firms and freelancers. [i.e., the Internal Workforce hypothesis]. Hypothesis 1 was partially supported. In terms of the make-or-buy decision, number of cultural workers did not show a statistical significance. On top of that, the coefficient for number of cultural workers was positive that was opposite to the hypothesis. In other words, companies that employed more cultural workers outsourced graphics and sounds more than companies with less cultural workers in the sample. However, in terms of outsourcing costs, there is a significant relationship between the number of cultural workers and outsourcing costs. The negative relationship that supported the hypothesis was found. Companies with more cultural workers appear to spend less on outsourcing than companies with fewer cultural workers do.

Hypothesis 2 was that game companies that import their cultural content from existing industries such as animation are less likely to utilize external partners such as external firms and freelancers [i.e., IP purchase hypothesis]. Significant relationships in

the models for make-or-buy decision and outsourcing costs were found. Game companies that purchase cultural content through IP licensing are less likely to decide to outsource in terms of make-or-buy decision than game companies with lower spending on IP licensing. In addition, the former appears to spend less money on outsourcing costs than the latter.

Hypothesis 3 was that game companies that have been accumulating knowledge assets in the game industry are less likely to utilize external partners such as external firms and freelancers [i.e., the history hypothesis]. This historic nature was examined through (1) the initial type of a company ('initial') and (2) the duration of a company in the industry ('gameyears', 'gameyearsq'). The duration of a company was found to have no significant relationship with the outsourcing decisions. However, initial type of a company has significant relationships with the outsourcing decisions. A company that started its business in the game industry has less chance of and less spending on outsourcing than another company that changed its industry type from non-game industry to the game industry.

With regard to the locational decisions of outsourcing companies, this research examined the impacts of several mediating factors: codification, information technology, built-in trust, and communities of practice.

Hypothesis 4 is that if game companies have a well-documented form of their knowledge and production process, the geographical proximity among other related economic actors is not important [i.e., the Codification hypothesis]. The presence of manuals shared with external partners was used to represent codified knowledge. The OLS regression model showed no statistical significance of the manual variable.

Hypothesis 5 is that if software companies have project-specific mailing lists or a secured website for interactions among project members, geographical proximity among other related economic actors is not important [i.e., the IT hypothesis]. In this research, internet messenger technology is used for information communication technology. Outsourcing companies that use messenger technology as a primary communication channel with outsourcing companies are less likely to take clustering seriously than other outsourcing companies are. In other words, the IT hypothesis is confirmed.

Hypothesis 6 is that if companies continue to use a same partner based on “built-in trust,” geographical proximity among other related economic actors will not have specific spatial tendencies [i.e., the Built-in Trust hypothesis]. However, built-in trust has statistically significant, positive impacts on the importance of clustering. In other words, companies value the importance of geographical proximity more than the other companies do.

Hypothesis 7 is that if companies rely on “communities of practice” to search for external partners, geographical proximity among other related economic actors will be important [i.e., the Communities of Practice hypothesis]. As with built-in trust in hypothesis 6, the communities of practice appear to play a role as centripetal force on the clustering decision. Companies that search for their external partners based on the recommendations from the communities of practice are more cluster-oriented than other companies that are not.

8.1.2 Other Findings

Along with the hypotheses tests, this research also explored the process of knowledge conversion in each stage of a project and organizational arrangements as well as searching patterns and the roles of communities of practice.

Knowledge Conversion and Communication

As project is in progress, game companies develop codified knowledge through brainstorming and intensive interaction between project members with different knowledge. The result of the externalization process – concept report, detailed plans, prototype, and manuals – are considered as a milestone in the project. This externalization process allows project members to communicate easier and clearer and to share the common ideas and concepts. Therefore, as a project goes on over time, the number of participants on the project can be expanded without frictions of communications. When a few planners propose a concept report, a small number of developers from graphic, programming, and marketing come together to discuss the concept report. In the middle of a project, the project team produces other codified forms of knowledge: the prototype and manuals. Although such codified forms of knowledge require intensive interaction among the members of different sub-teams (e.g., the graphics team), they allow teams to share knowledge more easily so that the goals of a project are more easily realized. In addition, they provide team members with a reference point for solving and discussing problems. Therefore, the transfer of knowledge can easily take place through information technology such as messenger. As a result, primary communication methods among team members and between internal team members and

external partners are messengers. In addition, a game company sometimes uses internal organizational brokers that connect a sub-team with another sub-team. For example, concept artists may deliver the ideas of the planning team to the graphics team.

Organizational Conflicts and Coordination

Along with the cognitive dimension previously mentioned, this research also showed that the Korean game companies have another way to integrate diverse mindsets and opinion to suppress too many conflicts in their organizations. The main organizational conflicts come from between game development team and marketing division regarding selection of genres, target consumers, and modification of game story and contents according to business model. This conflict seems to come from different mindsets and different sources they referred in a decision time. Marketers look at the number found in market trend reports whereas developers conjecture future direction for game market by looking at the active online clubs, movies, or novels, which cannot be easily quantified and thus leads to somewhat subjective opinions. In addition, it is partially due to the purposeful intention of the game company to detach marketing persons from the game development process in order to preserve the diverse view on a game title by separating marketing persons from a development team and assigning them to a separate department – marketing department. In addition, another organizational conflicts occurred between subdivisions regarding different ideas about graphic images.

This research shows that such organizational conflicts mostly are resolved in favor of the development team. It is due to an unbalanced power relationship between marketing persons and development team. The presidents of the game companies were

developers in their early days. Game companies heavily rely on the current game developers and cannot easily substitute the existing developers because of the attributes of projects. Therefore, game companies have less power over game developers than over marketing persons. However, nowadays, game companies began referencing opinions of publishers and game players to balance out the power relationships and to approach current market needs and preferences. Therefore, when a project encounters severe conflicts, they started to survey the opinions of game players and to consult with potential publishers.

Communities of Practice and Built-in Trust

This research found that the Korean game companies heavily rely on trust mechanisms from communities of practice in order to search for trustworthy, competent game developers. The main criteria for searching were (1) knowledge in certain field (e.g. graphic) and some familiarity to other fields, (2) social skills; (3) game passions that relate to a general common cognitive structure in a broad sense. In order to fulfill these requirements, the majority of companies searched for employees through the recommendations of their current employees or other gaming companies. The primary hiring method of game planners and programmers was using the recommendations from communities of practice: those from employees (44% and 43% of the companies in the sample, respectively) and those from other game companies (5.8% and 2.0%, respectively). Clearly, game companies rely more strongly on recommendations from their employees, who access their own communities, including vocational institutes they

attended, game-related clubs they participated in while at the university, online communities, and so on.

However, communities of practice does not limit their roles to inform the job availability to job-seekers. Conversely, job seekers also actively pursue contacts with individuals in their communities in order to get information. In addition, job seekers also received feedback from these individuals on their portfolios that they submitted for job interviews (figure 5.1).

Similar to the hiring patterns for new employees, game companies did not use formal methods to find suitable external partners. They used newspapers or the Internet (10%) for outsourcing announcements. They were highly dependent on the built-in trust to hire current external partners such as freelancers. Forty-two percent of the companies continued to use the same partners (42%), suggesting that game companies limited their search boundary since they pursued external partners who were familiar with their practices and conventions.

8.2 Implications for Theory

This research aimed to further explore the balance between diversity and coherence based on evolutionary theory, knowledge conversion and project organization, and regional clustering theory.

Meaning of Communities of Practice

As one way of multiple base of learning and the infusion of diversity, evolutionary approaches have suggested communities of practice. The main focus of the

existing research is how the existing employees in the companies obtains a new knowledge and skills from their communities of practice and how they integrate them into their companies. However, such role of the communities of practice seems to function in somewhat opposite way in the case of the Korean game industry. As presented previously, the Korean game companies seek for the trustworthy people and external partners through the recommendations of the communities of practice. If we closely look at the searching and hiring behaviors of the Korean game companies, the existing employees and other game companies recommended job-seekers whom they met in the same vocational institutions, previous companies, or online community clubs. Such searching patterns affect the composition of employees and power relationships of the companies. When companies rely on the recommendations of current employees, they will often find employees with similar backgrounds, thus reducing the communication difficulties among team members. Rather than receiving a new ideas and skills, such hiring convention may lead to a common coherent framework in each division (e.g., the graphic team, the planning team) which thwarts the input of knowledge or ideas and thus creativity. I do not argue that communities of practice always results in the inputs of similar ideas, knowledge, and skills. What I mean is that communities of practice is not ways good. Communities of practice would have positive role in absorption of new knowledge if current employees were actively engaged in communities of practice. However, communities of practice would have different meaning if it were used for hiring new people. In addition, any situation in which developers hire other developers might impede the balance of power in relationships between the development team and

managers, including those of the marketing teams. Therefore, the meaning of communities of practice should be carefully applied to the empirical research.

Legitimacy of Decisions

When evolutionary approaches explore the sources of diverse knowledge, it seems to me that they emphasize the cognitive aspect while ignoring the power relationship and thus legitimacy of decisions. The introduction of diversity and integration of different thoughts and ideas does not only require the achievement of mutual understanding. However, it also requires persuasion and agreements that evolutionary approaches address in organizational learning except diversity.

This research has also found in the Korean game industry “horizontal communication” (Marengo, 1992) that integrate different knowledge existed across different units. In the Korean game company, marketing person is detached from development team in a different organizational unit, marketing department. This separate organizational setting appears to be devised intentionally by game companies to preserve different viewpoints of and learning for marketing persons. Intensive communication between marketing persons and development team occurred around early stage – concept report writing – and final stage of projects via project meeting, which is similar to the “horizontal communication” (Marengo, 1992).

However, due to power relationship, the opinions of marketing person seems to be equally dealt with as much as those of game developers. In this case, horizontal communication is not much effective in terms of the integration of diversity. In this regard, the most influential decision comes from outside of the company: publishers and

game players. The Korean game industry might be one of typical examples for “open innovation” (Chesbrough, 2003, 2004). It implies that research efforts to detect the presence of diversity within an organization are not enough to explore the roles of diverse knowledge within an organization, although it is meaningful. In this regard, research might have to examine both cognitive aspects and coordination aspects beyond search for the diversity.

Regional Clustering Study

The main findings of this research related to locational orientations of the Korean game industry are the lower importance of clustering factor and no significant of codified knowledge. First, the clustering factor was found the second to the bottom among the five factors identified in chapter 5. The most important factor was the physical environment factor such as an affordable office and convenient transportation. The second most important factor was the labor factor, which indicates the ease of hiring experienced and inexperienced workers. It might implicate that geographical clusters does not necessarily reflect intensive collaboration and interactions among companies and between companies and other related industries and organizations. In other words, in case of Korea, although majority of the game companies clustered in several sub-regions within Seoul, this cluster might indicate just physical cluster, not collaborative cluster. Rather than that, the game industry that requires talents with different knowledge pursues other factors such as labor factor than collaboration. Therefore, regional cluster study should have comprehensive view on the factors that contribute the concentration of companies without overemphasizing the collaborative R&D projects or interactions among economic actors.

In addition to that, this research shows no significance of the nature of knowledge – the codified knowledge – in the clustering orientation of the Korean game companies. In other words, sharing manuals with external partners showed no statistically significance impact on the clustering orientation. This is against the core argument of cluster study, of which argument is that high-tech cluster because geographical proximity, high-tech cluster, is a necessary condition for the circulation of tacit knowledge. The result of this research does not mean that tacit knowledge is not important. In some cases, tacit knowledge or any kind of knowledge would be a primary reason for the presence of clusters. However, it is not always true. Therefore, for economic development purpose, regional cluster study might be better to decompose the reasons of geographical cluster without jumping on the research on region under the assumption of the effectiveness or value of collaboration and tacit knowledge.

8.3 Implications for Policy

This research suggests several policy implications for regional economic developments. First, this research has implications for the importance of labor factors in attracting company. Although the advantage of clustering has been often emphasized in the regional development policy and program, the Korean game companies do not seem to appreciate the benefit from the clustering. As mentioned in the previous section, the most important locational factor was a physical factor such as office infrastructures and transportation, and the second important factor was the labor component. In addition to that, the test for the codification hypothesis shows that the nature of knowledge does not

appear to have significant impacts on the cluster-oriented decision. The Korean game companies seem to orient clustering because of built-in trust and the other trust driven from communities of practice. Note that the trust mechanisms in this research have different roles than trust mechanisms in other cluster studies in the sense that the former relate to hiring patterns whereas the latter relate to sharing information and knowledge. These trust mechanisms are also involved in the recruitment of labor factors while it is stabilizing the process of a development project.

This finding suggests that nurturing labor forces may be set to be a first priority for economic development. However, the current policy of local government in Korea as well as in other countries seems to take different programs and actions. Korean provincial governments have provided tax exemptions to local companies to nurture start-ups and attract large companies. Such policy does not seem to be effective. First, the same offer in tax subsidy from several local governments makes competition among local governments more severe. Second, some game companies just exploit the supports of local governments by putting pseudo-head office in a tax-benefit providing locality.

Our head office is in another city, Chunchon. However, the head office is not an actual head office. We just locate an office with one person over there and all the decisions and project activities are conducted in Seoul. We just keep our head office over there because of tax exemption and administrative supports from the Chunchon city government. (Interview with ZOL, Marketing and Public Relations, on March 28, 2006)

Therefore, local government might consider the training program to enhance the attractions of regions. When I met one policy maker, he was confident that a government funded training program, Game Academy, was one of the successful programs. He said

that the game companies prefer hiring graduates from the training program for their employees. His argument seems to be supported by other game developers whom I met for the interviews as seen below.

Among other programs of the *[Korean]* government, the most effective one might be the Game Academy *[which is a public vocational institute operated by the Korea Game Development and Promotion Institute]*. In fact, the Game Academy has many programs for each of the different occupations in the game industry. The level of training curriculum is quite higher than other private vocational institutes. Particularly, its two-year training course encompasses a development project and gets trainers to produce portfolios. It is more practical and game-specific than academic curriculum (Interview with JMS, President of a professional association and Project Manager, on February 14, 2006).

Such a training program seems to be more useful to the game industry compared to the university and private institute. University curriculum does not provide industry-specific curriculum whereas most private vocational institutes seem to target people who want to get a “game certificate” that was not criticized by current game developers (mentioned in section 5.1). However, the Game Academy is in Seoul only and thus it deteriorates the situations of other regions more due to the outflow of prospective game developers from other regions to Seoul. Therefore, the establishment of the Game Academy in other regions could be considered for local economic development. Such training programs can be applied to other countries where regional disparity is severe in terms of the population of prospective workers.

The importance of a human resource development strategy might be true for other high-tech and cultural industries because of the progress of globalization and the

development of information technology that leads to regional differences to disappearing, and enables companies to be more more footloose. This aspect would be more critical to the game industry than other tradition industries, because the game industry requires a diverse “creative class”⁵³ (Florida, 2004, 2005). Creative class is a certain group that creates new technology or new contents (Florida, 2004).

For the development of local economies, Florida (2004: 283) suggests, “the bottom line is that cities need a people climate even more than they need a business climate”. This notion leads another aspect of the human resource development of local governments. In the case of the game industry, retaining game developers beyond attracting game developers may be accomplished with investments on “creative capital” (Florida 2004: 319) such as street-level amenities and restorations of authentic places.

The second policy implication of this research relates to communities of practice. This research suggests the tremendous roles of communities of practice to both companies and employees. To companies, communities of practice, which may be more important sources of information than formal academic or vocational qualifications, are a critical source of contacts through which companies can search for new workers and check the reputation of prospective employees. At the same time, employees can get information about jobs and technology as well as feedback on their work performance from communities of practice, where job searches are primarily conducted.

In addition, the importance of communities of practice is reflected in the locational decisions of companies in the game industry. Companies that use communities

⁵³ Florida (2004: 8) shows the example of creative class: artists, engineers, musicians, computer scientists, writers, or entrepreneurs. Creative class does not follow a fixed instruction or process to complete their job duty unlike working class.

of practice to search for external partners seem to be more concerned about the clustering factor. This finding implies that communities of practice play a strong role in enhancing and accelerating geographical clustering. Conversely, geographical clustering might facilitate the formation of communities of practice. Therefore, geographical clustering might be reinforced and thus more likely to occur. One interviewee said his game companies re-located from a local city to Seoul to obtain accessibility to the communities of practice and game developers:

The reason we moved our office to Seoul is to be closer to publishers and to access to the communities of practice more easily. We should be able to meet other game developers. (Interview with ZOL, Marketing and Public Relations, March 28, 2006)

Along with the importance of the communities of practice, the communities may need to be under intentional actions. Wenger et al. (2002: 13) point out that the communities of practice may not always be able to achieve “their full potential” since the development of the communities depends on “the spare time of members, and participation is more likely to be spotty, especially when resources are lean”. Therefore, intentional cultivation is recommended in order to achieve its full potential. In addition, communities of practice might be fragmented and exist in a form of club good. In other words, the communities do not seem to contribute evenly to each of the members and companies.

According to the questionnaire survey, the level of accessibility of companies was found to be different depending on the firm size in the Korean game industry. Table 8.1 describes the mean value of accessibility to communities according to firm size.

Responding companies ranked accessibility on a five-point Likert scale by answering the following question : “It is easy to learn about how the external partner behaved in its previous relationships with other firms”(1=least true 5=very true). A higher value indicates higher accessibility. The mean value of small companies that employ less than ten workers reported an average of 2.8 while that of large companies with more than 100 employees reported an average of 4.4. This finding might stem from the small number of employees engaged in communities of practice. However, the accessibility of small companies can be enhanced through local governmental efforts that promote informal meetings between large and small companies.

Table 8.1. Accessibility to Communities of Practice

Firm size	Mean	Std. Dev.	Freq.
1-9 (A)	2.818*	1.168	11
10-49 (B)	3.367*	0.882	60
50-99 (C)	3.857	1.069	7
100 + (D)	4.438	0.496	8
Total	3.436	0.982	86

* Indicates that the mean difference of (4) is statistically significant at a 0.05 level.
Source: Questionnaire survey

As a next step of enhancement of training programs, another main goal of local government policy may be the promotion of communities of practice based on the existent labor pool of game developers. If the formation of the communities succeeds, then the region becomes more attractive with regard to retaining the existent game developers and attracting more companies. In this case, government can play a role as a “support team” (Wenger et al., 2002). According to Wenger et al. (2002: 206), a support team is a team dedicated to initiate effective communities of practice and plays a role in

“integrating them within the broader knowledge system”. This support team requires resources in terms of time and finance that companies cannot afford. Through the initiation of this support team, governments could reduce the gap between large and small companies by hosting formal seminars, and workshops that are open to small companies.

The efforts of local governments to nurture creative class and communities of practice can also be supplemented by enhancing connections to outside of their regions. The importance of publishers cannot be ignored in attracting and retaining game companies to certain regions. Since the game industry in Korea evolved and matured, the expertise of publishers has increased. Some people who were working as developers or marketers in the game industry have been moving to publishing companies. Therefore, the role of publishers, who are no longer investors, has become more important and evident in the strong relationship between the developers and management in game companies. As mentioned in section 5, due to the hiring patterns of companies and frequent job-hopping behaviors of game employees, developers gain an advantage over marketing personnel whenever a game company faces critical decisions such as the selection of a game genre and graphic images, or the modification of a game story or rules that would be more profitable. Such an unbalanced power relationship might lead to a higher risk of failure of a game title (and the subsequent shutdown of a company) since the lack of a clear marketing perspective results in lower revenues from a game title. However, the local government should function as a broker that connects publishers and game companies, for example, by inviting publishers into its region or by hosting meetings of local game companies that include publishers.

8.4 Limitations of this Study and Directions for Future Research

This study has several limitations.

First, there might be some limits in generalizing the findings of this research for the entire Korean game companies or some industry. Since the sample is limited to game companies that have released at least one game title, this research does not describe game companies that just entered the business and is in the early stage of a company. In other words, this research does not present small and quite new companies that might seriously need the access to and interactions with other game companies and suffer from poor project management because of less formality in their organization. However, other than that, this research might be able to be applied to other industries that requires diverse group of employees and demands higher trust system for hiring people due to absence of or mistrust with formal education system.

When the models for the outsourcing decision mechanism were constructed, several variables were used to represent the internal capability of companies to conduct their own game development projects: the number of cultural workers, IP purchases costs, initial, and game years. These variables, related to the outsourcing decisions, are assumed to represent both managerial and technical capabilities, as they are assumed to represent the managerial capacity of the company. As a result, this research cannot identify differences between specific characteristics of outsourcing companies and those of non-outsourcing companies. If the differences between managerial and technical capabilities were studied and identified, then we would discover which capabilities are the more important and understand to what extent trust derived from communities of practice and built-in trust influence the locational decisions of companies.

In light of the first limitation, this study measured the knowledge assets of the companies using two variables: initial and game years. The logic used to employ the two variables follows. With regard to the “initial” variable, if a company was initially a game industry business, the starting point of the company in the learning curve would not be zero but at least higher than that of companies that were not initially such businesses. In addition, game years is a variable that indicates the knowledge base of companies and that assumes that they will accumulate knowledge over time, as learning is cumulative. However, organizational learning or the results of learning are not embodied in a physical environment such as a computer or a network.

Although measuring the knowledge base and assets of a company is not easy, it might be more accurately measured. Organizational knowledge is stored in either the mind of an organizational member (an employee) in tacit form or certain manuals and databases of graphic images in codified form. In the case of the game industry, one of the features is frequent job-hopping. Therefore, it would be preferable that the two variables be supplemented by employee turnover and average work experience data.

Although this research emphasizes the communities of practice, it does not analyze the communities of practice. It simply looks at their role in searching and hiring new employees, but not in their initial formation, development, and characteristics. In addition, their effect on learning has also not been examined. Although it is obvious that the community promotes the exchange of information, communities of practice in the game industry may or may not play an important role in learning and training. Moreover, the geographical boundary of the communities of practice is unknown. As information technology develops, more and more learning occurs in cyberspace. Such learning,

however, may sometimes be converted into offline learning, resulting in the synergistic effect of learning and knowledge circulation. Thus, if the main benefits of the communities of practice stem from offline, the geographical boundary of the communities of practice would be limited. In order to determine the impact of communities of practice, further research should conduct the initial formation mechanism, the development, and the expansion of communities of practice.

While exploring the locational decisions of companies, this research used the perceived importance of each location factor by companies. Thus, although a higher value in the clustering factor did not indicate actual geographical clustering, it might explain the reality of the situation. Thus, a further study might explore the clustering index that comprehends the geographical distances from each actors related to the industry and then explore the impact of several mediating variables (i.e., messenger, manual, communities of practice, built-in trust) on the locations of companies and clustering.

Appendix A: Consent Form (IRB Approval)



Korean Game Software Industries Project

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January 2005

Dear game software industries executive,

In recognition of the importance of knowledge-based and cultural economy in Korea and worldwide, game software industries have started getting more attention from policy areas and regional governments.

Korean game software companies are being asked to complete the enclosed survey, part of a doctoral dissertation research of Eunjoo Oh who is a Ph.D. candidate at Georgia Institute of Technology. The survey will provide current information about the state of Korean game software industries and reveal dynamic mechanisms of creative development processes in making a new game title.

The survey helps to provide policy agenda and solutions to enhance competitiveness and creativeness of Korean game software industries. We expect that this survey will be very important and useful for game software industries itself as well as policy makers and local communities.

Your participation in this survey is voluntary. Your responses will be kept in confidence and no individual information will be released. Please read the information at the end of this letter regarding your participation in this study. You are able to receive summary of the survey results, if you request. If you agree to participate, it means that you have read the information contained in this letter.

Thank you in advance for your help.

Sincerely,

Handwritten signature of Philip Shapira in black ink.

Dr. Philip Shapira
Professor, Georgia Tech School of Public Policy

Handwritten signature of Eunjoo Oh in black ink.

Ph.D. Candidate Eunjoo Oh
Georgia Tech School of Public Policy

The data that is collected about you will be kept private to the extent allowed by law. Your data will be kept under a code number and all individual firm information will be kept in a secured, limited access location. Results will only be presented in an aggregated form. Your identity will not be revealed in any publication or presentation of the results of this survey. There are no foreseeable risks to you by participating in this study. Your participation in the survey is voluntary and you will not have to pay to participate nor will you be paid. If you have any questions about your rights in participating in this research study, you may contact Ms. Eunjoo Oh at Georgia Institute of Technology at (404) 7484-5606



Consent Form Approved by Georgia Tech IRB: February 09, 2006 - February 08, 2007



한국 게임소프트웨어 산업 연구

공공정책학과
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2005 년 1 월

한국 게임산업 종사자 여러분들께,

한국과 전세계적으로 지식기반 경제와 문화경제가 중요해지고 있음에 따라, 게임소프트웨어 산업 역시 그 일환으로 정책 분야와 지방정부의 관심을 받기 시작하고 있습니다.

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설문에 응답해주셔서 감사합니다.

안녕히 계십시오.

박사 필립 사피라
교수, 조지아텍 공공정책학과

박사과정 오은주
조지아텍 공공정책학과

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Consent Form Approved by Georgia Tech IRB: February 09, 2006 - February 08, 2007

Appendix B: Survey Instrument

[Game Development Processes in Korea]

Hello,

Eunjoo Oh, a Ph.D. student at the Georgia Institute of Technology, is conducting doctoral dissertation research to understand the product development process of Korean game software industries. This survey aims to understand the characteristics of game development processes in Korean game software industries. The survey results will be utilized in Eunjoo Oh's dissertation, "Project Organization, Diverse Knowledge, and Innovation Systems in the Korean Game Software Industries."

Results will be presented only in an aggregated form. All individual firm information will be kept in a secured, limited access location. If you wish, you can receive a summary of the survey results by request. Your voluntary input would be very grateful.

Thank you for taking part in this research.

February 2006
Eunjoo Oh

For further questions, p: Please contact Eunjoo Oh, Public Policy, Georgia Institute of Technology.
Email: ****@hot**.com. Voice +82.**.*****

General Questions

1. In what year was your company founded? (mm/yy) ()yr ()mm
2. What was the initial industry that you were in? (Please check)
①Initially, gaming industry ②Other IT industry ③Others(detail:)
2-1.(if you answer ② or ③) when did your firm consider game industry as a core activities?
()yy
3. What were your main platforms in 2005? Please fill out first and second priority. 1st (), 2nd ()
① On-line game ② Mobile game ③ PC game ④ Arcade game ⑤ Video game
4. In 2005, how did you handle product development? ()
① Development of our own game titles (**no outsourced works** for other companies)
② Involved in the game developments of other firms, but **mostly in our own game developments**
③ **Most activities involved in game developments of other firms**, with little effort in development our own game titles
5. In 2005, did you publish game titles?
① No publishing ② Yes
5-1. (If you published) what game did you publish? ()
① our own game titles ② other companies' game title
6. What was the main genre? (first and second priority) 1st () 2nd ()
① RPG ② Simulation ③ Adventure ④ Sports/Racing/Shooting/Action
⑤ Puzzle/Board ⑥ Complex genre (detail:) ⑦
Miscellaneous(detail:)
7. How have the sales in your company changed since it was founded? Give an estimate.
7-1. What were your total annual sales in 2005? ₩()
7-2. What was the proportional rate of the following activities in sales amount?

Sales amount in 2005 (100%)	=	Your own game title ()% + outsourced game development work for other companies ()% + Publishing revenue ()% + Non-gaming sector ()%
--------------------------------	---	--

7-3. For one year after the foundation, what were your total annual sales? ₩()

8. How many game titles did you release after your company was founded?

For one year after the foundation: ()	In 2005: ()	Total game titles since the foundation: ()
---	--------------	--

8-1. Since 2005, how many titles are in the middle of the development process? ()

9. Here, we seek to understand your investments in 2005. Could you state your expenses on each of the following items? Please give an estimate. (If you didn't spend, please write 0%)

	Items	Ratio	Spent Won(₩)
Development tasks	Workforce payments	()%	()Million₩
	Outsourcing to external partners (firms, freelancers, universities, etc.)	()%	()Million₩
	Equipment purchases (computer, S/W, etc.)	()%	()Million₩
	Training costs (excluding English and other welfare-characteristic training costs)	()%	()Million₩
Purchases of intellectual properties	Game engine purchase	()%	()Million₩
	Scenario	()%	()Million₩
	Graphics	()%	()Million₩
	Sounds	()%	()Million₩
Miscellaneous (all except the above)		()%	()Million₩
Total spending in 2005		100%	()Million₩

10. (If your firm outsourced some work to external partners, please answer) Please write your total spending by the type of external partners and its ratio by each development tasks.

Type of external partners	Total spending	Ratio of spending by tasks
Firms or Universities	()Million₩	Planning()%, Scenario()%, Graphics()%, Sounds()%, Programming/server()% Testing/Debugging()%
Freelancers	()Million₩	Planning()%, Scenario()%, Graphics()%, Sounds()%, Programming/server()% Testing/Debugging()%

Project Team Activities in Game Development

11. Did you employ a person who worked on **only** scenarios? ()

- ① Yes ② No, planners worked on scenario-writing.

12. Which person is a person who made decisions in the following matters? Please indicate a person using the number described in the box below.

① President/CEO ② Development head ③ Project manager ④ Project sub-manager in each part (e.g. Graphic head in a team)
--

12-1. Who had an authority to select team members? ()

12-2. Who had an authority to choose external corporate/university partners? ()

12-3. Who had an authority to choose freelancers? ()

12-4. In the middle of projects, who decided to stop projects or continue projects? ()

13. Which are the first and second frequently used communication media among project team members?
Please use the box below.

① Face-to-face meetings	② Telephone talk	③ Messenger	④ Email
⑤ Intranet, Secured website	⑥ Miscellaneous ()		

13-1. Internal communication of your company's team members: 1st () 2nd ()

13-2. External communication of your employees' and other companies/universities: 1st ()
2nd ()

13-3. External communication of your employees' and freelancers: 1st () 2nd ()

14. Did your firm have some systems to share knowledge and know-how accumulated through project activities across the firm? ()

① No formal system, Informal sharing ② Formal system existed

14-1. (If you answer) how did you share?

① Distribution of documentation ② Through workshop ③ Uploading to the Intranet

④ Miscellaneous ()

15. Do you have any lists of other gaming firms for potential business partners?() ① Yes ② No

16. Did you use any codebook or notepad that explains confusing terms or conceptions?() ① Yes
② No

(If you answer ① Yes, please answer 16-1, 16-2, 16-3)

16-1. Was the codebook/notepad continuously added or updated during project activities?()

① Yes ② No

16-2. Was the codebook/notepad a company-wide or project-specific document? ()

① Company-wide ② Project-specific

16-3. (Only if you had external partners, please answer this question) Did you provide the codebook/notepad to external partners?() ① Yes ② No

17. In 2005, how did you perform tasks by each stage of game developments? Please check the typical way.

Developmental stage	Typical way to perform		
Planning	<input type="checkbox"/> Not used external partners	<input type="checkbox"/> Partial outsourcing	<input type="checkbox"/> Full outsourcing
Scenario	<input type="checkbox"/> Not used external partners	<input type="checkbox"/> Partial outsourcing	<input type="checkbox"/> Full outsourcing
Graphics	<input type="checkbox"/> Not used external partners	<input type="checkbox"/> Partial outsourcing	<input type="checkbox"/> Full outsourcing
Sounds	<input type="checkbox"/> Not used external partners	<input type="checkbox"/> Partial outsourcing	<input type="checkbox"/> Full outsourcing
Programming/Server	<input type="checkbox"/> Not used external partners	<input type="checkbox"/> Partial outsourcing	<input type="checkbox"/> Full outsourcing
Synthesis	<input type="checkbox"/> Not used external partners	<input type="checkbox"/> Partial outsourcing	<input type="checkbox"/> Full outsourcing
Testing/Debugging	<input type="checkbox"/> Not used external partners	<input type="checkbox"/> Partial outsourcing	<input type="checkbox"/> Full outsourcing

Workforce and Training

18. We would like to ask few questions about your workforce. Please how many employees worked in 2005 and the year the firm was founded? If a person carried multiple tasks, just count the

individuals in his core task (e.g.: consider a person who did the planning and scenario-writing together as a planner). Please give an estimate.

	Total number of employees	Planning	Scenario	Graphics	Sounds	Programmers	H/W, Network	System engineers	Others (e.g. Marketing)
In 2005									
Founding year									

19. Please indicate the two main methods of how you searched and hired employees (use the box below)

- | | |
|--|--|
| ① Internet, newspaper, etc. | ② Recommendation of our employees |
| ③ Recommendation of past/current business partners | ④ Recommendation of gaming companies |
| ⑤ Recommendation of non-gaming companies | ⑥ Recommendation of publishers and investors |
| ⑦ Trade associations or business associations | |
| ⑧ Educational institutions, headhunters or employment agencies | ⑨ Miscellaneous |

	Experienced worker 1 st () 2 nd ()	New worker 1 st () 2 nd ()
Planning	Experienced worker 1 st () 2 nd ()	New worker 1 st () 2 nd ()
Scenario	Experienced worker 1 st () 2 nd ()	New worker 1 st () 2 nd ()
Graphic	Experienced worker 1 st () 2 nd ()	New worker 1 st () 2 nd ()
Sound	Experienced worker 1 st () 2 nd ()	New worker 1 st () 2 nd ()
Programmers	Experienced worker 1 st () 2 nd ()	New worker 1 st () 2 nd ()
H/W, Network	Experienced worker 1 st () 2 nd ()	New worker 1 st () 2 nd ()
System Engineers	Experienced worker 1 st () 2 nd ()	New worker 1 st () 2 nd ()

20. When you employed a new worker, what was his employment status? ()

- ① Regular employees in the beginning ② Regular employees after interns or temporary employees
 ③ Temporary employees all

21. How employees were paid off for their works in 2005? ()

- ① Fixed salary ② Salary + monetary incentives
 ③ Salary + non-monetary incentive (details:) (e.g. Tokyo game show tickets)

22. Did you provide training courses for only task-related **knowledge (not attitude)** both internally and by externally by training institutes? (Include internal OJT, external training institutes on commission.)

① Yes 23.1. If yes, please check all the occupations trained.

- ② No Planning Scenario Graphic Sound
 Programmer H/W, Network Marketing, Advertisement

23. Please check how appropriately each of the following statements describes your company policy and environment. Please rate the degree of appropriateness from 1 to 5. (1= completely inaccurate description; 5=completely accurate description)

Descriptions: Openness	①~⑤
(1) Employee participation in external seminars is strongly encouraged.	① ② ③ ④ ⑤
(2) Employee participation in domestic expos or similar events is strongly encouraged.	
(3) Employee participation in foreign expos or similar events is strongly encouraged.	
(4) Ideas and suggestions of employees in non-planning divisions are strongly encouraged.	
(5) During office hours , playing new games of other firms is strongly encouraged.	
(6) Employee participation in the internet community or informal groups is strongly encouraged.	
(7) In our company, employees in technical division (e.g., programming) and in the cultural division (scenario, graphics, sounds) are harmonically communicated.	

Business Locations

24. Have you moved from the initial location in the founding year to the other place? () ① Yes ② No

24-1. Where was your initial location? _____(city) _____(gu)

24-2. Where are you now? _____(city) _____(gu)

25. Do you have a plan to move to another place? ()

① No plan to move ② Staying here and also establishing another facility(ies) ③ Plan to move

25-1. (If you answer ② or ③, please answer this question) Where do you have plan to establish/move?

① Same Gu in current location ② Same city ③ Seoul Metropolitan Areas

④ Elsewhere in Korea (where: _____city) ⑤ Outside of Korea (where: _____)

26. For your locational decisions, please indicate the degree of importance of the following factors. (1= least important 5=most important)

	If you answer ① or ② in the question 25, please provide about the reason for staying in a current location	If you answer ② or ③ in the question 25, please provide the reason for establishing/moving a facility to other location
Easy to hire experienced workers	① ② ③ ④ ⑤	① ② ③ ④ ⑤
Easy to hire inexperienced workers	① ② ③ ④ ⑤	① ② ③ ④ ⑤
Proximity to past/current business partners	① ② ③ ④ ⑤	① ② ③ ④ ⑤
Proximity to other gaming firms	① ② ③ ④ ⑤	① ② ③ ④ ⑤
Proximity to other IT firms	① ② ③ ④ ⑤	① ② ③ ④ ⑤
Proximity to marketing/consulting firms	① ② ③ ④ ⑤	① ② ③ ④ ⑤
Proximity to trade associations and public support organizations/facilities	① ② ③ ④ ⑤	① ② ③ ④ ⑤
Proximity to publishers	① ② ③ ④ ⑤	① ② ③ ④ ⑤
Proximity to investors	① ② ③ ④ ⑤	① ② ③ ④ ⑤
Ease of joining game developers' informal meetings	① ② ③ ④ ⑤	① ② ③ ④ ⑤
Proximity to gaming-related events and expos	① ② ③ ④ ⑤	① ② ③ ④ ⑤
Proximity to consumers	① ② ③ ④ ⑤	① ② ③ ④ ⑤
A feeling of being in a creative and dynamic cultures	① ② ③ ④ ⑤	① ② ③ ④ ⑤
Image of place (e.g. Kangnam Taeharan-ro)	① ② ③ ④ ⑤	① ② ③ ④ ⑤
Low cost, convenient office space	① ② ③ ④ ⑤	① ② ③ ④ ⑤
Convenient traffic facilities	① ② ③ ④ ⑤	① ② ③ ④ ⑤

If you used freelancers or other gaming firms in 2005, please complete the following section.

For companies using freelancers or other gaming firms during the developments of titles

27. For each developmental stage, what are the locations of and the commuting time to the top 1 firm that you outsourced your work to? Please indicate the location using the number of the box below.

① Same Gu in current location ② Same City ③ Seoul Metropolitan Area

④ Elsewhere in Korea(where: city) (where:)	⑤ Outside of Korea
--	--------------------

	Planning	Scenario	Graphic	Sounds	Programming /Server	Synthesis	Testing /Debugging
Location							
Commuting time	()min.	()min.	()min.				

28. How do you find external partners whom you outsourced your work to? Please indicate the typical way using the number of box below.

① Open bidding & competitions (newspaper, internet announcements)	③ Recommendation of our employees
② Stay with an existing partner	④ Recommendation of past business partners (firms/individual)
⑤ Recommendation of gaming companies	⑥ Recommendation of non-gaming companies
⑦ Recommendation of publishers and investors	⑧ Trade associations or business associations
⑨ Miscellaneous	

28-1. For selection of firms or universities, please describe the 1st and 2nd selection methods.

- (1) Planning, Scenarios: 1st() 2nd()
 (2) Graphics, Sounds: 1st() 2nd()
 (3) Programming, Synthesis, Testing, Debugging: 1st() 2nd()

28-2. For selection of freelancers, please describe the 1st and 2nd selection methods.

- (1) Planning, Scenarios: 1st() 2nd()
 (2) Graphics, Sounds: 1st() 2nd()
 (3) Programming, Synthesis, Testing, Debugging: 1st() 2nd()

29. Where did your external partners conduct their tasks? ()

- ① Dispatched into our site all the time ② Majority of tasks were conducted at our site
 ③ They conducted tasks at their site except when they encountered serious problems

30. Please check how much appropriately each of the following statements describes your contexts and experiences with your contracted firms and freelancers. Please rate the degree of appropriateness from 1 to 5. (1= completely inaccurate description; 5=completely accurate description)

Descriptions: Formal Agreements and Reality	Firms /University	Freelancers
(1) Mutually expected that conflicts will be resolved fairly, even if no guidelines are given by our formal agreements.	①②③④⑤	①②③④⑤
(2) Mutually understood that problems will be solved jointly through communication and cooperation rather than just reference to our formal agreements.	①②③④⑤	①②③④⑤
(3) Mutually expected that each will be flexible and responsive to requests by the other beyond formal agreements.	①②③④⑤	①②③④⑤
(4) Both are expected to share helpful information to an extent beyond formal agreements.	①②③④⑤	①②③④⑤
(5) Mutually expect that the contractor's responsibilities that go beyond formal agreements.	①②③④⑤	①②③④⑤
(6) When an unexpected situation arise, the parties have a mutual understanding that a win-win solution will be found, even if it contradicts our formal agreements	①②③④⑤	①②③④⑤
(7) Mutually understood that each will adjust to changing circumstances even if not bound to change by formal agreements.	①②③④⑤	①②③④⑤
(8) Expected that the partners will secure development contents.	①②③④⑤	①②③④⑤

Descriptions: Characteristics of tasks contracted out	Firms /University	Freelancers
(1) Usually, contractors have new ideas that we don't have.	①②③④⑤	①②③④⑤
(2) Our project managers had prior personal experience with the type of work that contractors performed for us	①②③④⑤	①②③④⑤
(3) Our project team members had the same training and technical background as the contractor's people on our project	①②③④⑤	①②③④⑤
(4) The type of work that contractors performed for us is also regularly done by our unit.	①②③④⑤	①②③④⑤
(5) Most of work contracted out is technically at lower level than what we did on our own	①②③④⑤	①②③④⑤
(6) Usually, we contracted out to complete our project quickly.	①②③④⑤	①②③④⑤

Descriptions: Easiness of communications with contractors	Firms /University	Freelancers
(1) It is difficult for the subcontractor to explain decisions to our people	①②③④⑤	①②③④⑤
(2) Face-to-face discussions are required to really understand the issues facing the contractors and the decisions they made	①②③④⑤	①②③④⑤
(3) The only way to understand the knowledge involved in the contractor's work is through first-hand experience.	①②③④⑤	①②③④⑤
(4) Our project team members need the same background as the contractor's people to communicate effectively with them.	①②③④⑤	①②③④⑤
(5) We prefer firms close to our location to easily monitor and communicate with contractors.	①②③④⑤	①②③④⑤

Descriptions: Characteristics of trust and reputations	Firms /University	Freelancers
(1) When we choose a contractor, the careers and reputations of the individuals working on the project are more important than the contractor's company image.	①②③④⑤	①②③④⑤
(2) Unless big failures and problems arise, we continue to work with the existing partners	①②③④⑤	①②③④⑤
(3) If project participant in contractors move to another company-let's say, B-, we change contractors into B the next time.	①②③④⑤	①②③④⑤
(4) We seek to search for the reputations of potential contractors before signing off formal agreements	①②③④⑤	①②③④⑤
(5) It is easy to learn about how the contractor has behaved in its previous relationships with other firms.	①②③④⑤	①②③④⑤
(6) If the contractor was less than cooperative in our relationship, this will greatly damage their reputation with other firms.	①②③④⑤	①②③④⑤
(7) In our industry, it is widely known which contractors are the best in terms of performance and collaboration.	①②③④⑤	①②③④⑤
(8) Contractors in our industry watch their reputations closely.	①②③④⑤	①②③④⑤

Please check this box if you wish to receive a summary of the research results.

Respondent's Information

Company name		Respondent's Name	
Telephone		Respondent's position	

-----THANK YOU-----

Appendix C: Interview Protocol



Eunjoo Oh, a Ph.D. student at Georgia Institute of Technology, are conducting a doctoral dissertation research to understand product development process of Korean game software industries.

The creative and dynamic combinations of non-technological (cultural) knowledge and technological knowledge are increasingly critical to the developments of successful and attractive game titles. However, despite few research and statistics about game software industries, there is little systematic data collection about project itself.

This interview survey aims to understand dynamic communications of project members and project managements that will provide guidance to successful benchmark model. It is important to hear from people who were actually involved in the game development project. Your input will help local governments and public agencies understand the dynamic mechanisms of game development process.

The research depends on you answering each question as completely and honestly as possible. Even if you are having trouble answering a question, we ask that you make your best guess. Your response is completely confidential. Thank you for taking part in this research.

February 2006

For further question: Please contact Eunjoo Oh, Public Policy, Georgia Institute of Technology. Email: ****@hot**.com. Voice +82.**.*****

Background Questions	
1	What are the main product undertaken at this firm by service platform and game genre? How many employees in the firms? By occupations?
2	Since start-ups, growths of this firm When was the founding year of the firm? How many growths in employees and sales amounts since start-up? How many game titles have you completed?
3	The past and present departmental arrangements of the firm Could you describe what departments currently are in the firm? <u>Examples:</u> (1) All developmental units in one department/Game operating/Other assisted department or, (2) Each developmental units have their own departmental heads The current departmental arrangements were different in the past, and how? Who has authority in the allocation of human resources and funding for project team?
4	Rivalry in the firm Does the firm usually promote multiple game development projects concurrently? If yes, were some of projects ordered to stop in the middle of the activities? If yes, how were

	the decisions made? And, who made the decisions?
--	--

Interviewee's Personal Career	
5	<p>Entry into Gaming industry What was your first company? What activities and roles were your first jobs in the company? Could you describe why you consider gaming industry as a potential place of work and describe your technical and non-technical backgrounds and experiences?</p>
6	What are your roles in current firm and how could you get an interview with this firm?
7	<p>Future career plan Do you have plan for your future career goals? If yes, please tell me. <u>Examples:</u> Becoming planners, Establishing own company, etc. To achieve your future goals, what have you done (what will you do)?</p>
8	<p>Different perspectives on good game Please define what good game is that you pick up among present game titles or you want to make in the future</p>

General questions about a project in question	
9	<p>Please explain the scale and importance of the game title produced through a project in question Compared to prior game titles, what are the most distinctive features of the game title?</p>
10	<p>Participation paths in a project in question For the development of this game title, have your organization employed new workers? If yes, please tell me the reasons for that and the roles of new workers? Through what channel did you participate in the project? Through your departmental heads or through project manager? Did you voluntarily approach to a person who has an authority in the personnel appointments? Or, were you just passively appointed by the person? If the participation was what you wanted, why?</p>
11	<p>Qualifications of project team member (questions towards persons who chose team members) During the selection of team members, what were considered to be the most important skills that team members must have?</p> <ul style="list-style-type: none"> ▪ Skills in particular technologies or creative areas ▪ Perceptive to trends and fashions in technological or non-technological areas ▪ Ability to understand other members' activities ▪ Social and communicative skills <p>If your organization hired new workers, what are the most important things that made you hire them in any of the followings?</p> <ul style="list-style-type: none"> ▪ Resume ▪ Portfolio ▪ Interview ▪ Recommendations of other people ▪ Others

Game Planning Process					
12	<p>Composition of planning team</p> <p>Who initiated ideas of the game title?</p> <p>How did you make a storyline for the game title in any of the followings?</p> <p>During concept-report writing periods, how the composition and scale of planning team changed?</p> <p>In the middle of writing concept-report, are there any communications of planning team with marketing (-related) departments and other departments?</p> <p>When planning team wrote concept-report, did they take the business model for the title into consideration?</p> <p>Who selected business model?</p>				
13	<p>Do you use any of the following internal and external sources of information and expertise, and how and why?</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Sources</th> <th style="width: 50%;">How</th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> ▪ Colleagues in same company ▪ Other gaming company ▪ Non-gaming company ▪ Trade associations ▪ University ▪ Public R&D groups ▪ Game users ▪ Others </td> <td> <ul style="list-style-type: none"> ▪ Face-to-face interactions ▪ Phone ▪ Messenger ▪ Individual homepage, blog, etc. ▪ Secured website, intranet, etc. ▪ Formal/informal seminar ▪ Game-specific communities (on-line/off-line) ▪ Others </td> </tr> </tbody> </table> <p>Particularly, did you explore game titles released by other competing gaming companies?</p> <p>Particularly, did you explore the successful models and fashions from non-gaming IT services?</p> <p>How did these communications affect the final draft of concept-report?</p>	Sources	How	<ul style="list-style-type: none"> ▪ Colleagues in same company ▪ Other gaming company ▪ Non-gaming company ▪ Trade associations ▪ University ▪ Public R&D groups ▪ Game users ▪ Others 	<ul style="list-style-type: none"> ▪ Face-to-face interactions ▪ Phone ▪ Messenger ▪ Individual homepage, blog, etc. ▪ Secured website, intranet, etc. ▪ Formal/informal seminar ▪ Game-specific communities (on-line/off-line) ▪ Others
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14	<p>Evaluations and feedback on concept-report</p> <p>Are there any formal procedures for evaluations and feedbacks on concept-report? If yes, who was involved in the procedures?</p> <p><u>Examples:</u> other planners in this firm, marketing head, heads of developmental parts like sounds, graphics, and programming, external personnel</p> <p>Did that formal procedures included persons outside of the firm? If yes, how did you ensure both securities and information-sharing?</p>				
15	<p>Concept-report and prototype</p> <p>What is the purpose of making a prototype? (<u>Examples:</u> mutual understandings between people with different expertise)</p> <p>To whom was this prototype presented? Internally and/or externally? (<u>Examples:</u> investors, publishers, etc.)</p> <p>How did this prototype improve productivity, communications, and good response to market?</p>				

Outsourcing of Project works	
16	<p>Whether to use external organizations</p> <p>Did you get any external organizations and freelancers involved in the project?</p> <p>If yes, what stage of development processes and what kind of organizations as external partners?</p> <p>If yes, why did you outsource these works? (<u>Examples:</u> timely delivery, solutions to</p>

	<p>delayed development, lack of human resources, lack of skills and technologies, need for new idea and technology, etc.)</p> <p>Did you originally have plans for using external partners in the beginning like concept-report? Please tell me what outsourced works were unplanned and planned.</p>
17	<p>How to select external partners</p> <p>How did you select external partners? Did you continue to use partners that you had done with before?</p> <p>If you use a new partner, how did you search for potential partners and choose one of them? Who is the final decision maker to choose external partners?</p> <p>What did you pay most attention in making contracts?</p>
18	<p>What to share with external partners</p> <p>Besides concept-report, what did you share with external partners?</p> <p>Did you give them a document of task procedures that includes labor divisions of development processes –who works and who’s a decision-maker on each task?</p> <p>Did you prefer partners to locate closely to your firm? Or, do not geographical distances matter? Why is that?</p>
19	<p>Mutual understandings</p> <p>What was the most difficult thing to communicate with external partners?</p> <p>Who took the responsibility to communicate with external partners?</p> <p>Was there any person who was able to understand and monitor the skills and work progresses of external partners before they finished?</p> <p>If there were misunderstandings on original thoughts and main ideas of the game title, how did you solve that? (Examples: prototype presentations, metaphorical expression like ‘we want graphics like Laputa’, co-working, others)</p>
20	<p>Are you willing to work together with the external partners in the future again?</p> <p>If yes, why? If no, why?</p> <p>Did you have formal procedures to evaluate external partners? If yes, how were evaluation results accumulated and distributed across this firm?</p>

Just before and after releasing game title	
21	<p>Who participated in testing the game title? Please tell me how many persons both inside and outside of this firm participated.</p> <p>Did you hire game consulting company to evaluate and test the title? If yes/no, why?</p> <p>What feedbacks did you have from insiders and outsiders? Did it include item, graphics, view of game world, and game rules?</p>
22	<p>Changes in compositions of team members after release</p> <p>After game release, were there any changes in the number of team members and the status of project manager? Please tell me that in connections with daily operating team.</p>

Project Managements	
23	<p>Documentations of task procedures and plan</p> <p>Were task procedures documented? If yes, was it thoroughly informed to all members and how?</p> <p>Were concept-report and detail plans for each part documented? If yes, were these thoroughly informed to all members and how? Did detail plans include required technologies, human resources, and schedules?</p>
24	<p>Licensing intellectual properties</p>

	Who purchased in intellectual properties such as graphics, sounds, game engines?
25	<p>Delayed schedule and release date</p> <p>How different from the planned release date and the actual release date? Why? What problems with what stages of developments? Who finally decide a final release date? (Examples: Project team, CEO, Investors, Publishers, etc.)</p>
26	<p>Communications and conflicts inside of development team</p> <p>What is the main communication media among team members? How often and when team meetings that all the members joined were held? Were these on a regular basis or only when problems occurred? What was the most crucial conflicts among different parts and why? Who was a mediator between conflicting parts? Among several subdivisions, which part has the most authority to lead game development process?</p>
27	<p>Communications and conflicts between development team and other departments (e.g. marketing)</p> <p>When was development team ordered to communicate with and get feedback from other departments? Was it officially defined? During communications, did department-specific languages obstruct understating each other? If so, how was it solved? What was the most crucial conflicts with other departments and why? Who was a mediator between conflicting parts? Who were sitting on that negotiation table? After conflicts and negotiations, what was the final result? And, were you satisfied at that?</p>
28	<p>Communications and conflicts with external partners, publishers, and investors</p> <p>How did you solve conflicts with external partners, publishers, and investors? How does it differ from the ways of solving internal conflicts? Who was a mediator between conflicting parts? Who were sitting on that negotiation table?</p>
29	<p>Accumulations of knowledge</p> <p>Is there any formal/informal mechanism to store and distribute technological/non-technological knowledge and ideas that were derived from development work and/or weren't used? (Examples: training, formal workshop, uploading onto intranet DB system, others) Is there any formal/informal mechanism to enlist potential cooperative and competing companies and other agencies?</p>

Appendix D: Descriptive Statistics

Table D.1. Korean Game Companies and Survey Respondents

	Korea		Seoul		Survey Respondents	
	Firm	Employee	Firm	Employee	Firm	Employee
Total	506	8,890	341	7,663	104	6,160
1-9 persons	281	1220	156	715	19	124
10-49 person	189	3672	150	3011	70	1535
50-99 person	21	1,345	20	1,284	7	465
100-299 person	13	1,835	13	1,835	4	627
300 more	2	818	2	818	4	3409

*. KNSO statistics reported statistics in 2004 about a category of “72201 Game Software/Publishing”

** . Questionnaire survey was conducted in 2006. However, the survey asked the information about companies as in 2005.

Source: Korea National Statistical Office (KNSO), Questionnaire survey

Table D.2. Number of Employee in the First Year of Business

	Observation	Mean	Maximum	Minimum	Median
Mobile	37	7.0	18	3	5
Online	55	9.6	31	2	7
Total	92	8.5	31	2	6

Table D.3. Number of Firms by Employment Size in 2005

	less than 10	10-49	50-99	100-299	300 +	Total
Freq.	19	70	7	4	4	104
Percent	18.27	67.31	6.73	3.85	3.85	100

Source: Questionnaire survey

Table D.4. Initial Type of Industry

	Game industry	Non-game industry	Total
Freq.	76	28	104
Percent	73.08	26.92	100

Source: Questionnaire survey

Table D.5. Primary Game Platform

	Online	Mobile	Total
Freq.	62	42	104
Percent	59.62	40.38	100

Source: Questionnaire survey

Table D.6. Secondary Game Platform

	Online	Mobile	PC	Arcade	Video	Total
Freq.	8	19	5	1	6	39
Percent	20.51	48.72	12.82	2.56	15.38	100

Source: Questionnaire survey

Table D.7. Secondary Game Platform by Primary Platform

Primary Platform		Secondary Game Platform					
		Online	Mobile	PC	Arcade	Video	Total
Online	Freq.	-	18	5	1	6	30
	Percent	-	60.00	16.67	3.33	20.00	100.00
Mobile	Freq.	8	-	0	0	0	8
	Percent	100	-	0	0	0	100.00
Total	Freq.	8	18	5	1	6	38
	Percent	21.05	47.37	13.16	2.63	15.79	100.00

Pearson $\chi^2(4) = 38.0000$ Pr = 0.000

Source: Questionnaire survey

Table D.8. Publishing Activities

	Publishing			Publishing what game?		
	Yes	No	Total	Own game	Own + Other firms' game	Total
Freq.	59	45	104	40	19	59
Percent	56.73	43.27	100	67.8	32.2	100

Source: Questionnaire survey

Table D.9. Sales Revenue in 2005

(Million dollars)

	N	min	max	mean	std. dev.	median
Total sales	104	0.0	330.9	7.7	36.4	0.6
Game sales (A)	104	0.0	297.8	5.7	30.8	0.4
A's portion in the total (%)	104	0.0	100.0	70.4	35.9	90.0
Revenue from subcontracted works (B)	104	0.0	351.6	2.1	10.4	0.0
B's portion in the total (%)	104	0.0	100.0	11.3	24.5	0.0
Revenue from publishing other firms' game (C)	104	0.0	63.1	1.2	7.3	0.0
C's portion in the total (%)	104	0.0	49.8	2.3	7.6	0.0
Miscellaneous (D)	104	0.0	36.4	0.7	3.7	0.0
D's portion in the total (%)	104	0.0	100.0	16.0	30.5	0.0
Sales in the first year	102	0.0	4.9	0.2	0.6	0.0

Source: Questionnaire survey

Table D.10. Expenditure in 2005

('000 dollars)

	N	min	max	mean	std. dev.	median
Development expenditure	103	33.2	42993.2	1152.3	4248.3	468.8
Labor costs (%)	103	2.8	95.0	70.6	15.0	72.0
Outsourcing costs (%)	103	0.0	80.0	6.7	12.0	3.3
Equipment costs (%)	103	0.0	27.0	7.0	5.5	5.5
Training (%)	103	0.0	15.0	1.1	2.4	0.0
Game Engine (%)	103	0.0	39.6	2.5	5.5	0.0
Licensing: scenario (%)	103	0.0	5.0	0.1	0.8	0.0
Licensing: graphic (%)	103	0.0	10.0	0.2	1.1	0.0
Licensing: sounds (%)	103	0.0	19.2	1.2	2.9	0.0

Details in outsourcing

Outsourcing costs to firms (%)	103	0.00	0.80	0.05	0.11	0.02
Outsourcing costs to freelancers (%)	103	0.00	0.35	0.02	0.04	0.00

Source: Questionnaire survey

Table D.11. Employee in 2005

	N	min	max	mean	std. dev.	median
Total employee	104	3.0	1200.0	59.2	170.3	20.0
Developers (#)	104	3.0	630.0	35.7	81.7	15.5
Developers (%)	104	30.2%	100.0%	81.3%	14.3%	84.7%
Cultural workers (#)	102	0	320	12.4	33.2	5
Cultural workers (%)	102	0.0%	60.0%	30.8%	11.9%	30.2%
Technician (#)	102	1	260	12.1	27.3	6
Technician (%)	102	10.5%	66.7%	34.2%	11.7%	33.3%
Details in cultural and managerial workers						
Planners (%)	102	3.7%	42.9%	15.2%	7.2%	13.3%
Scenario (%)	102	0.0%	16.7%	0.8%	2.8%	0.0%
Graphics (%)	102	0.0%	60.0%	29.6%	12.1%	28.6%
Sounds (%)	102	0.0%	18.5%	0.4%	2.0%	0.0%
Managerial/marketing (%)	104	0.0%	69.8%	18.7%	14.3%	15.3%

Source: Questionnaire survey

Table D.12. Activities of Company in 2005

	N	min	max	mean	std. dev.	median
Company ages	103	0.2	12.0	4.7	2.3	4.8
Years in game industry	104	0.0	12.0	3.7	2.5	3.0
Total titles produced	104	1.0	120.0	14.1	19.5	6.5
Titles completed in 2005	104	0.0	22.0	3.9	4.2	2.0
Titles completed and uncompleted in 2005	104	1.0	82.0	8.0	9.8	5.0

Source: Questionnaire survey

Table D.13. Business Focus in 2005

	Freq.	Percent
The development of company's own game title development without subcontracted work.	61	58.65
The development of company's own game title development with subcontracted work.	40	38.46
Mainly subcontracted work.	3	2.88
Total	104	100

Source: Questionnaire survey

Table D.14. Primary Hiring Method for Experienced Employee

(Frequency)

	Planners	Graphics	Programmers	H/W, network	System engineer
Internet, newspaper, etc	46	50	46	52	49
Recommendation of our employees	46	45	48	44	45
Recommendation of past/current business partners	3	4	3	2	2
Recommendation of gaming companies	5	1	1	2	1
Recommendation of non-gaming companies	1	1	3	3	4
Educational institutions, Headhunters	3	3	5	3	5
Total	104	104	104	104	103

Source: Questionnaire survey

Primary Hiring Method for Experienced Employee (relative frequency, %)

	Planners	Graphics	Programmers	H/W, network	System engineer
Internet, newspaper, etc	44.2	48.1	44.2	50.0	47.6
Recommendation of our employees	44.2	43.3	46.2	42.3	43.7
Recommendation of past/current business partners	2.9	3.9	2.9	1.9	1.9
Recommendation of gaming companies	4.8	1.0	1.0	1.9	1.0
Recommendation of non-gaming companies	1.0	1.0	1.0	1.0	1.0
Educational institutions, Headhunters	2.9	2.9	4.8	2.9	4.9
Total	100	100	100	100	100

Source: Questionnaire survey

Table D.15. Secondary Hiring Method for Experienced Employee

(Frequency)

	Planners	Graphics	Program mers	H/W, network	System engineer
Internet, newspaper, etc	19	22	23	20	22
Recommendation of our employees	34	35	30	35	32
Recommendation of past/current business partners	5	2	3	2	4
Recommendation of gaming companies	17	18	21	19	18
Recommendation of non- gaming companies	1	1	3	3	4
Educational institutions, Headhunters	8	6	8	8	8
Miscellaneous	1	2	1	2	1
Total	85	86	89	89	89

Source: Questionnaire survey

Secondary Hiring Method for Experienced Employee (relative frequency, %)

	Planners	Graphics	Program mers	H/W, network	System engineer
Internet, newspaper, etc	22.4	25.6	25.8	22.5	24.7
Recommendation of our employees	40.0	40.7	33.7	39.3	36.0
Recommendation of past/current business partners	5.9	2.3	3.4	2.3	4.5
Recommendation of gaming companies	20.0	20.9	23.6	21.4	20.2
Recommendation of non- gaming companies	1.2	1.2	3.4	3.4	4.5
Educational institutions, Headhunters	9.4	7.0	9.0	9.0	9.0
Miscellaneous	1.2	2.3	1.1	2.3	1.1
Total	100	100	100	100	100

Source: Questionnaire survey

Table D.16. Primary Hiring Method for New Employee

(Frequency)

	Planners	Graphics	Programmers	H/W, network	System engineer
Internet, newspaper, etc	69	64	67	65	63
Recommendation of our employees	21	22	23	25	25
Recommendation of past/current business partners	0	1	0	0	0
Recommendation of gaming companies	0	1	1	0	0
Recommendation of non-gaming companies	0	1	0	1	1
Educational institutions, Headhunters	4	4	4	4	4
Total	94	93	95	95	93

Source: Questionnaire survey

Primary Hiring Method for New Employee (relative frequency, %)

	Planners	Graphics	Programmers	H/W, network	System engineer
Internet, newspaper, etc	73.4	68.8	70.5	68.4	67.7
Recommendation of our employees	22.3	23.7	24.2	26.3	26.9
Recommendation of past/current business partners	0.0	1.1	0.0	0.0	0.0
Recommendation of gaming companies	0.0	1.1	1.1	0.0	0.0
Recommendation of non-gaming companies	0.0	1.1	0.0	1.1	1.1
Educational institutions, Headhunters	4.3	4.3	4.2	4.2	4.3
Total	100	100	100	100	100

Source: Questionnaire survey

Table D.17. Hiring Experienced Planners by Third-Party (Primary Method)

	News, Online	Built-in trust	Communitie s of practice	Miscellaneo us	Total
Third-party developers	26	3	22	0	51
	(51.0)	(5.9)	(43.1)	(0.0)	(100.0)
Others	20	0	30	3	53
	(37.7)	(0.0)	(56.6)	(5.7)	(100.0)
Total	46	3	52	3	104
	(44.2)	(2.9)	(50.0)	(2.9)	(100.0)

Pearson $\chi^2(3) = 7.9779$ Pr = 0.046

Source: Questionnaire survey

Table D.18. Hiring Experienced Graphics by Third-Party (Primary Method)

	News, Online	Built-in trust	Communitie s of practice	Miscellaneo us	Total
Third-party developers	28	2	21	0	51
	(54.9)	(3.9)	(41.2)	(0.0)	(100.0)
Others	22	2	26	3	53
	(41.5)	(3.8)	(49.1)	(5.7)	(100.0)
Total	50	4	47	3	104
	(48.1)	(3.9)	(45.2)	(2.9)	(100.0)

Pearson $\chi^2(3) = 4.2150$ Pr = 0.239

Source: Questionnaire survey

Table D.19. Hiring Experienced Programmers by Third-Party (Primary Method)

	News, Online	Built-in trust	Communitie s of practice	Miscellaneo us	Total
Third-party developers	26	2	22	1	51
	(51.0)	(3.9)	(43.1)	(2.0)	(100.0)
Others	20	1	28	4	53
	(37.7)	(1.9)	(52.8)	(7.6)	(100.0)
Total	46	3	50	5	104
	(44.2)	(2.9)	(48.1)	(4.8)	(100.0)

Pearson $\chi^2(3) = 3.5988$ Pr = 0.308

Source: Questionnaire survey

Table D.20. Hiring Experienced Planners by Third-Party (Secondary Method)

	News, Online	Built-in trust	Communiti es of practice	Miscellaneo us	Total
Third-party developers	6	1	30	3	40
	(15.0)	(2.5)	(75.0)	(7.5)	(100.0)
Others	13	4	21	7	45
	(28.9)	(8.9)	(46.7)	(15.6)	(100.0)
Total	19	5	51	10	85
	(22.4)	(5.9)	(60.0)	(11.8)	(100.0)

Pearson $\chi^2(3) = 7.2983$ Pr = 0.063

Source: Questionnaire survey

Table D.21. Hiring Experienced Graphics by Third-Party (2nd main method)

	News, Online	Built-in trust	Communitie s of practice	Miscellaneo us	Total
Third-party developers	7	1	33	2	43
	(16.3)	(2.3)	(76.7)	(4.7)	(100.0)
Others	15	1	20	7	43
	(34.9)	(2.3)	(46.5)	(16.3)	(100.0)
Total	22	2	53	9	86
	(25.6)	(2.3)	(61.6)	(10.5)	(100.0)

Pearson $\chi^2(3) = 8.8755$ Pr = 0.031

Source: Questionnaire survey

Table D.22. Hiring Experienced Programmers by Third-Party (Secondary Method)

	News, Online	Built-in trust	Communitie s of practice	Miscellaneo us	Total
Third-party developers	5	2	30	6	43
	(11.6)	(4.7)	(69.8)	(14.0)	(100.0)
Others	18	1	21	6	46
	(39.1)	(2.2)	(45.7)	(13.0)	(100.0)
Total	23	3	51	12	89
	(25.8)	(3.4)	(57.3)	(13.5)	(100.0)

Pearson $\chi^2(3) = 9.1787$ Pr = 0.027

Source: Questionnaire survey

Table D.23. Hiring Experienced Planners by Firm Size (Primary Method)

employees	News, Online	Built-in trust	Communities of practice	Miscellaneous	Total
1-9	7	0	12	0	19
	(36.8)	(0.0)	(63.2)	(0.0)	(100.0)
10-49	30	3	34	3	70
	(42.9)	(4.3)	(48.6)	(4.3)	(100.0)
50-99	4	0	3	0	7
	(57.1)	(0.0)	(42.9)	(0.0)	(100.0)
100 more	5	0	3	0	8
	(62.5)	(0.0)	(37.5)	(0.0)	(100.0)
Total	46	3	52	3	104
	(44.2)	(2.9)	(50.0)	(2.9)	(100.0)

Pearson chi2(9) = 5.0541 Pr = 0.830

Source: Questionnaire survey

Table D.24. Hiring Experienced Graphics by Firm Size (Primary Method)

employees	News, Online	Built-in trust	Communities of practice	Miscellaneous	Total
1-9	6	1	12	0	19
	(31.6)	(5.3)	(63.2)	(0.0)	(100.0)
10-49	33	3	31	3	70
	(47.1)	(4.3)	(44.3)	(4.3)	(100.0)
50-99	6	0	1	0	7
	(85.7)	(0.0)	(14.3)	(0.0)	(100.0)
100 more	5	0	3	0	8
	(62.5)	(0.0)	(37.5)	(0.0)	(100.0)
Total	50	4	47	3	104
	(48.1)	(3.9)	(45.2)	(2.9)	(100.0)

Pearson chi2(9) = 8.6195 Pr = 0.473

Source: Questionnaire survey

Table D.25. Hiring Experienced Programmers by Firm Size (Primary Method)

employees	News, Online	Built-in trust	Communities of practice	Miscellaneous	Total
1-9	5	0	13	1	19
	(26.3)	(0.0)	(68.4)	(5.3)	(100.0)
10-49	29	3	34	4	70
	(41.4)	(4.3)	(48.6)	(5.7)	(100.0)
50-99	6	0	1	0	7
	(85.7)	(0.0)	(14.3)	(0.0)	(100.0)
100 more	6	0	2	0	8
	(75.0)	(0.0)	(25.0)	(0.0)	(100.0)
Total	46	3	50	5	104
	(44.2)	(2.9)	(48.1)	(4.8)	(100.0)

Pearson chi2(9) = 12.4329 Pr = 0.190
 Source: Questionnaire survey

Table D.26. Hiring Experienced Planners by Firm Size (Secondary Method)

employees	News, Online	Built-in trust	Communities of practice	Miscellaneous	Total
1-9	1	3	3	3	10
	(10.0)	(30.0)	(30.0)	(30.0)	(100.0)
10-49	16	1	38	5	60
	(26.7)	(1.7)	(63.3)	(8.3)	(100.0)
50-99	1	1	5	0	7
	(14.3)	(14.3)	(71.4)	(0.0)	(100.0)
100 more	1	0	5	2	8
	(12.5)	(0.0)	(62.5)	(25.0)	(100.0)
Total	19	5	51	10	85
	(22.4)	(5.9)	(60.0)	(11.8)	(100.0)

Pearson chi2(9) = 21.9588 Pr = 0.009
 Source: Questionnaire survey

Table D.27. Hiring Experienced Graphics by Firm Size (Secondary Method)

employees	News, Online	Built-in trust	Communities of practice	Miscellaneous	Total
1-9	4	1	3	3	11
	(36.4)	(9.1)	(27.3)	(27.3)	(100.0)
10-49	16	1	39	5	61
	(26.2)	(1.6)	(63.9)	(8.2)	(100.0)
50-99	0	0	6	0	6
	(0.0)	(0.0)	(100.0)	(0.0)	(100.0)
100 more	2	0	5	1	8
	(25.0)	(0.0)	(62.5)	(12.5)	(100.0)
Total	22	2	53	9	86
	(25.6)	(2.3)	(61.6)	(10.5)	(100.0)

Pearson chi2(9) = 12.1826 Pr = 0.203

Source: Questionnaire survey

Table D.28. Hiring Experienced Programmers by Firm Size (Secondary Method)

employees	News, Online	Built-in trust	Communities of practice	Miscellaneous	Total
1-9	4	1	3	3	11
	(36.4)	(9.1)	(27.3)	(27.3)	(100.0)
10-49	17	2	37	7	63
	(27.0)	(3.2)	(58.7)	(11.1)	(100.0)
50-99	1	0	6	0	7
	(14.3)	(0.0)	(85.7)	(0.0)	(100.0)
100 more	1	0	5	2	8
	(12.5)	(0.0)	(62.5)	(25.0)	(100.0)
Total	23	3	51	12	89
	(25.8)	(3.4)	(57.3)	(13.5)	(100.0)

Pearson chi2(9) = 12.1826 Pr = 0.203

Source: Questionnaire survey

Table D.29. Searching Pattern for Subcontracting Companies

	1st method		2nd method	
	Freq.	Percent	Freq.	Percent
Open bid	7	10.1	8	14.3
Previous Partners	29	42.0	14	25.0
Recommendations of our employees	17	24.6	13	23.2
Recommendations of past partners	8	11.6	11	19.6
Recommendations of other game companies	7	10.1	5	8.9
Recommendations of non-game companies	0	0.0	2	3.6
Recommendations of non-game companies	0	0.0	1	1.8
Miscellaneous	1	1.5	2	3.6
Total	69	100.0	56	100.0

Source: Questionnaire survey

Table D.30. Searching Pattern for Freelancers

	1st method		2nd method	
	Freq.	Percent	Freq.	Percent
Open bid	3	5.9	10	22.2
Previous Partners	11	21.6	7	15.6
Recommendations of our employees	25	49.0	10	22.2
Recommendations of past partners	9	17.7	14	31.1
Recommendations of other game companies	3	5.9	4	8.9
Total	51	100.0	45	100.0

Source: Questionnaire survey

Table D.31. Scenario Writers and Firm Size

Hiring Scenario writer?	1-9	10-49	50-99	100-299	300 more	Total
Yes	1	2	1	1	3	8
No	18	68	6	3	1	96
Total	19	70	7	4	4	104

Pearson $\chi^2(4) = 30.0996$ Pr = 0.000

* One of companies less than 10 employees also hired scenario writers. However, this company has been involved in game industry for four years and cut their employees due to financial problems and initiated a new game title development. So, the firm size in this case should be understand as many as initial project team members that would hire more employees once the firm find investors or publishers based on their first concept report or prototype.

Source: Questionnaire survey

Table D.32. Differences in Means between Initial-game-business Firms and the Others

	Initial-game-business firms	Companies started in non-game sectors	Mean Difference
Years in game industry	3.9	3.4	3.7
Total expenditures in 2005	782.8	2141.8	1359.0
Total employees in 2005	54.1	73.3	19.2

* Differences between initial-game-business firms and the others in all of variables above are not statistically significant.

Source: Questionnaire survey

Table D.33. Number of Companies that used manuals and codebook in 2005

	Frequency	Percent
Manual: Yes	58	55.77
Manual: No	46	44.23
Total	104	100

Source: Questionnaire survey

Table D.34. Characteristics of Manual

	Manual Update		Manual Characteristic		Sharing Manual with External Partners	
	Yes	No	General	Project-specific	Yes	No
Firms	50	8	8	50	16	30
%	86.21	13.79	13.79	86.21	34.78	65.22

Source: Questionnaire survey

Table D.35. Update of Manual and Firm Characteristics (I)

	Total Mean	Update (Mean)	No update (Mean)	Mean difference
Game years	3.60	3.82	2.25	1.57
Sales revenue in 2005 (000 dollars)	11,553	12,959	2,768	10191
Total employees in 2005	85.1	94.0	29.8	64.2+
Number of developers in 2005	46.3	50.6	19.9	30.7+
Percentage of developers	78.5%	78.4%	78.9%	-0.5%
Total expenditures in 2005 (000 dollars)	1,500	1,605	857	748
Observation	58	50	8	

+ significant at 10%, \$1 = ₩1,024.

Source: Questionnaire survey

Table D.36. Update of Manual and Firm Characteristics (II)

	Initial Industry*		Main platform**		Outsourcing***	
	Game industry	Non-game industry	Online	Mobile	Outsourcing	No outsourcing
	# of firms, %	# of firms, %	# of firms, %	# of firms, %	# of firms, %	# of firms, %
Manual update	38	12	37	13	39	11
	88.4%	80.0%	97.4%	65.0%	84.8%	91.7%
No update	5	3	1	7	7	1
	11.6%	20.0%	2.6%	35.0%	15.2%	8.3%
Total	43	15	38	20	46	12
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

*Pearson $\chi^2(1) = 0.6555$ Pr = 0.418

**Pearson $\chi^2(1) = 11.5458$ Pr = 0.001

***Pearson $\chi^2(1) = 0.3793$ Pr = 0.538

Source: Questionnaire survey

Table D.37. Descriptive Statistics of Third-party developers and Others

	Observation	Mean	Max	Min	Median
Third-party	51	28.6	184	4	20
Others	53	88.7	1200	3	19
Total	104	59.2	1200	3	20

Table D.38. Presence of Project-specific Manual (I)

	Total Mean	General manual (Mean)	Project-specific (Mean)	Mean difference
Game years	3.60	3.84	2.13	1.72
Sales revenue in 2005 (000 dollars)	11,553	13,364	234	13,130+
Total employees in 2005	85.1	97.4	8.5	88.9*
Number of developers in 2005	46.3	52.6	7.4	45.2**
Percentage of developers	78.5%	76.2%	92.8%	-16.7%**
Total expenditures in 2005 (000 dollars)	1,500	1,721	148	1,573*
Observation	58	50	8	

+ significant at 10%; * significant at 5%; ** significant at 1%

\$1 = ₩1,024.

Source: Questionnaire survey

Table D.39. Presence of Project-specific Manual (II)

	Initial Industry*		Main platform**		Outsourcing***	
	Game industry	Non-game industry	Online	Mobile	Outsourcing	No outsourcing
	# of firms, %	# of firms, %	# of firms, %	# of firms, %	# of firms, %	# of firms, %
General manual (Mean)	7	1	2	6	3	5
	16.3%	6.7%	5.3%	30.0%	6.5%	41.7%
Project-specific (Mean)	36	14	36	14	43	7
	83.7%	93.3%	94.7%	70.0%	93.5%	58.3%
Total	43	15	38	20	46	12
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

*Pearson chi2(1) = 0.8642 Pr = 0.353

**Pearson chi2(1) = 6.7433 Pr = 0.009

***Pearson chi2(1) = 9.8863 Pr = 0.002

Source: Questionnaire survey

Table D.40. Comparisons between third-party developers and other firms (I)

	Initial Industry*		Main platform**		Outsourcing***	
	Game industry	Non-game industry	Online	Mobile	Outsourcing	No outsourcing
	# of firms, %	# of firms, %	# of firms, %	# of firms, %	# of firms, %	# of firms, %
Third-party	39	12	34	17	41	10
	51.3%	42.9%	54.8%	40.5%	47.7%	55.6%
Other firms	37	16	28	25	45	8
	48.7%	57.1%	45.2%	59.5%	52.3%	44.4%
Total	76	28	62	42	86	18
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

*Pearson chi2(1) = 0.5858 Pr = 0.444

**Pearson chi2(1) = 2.0668 Pr = 0.151

***Pearson chi2(1) = 0.3699 Pr = 0.543

Source: Questionnaire survey

Table D.41. Comparisons between third-party developers and other firms (II)

	Total Mean	Third-party (Mean)	Other Firms (Mean)	Mean difference
Game years	3.74	3.59	3.89	-0.30
Sales revenue in 2005 (000 dollars)	7,686	1,836	13,315	-11479
Total employees in 2005	59.2	28.6	88.7	-60.1+
Number of developers in 2005	35.7	22.2	48.8	-26.6+
Percentage of developers	81.3%	81.8%	80.8%	1.0%
Total expenditures in 2005 (000 dollars)	1,152	704	1,592	-888
Observation	104	51	53	

+ significant at 10%

\$1 = ₩1,024.

Source: Questionnaire survey

Table D.42. Distribution of third-party developers and other firms (I)

	Total Mean	Third-party (Mean)	Others (Mean)	Mean difference
Game years	3.74	3.59	3.89	-0.30
Sales revenue in 2005 (000 dollars)	7,686	1,836	13,315	-11,479
Total employees in 2005	59.2	28.6	88.7	-60.1+
Number of developers in 2005	35.7	22.2	48.8	-26.6+
Percentage of developers	81.3%	81.8%	80.8%	1.0%
Total expenditures in 2005 (000 dollars)	1,152	704	1,592	-888
Observation	104	51	53	

+ significant at 10%

\$1 = ₩1,024.

Source: Questionnaire survey

Table D.43. Distribution of third-party developers and other firms (II)

Firms that used	Initial Industry*		Main platform**		Outsourcing***	
	Game industry	Non-game industry	Online	Mobile	Yes	No
	# of firms, %	# of firms, %	# of firms, %	# of firms, %	# of firms, %	# of firms, %
Third-party	39	12	34	17	41	10
	51.3%	42.9%	54.8%	40.5%	47.7%	55.6%
Other firms	37	16	28	25	45	8
	48.7%	57.1%	45.2%	59.5%	52.3%	44.4%
Total	76	28	62	42	86	18
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

*Pearson $\chi^2(1) = 0.5858$ Pr = 0.444

**Pearson $\chi^2(1) = 2.0668$ Pr = 0.151

***Pearson $\chi^2(1) = 0.3699$ Pr = 0.543

Source: Questionnaire survey

Appendix E: Probit Model

Table E.1. Predicted Probabilities for the Make-or-Buy Decisions (Probit Model)
 (Model 6, Dependent Variable: outsourcing=1; no outsourcing=0)
 (The Results of “Prchange” Command in Probit Model)

	min->max	0->1	-1/2	-+sd/2	Marginal Effect
Cultural workers	7.4%	0.2%	0.2%	5.6%	0.2%
IP Purchase	-97.5%	-0.2%	-0.3%	-13.1%	-0.3%
Initial	-9.8%	-9.8%	-15.8%	-6.5%	-14.1%
Game years	0.1%	0.0%	0.0%	0.0%	0.0%
Gameyearsq	6.5%	0.1%	0.1%	2.2%	0.1%
Online	-1.8%	-1.8%	-1.8%	-0.9%	-1.8%
Expenditure	24.5%	0.0%	0.0%	56.3%	0.0%
Publisher	1.4%	1.4%	1.5%	0.6%	1.5%

Source: Questionnaire survey

Table E.2. Predicted Probabilities for the Manual Development (Probit Model)
 (Model 5, Dependent Variable: Manual=1; No manual=0)
 (The Results of “Prchange” Command in Probit Model)

	min->max	0->1	-0.5	-+sd/2	Marginal Effect
Third-party	19.5%	19.5%	19.5%	9.9%	19.7%
Online	12.4%	12.4%	12.3%	6.1%	12.3%
Gameyears	-96.3%	-4.7%	-16.1%	-38.9%	-16.2%
Gameyearsq	64.3%	1.1%	1.2%	30.0%	1.2%
Initial	-3.6%	-3.6%	-3.6%	-1.6%	-3.6%
Outsourcing	-19.1%	-19.1%	-20.2%	-7.7%	-20.4%
Employee	47.3%	0.1%	0.1%	20.0%	0.1%
Percent of developers	-55.3%	-59.8%	-81.2%	-14.9%	-104.9%

Table E.3. Predicted Probabilities for the Manual Development (Probit Model)
 (Model 5, Dependent Variable: Manual=1; No manual=0)
 (The Results of Prvalue Command in Probit Model)

Comparisons between 6-year-old and 7-year-old companies

	Current*	Saved**	Change***	95% Confidence Interval for Change
Pr(y=1x):	0.3984	0.4091	-0.0107	[-0.0795, 0.0582]

* Current is the predicted probability of a seven-year-old company for the use of manuals, holding all other variables at their mean.

** Saved is the predicted probability of a six-year-old company for the use of manuals, holding all other variables at their mean.

*** Change is the difference between a seven-year-old company and an eight-year-old company. It means that a seven-year-old company is less likely to develop manuals than a six-year-old company.

Comparisons between 7-year-old and 8-year-old companies

	Current*	Saved**	Change***	95% Confidence Interval for Change
Pr(y=1x):	0.4109	0.3984	0.0125	[-0.0761, 0.1012]

* Current is the predicted probability of an eight-year-old company for the use of manuals, holding all other variables at their mean.

** Saved is the predicted probability of a seven-year-old company for the use of manuals, holding all other variables at their mean.

*** Change is the difference between a seven-year-old company and an eight-year-old company

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