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Project-based Organizations

1.1. Why Are Project-based Organizations Necessary?

In the knowledge-based economy of the 21st century, diverse human knowledge has become the source of product, service and business models with a new competitive value. Many companies are discussing a move away from the mass-production, mass-consumption business model that thrived in the 20th century. They are rushing into an era where they must search for businesses that are as yet undiscovered. In the former business environment, certain level of profits could be made through management methods such as cost-cutting by investing in IT to boost business efficiency in sales and production divisions; strategic outsourcing; and rationalization of personnel. However, in an economic environment with an over-abundance of goods and services (especially in industrialized nations), rapidly developing Asian economies, and globalization, companies can no longer make a profit simply by developing and producing goods and services efficiently, and then supplying them to customers. The revolution in ICT (Information & Communication Technology), moreover, has led to great changes for the consumer, as well as the company. Because of this, companies must continually come up with creative and competitive products, services and business models, and must always deliver new value to the consumer. The larger the company, the greater the need to develop innovation and efficiency, while simultaneously pursuing economies of scale, scope and speed.

Meanwhile, the advance and diversity of technology and the rapid evolution of IT are adding complexity to the business models that companies ought to deliver. Companies urgently need to fuse and integrate different technologies and product, service development and business

models across industries (see Kodama, 2002, 2005). Previous technology innovations involved an exhaustive pursuit and development of specialist knowledge, but the unprecedented concepts behind the new products and services have led to frequent cases of fusing technologies from different fields. In high-tech business fields such as IT, telecommunications, e-business and content, automobiles, electronics, FA (factory automation), precision instruments and biotechnology, the best core technologies have been dispersed, which have led to innovation globally. In the knowledge-based economy, many companies are finding it difficult to keep innovations in these cutting-edge business areas under the full control of the company, as they did under the conditions of hierarchical organizations and closed, autonomous systems of the mass-production era (see Sawhney and Prandelli, 2000; Chesbrough, 2003; Haour, 2004).

Accordingly, in an era where valuable knowledge produces wealth, open systems in which the management integrates advanced knowledge from multiple viewpoints dispersed within and outside the organization (including customers) will become increasingly important. This is not to go so far as to say, however, that one company should encourage another to sustain and develop the first company's hard-to-copy core competences as its own (see Hamel and Prahalad, 1994). Put another way, in the knowledge-based economy, it will become increasingly important to develop and accumulate in-house the core competencies that confer a competitive advantage, while undertaking external core competences, and creating new product and service business models from knowledge integration among one's own and other companies.

One question is the kind of management that companies creating a competitive edge in this kind of knowledge-based economy should possess. One of the solutions is the message of building project-based organizations within the company, as I emphasize in this book. In recent years, the most advanced high-tech and multinational corporations (MNCs) (see Forsgren, 1997; Bartlett and Ghoshal, 1989; Nohria and Ghoshal, 1997) have been transforming their traditionally hierarchical organizations to flatter, speedier, and more flexible and horizontally-integrated structures based around teams and projects (see Child and McGrath, 2001; Child and Rodrigues, 2003). In an environment with such dramatically changing markets and technologies, flexible and autonomous project-based organizations are also optimal organizational structures to integrate knowledge both within and outside the company, and to generate business models for new products and services (see Lundin and Midler, 1998; Hobday,

2000; DeFillipi, 2002; Lindqvist, 2004). Project members target shared objectives and collaborate, while promoting business within set time frames (see Henrie and Sousa-Poza, 2005).

The structure of project-based organizations has come to be applied to a range of industries, especially construction (Gann and Salter, 1998), IT, communications (Kodama, 1999), automobiles (Clark and Fujimoto, 1991), the media (Windeler and Sydow, 2001; DeFillippi and Arthur, 1998), and consulting and professional services (Alvesson, 1995). The mission of the project-based organizations is to generate results in response to specific client demands by structuring projects around temporary assemblies of in-house specialist staff and executing business within a fixed time limit. The entire company can also be thought of as an assembly of project-based organizations where the routine business that goes on at a consulting firm is almost non-existent.

A great deal of research has accumulated around project management and project-based organizations (see Turner, 1999; DeFillippi, 2001; Sydow, Lindkvist and DeFillippi, 2004). Definitions of project-based organizations vary, but a key point is that project-based organizations possess all internal and external resources, as well as individual functions such as development, production and sales, and established organizations are structured to execute business as individual projects (Hobday, 1998, 2000; Prencip *et al*., 2001). Another point is that in order for large companies to implement the most important themes, such as projects to enhance management efficiency or develop new products, an organizational structure should exist to build the project after members of temporarily existing organizations have ended their participation, and to have the project carried out by specialist members (see Midler, 1995; Keegan and Turner, 2002). A third characteristic is that a matrix form exists for members to participate in projects in addition to following their primary business in existing organizations (see Galbraith, 1969). The fourth characteristic is that there are cases where members of existing organizations form informal project networks within and outside the company (cases of Japanese companies working to maximize these features are analyzed in this book) (see Kodama, 2005). As you can see, the term "project-based organizations" has several meanings. In this book, I have used the same term to define all these variants.

In this book, I also identify new knowledge generated from the boundaries of inter-organizational networks (between disciplines, projects and existing organizations, among projects, and between project

networks within and outside the organization), centered on project-based organizations, as a source of innovation. The dynamic view of strategy comprising the development of diverse organizational and knowledge boundary networks existing within and outside companies (including customers and external partners) demonstrates the creation of new organizational capabilities to generate innovation. In this book, I use detailed case studies from hi-tech Japanese companies to analyze the mechanisms by which the development of diverse-boundary networks, formed through project-based organizations and project networks, dynamically integrate diverse knowledge within and outside the organization, and create new innovations and strategic positions. In this chapter, I propose frameworks for project-based organizations that form the core of this book.

1.2. The Philosophy of Project-based Organizations

The recent shape of project-based organizations has been defined in the following ways.

A project is a temporary organization to which resources are assigned to undertake a unique, novel and transient endeavor that involves managing the inherent uncertainty and need for integration in order to deliver beneficial objectives of change (Turner and Miller, 2003, p. 7).

Project-based organizations refer to a variety of organizational forms that involve the creation of temporary systems for the performance of project tasks (Sydow, Lindkvist and Defillippi, 2004, p. 1475).

Clearly, a project-based organization incorporates the meaning of an organizational structure specially formed for a temporary period to enable a project-based organization execute a specific task. The project-based companies of Japanese companies are not simply playing the role of organizations that execute temporary functions, but are also positioned as specialist, official organizations that execute specific functions.

Some companies, for example, adopt project-based organizations as organizations specializing in exploratory activities (March 1991) to promote future strategies. This book examines the cases of NTT DoCoMo in Chapter 2 and NTT in Chapter 7. Japanese companies, moreover, are structured simply as official project organizations. There are cases in which each functional organization builds projects through temporary responses from informal networks (see the cases of Sharp in Chapter 3 and Matsushita Electric in Chapter 6). Moreover, these organizational

forms do not exist simply as project-based organizations enclosed within a single company, or between company and client, which are perceived as a project-based organization, but rather as wide-ranging inter-company networks incorporating clients, group affiliates and partner companies (see cases of Mitsubishi Electric in Chapter 4, Sony in Chapter 5, and Canon in Chapter 6). Accordingly, in this book, I am not looking at project-based organizations from the viewpoint of projects as temporary systems or systems sealed within a single organization. Rather, I want to view them as optimized organizational forms to achieve specific work targets, and to formulate and implement future strategies through the adjustment and integration of resources and capabilities within and outside organizations (including customers).

Next, I would like to mention the differences between projects in US and in European companies on the one hand, and Japanese companies on the other. In the academic research centered on the US and Europe, projects have come to be perceived as a favored methodology adopted to achieve innovation (see Hobday, 2000; Lundin and Midler, 1998). Because the project itself is a temporary organization, however, it has been pointed out (see DeFillippi, 2001; Keegan and Turner, 2001; Grabher, 2002; Newell *et al*., 2003; Prencipe and Tell, 2001; Middleton, 1967) that the accumulation of knowledge within the project is insufficient, and that knowledge transfer to other projects and existing organizations and organizational learning through knowledge sharing is problematic. What happens with projects at Japanese companies? My conclusion, derived from qualitative data[1] through ethnography, participant observation and interviews, is that Japanese companies tend to promote more mutual learning, knowledge transfer, and knowledge sharing among projects and between projects and existing organizations. I will describe this when I discuss the project-based organization framework.

[1] This book is based entirely on inductive research from qualitative data. Over the past decade, I have acquired considerable insights from semi-structured interviews and informal dialogues with a total of 308 people including project leaders, project managers, technical staff, strategy division managers, marketing and sales division managers, and production division managers in high-tech Japanese companies (companies featured in this book's case studies and 23 other companies). I graduated from a Japanese Graduate School of Science and Engineering (majoring in electrical engineering), and have come to acquire a defined framework concerning the state of Japanese companies' distinctive project management, including knowledge gained from 20 years experience as a project manager and project leader, strategy division manager, planning division manager, and personnel training division staff of an IT company.

1.3. Community of Practice and Collectivity of Practice

Before I explain the project-based organization framework that forms the core of this book, I would like to consider the existing research. Recent research regarding the organizational behavior of temporary projects involves analyses from the viewpoint of the typology of knowledge work (Lindkvist, 2005). As Wenger (1998) mentions, a project clearly differs from a community of practice. The latter involves a group of actors rooted in the community within a company, who have the same specializations and job functions. A community of practice has the character of a "learning community" (Lave and Wenger, 1991; Brown and Duguid, 1991; Orr, 1996) comprising a group with the same basic specializations (actors possessing fixed domain-specific knowledge in fields such as management, development and production).

Vital knowledge in the community of practice resides in practice as "decentered" knowledge, in the system of activities and the tacit, communal background knowledge contained in the practice and narratives of the community. In the community of practice, vital knowledge resides in practice as "decentered" knowledge, in the system of activities and the tacit, communal background knowledge contained in the practice and narratives of the community. The community of practice does not rely on specific individual knowledge. Members create a communal and coherent knowledge platform through sustained cooperation and coordination over an extended period of time. It has the merit that the knowledge thus accumulated through sustained learning is oriented toward organizational growth. Since the actors in the community of practice are working in the same functions and specialist fields, the members possess similar "thought worlds" (Dougherty, 1992), and the knowledge boundaries between them (Brown and Duguid, 2001) are not great. Since the work revolves around the daily business routines, the project-work elements of novelty and uncertainty do not figure large in the project-work. It follows that there is little conflict and abrasion among the actors. In the community of practice, new meaning is created amidst the daily business routine, and incremental improvement is promoted through the learning of these members and sharing the depths of their knowledge.

Community practice project members come from various specialist groups. Lindkvist (2005, p. 1190) considers the organizational behavior of projects as follows:

Typically, such temporary organizations or groups within firms consist of people, most of whom have not met before, and who have to engage in

swift socialization and carry out a pre-specific task within set limits with respect to time and costs. Moreover, they comprise a mix of individuals with highly specialized competences, making it difficult to establish shared understandings or a common knowledge base. Such a transient group, I suggest, operates more like a "collectivity of practice".

Projects are highly autonomous within goals set, in terms of time, money and outcome qualities. In particular, projects have strict time limit targets, and project members have no time to take on the new behaviour of the community of practice, share new meaning and context, and accumulate sufficient communal knowledge. It follows that the project tasks depend greatly on the knowledge and competence of the project members. In the project, members do not rely on decentered knowledge (as in the community of practice), but must be able to operate on knowledge that is radically dispersed, distributed or individualized, being impossible to gather or comprehend for any single, overseeing mind. For the project leader, moreover, individually held domain-specific knowledge and coordination targeted at competences, integration (well-connectedness) has become especially important. So when projects are completed, the membership breaks up and the expertise gained as the fruit of the project is accumulated individually by the project members (effective as individual learning). It is difficult, however, to effectively engender transfer and sharing to other projects and other existing organizations.

With "collectivity of practice," moreover, since actors have different job functions and specialist fields, the actors each have different thought worlds (Dougherty, 1992) and large knowledge boundaries (Brown and Duguid, 2001). Moreover, the novelty and uncertainty elements from new project work become greater. Accordingly, new knowledge differences and business dependencies arise among actors. As a result, conflict and abrasion frequently occur within a project.

The community of practice and collectivity of practice can be positioned figuratively on a knowledge-based axis as in Figure 1.1, showing the extent of knowledge boundaries among actors, abrasion and conflict among actors, and the "thought world" possessed by the actors. In the community of practice, the actors from the same disciplines with the same specialist knowledge (knowledge boundaries among actors are small) possess similar "thought worlds," and embed new knowledge as a group or organization through the practices of far-reaching dialogue and collaboration (little conflict and abrasion among actors) on the foundations of context and meaning.

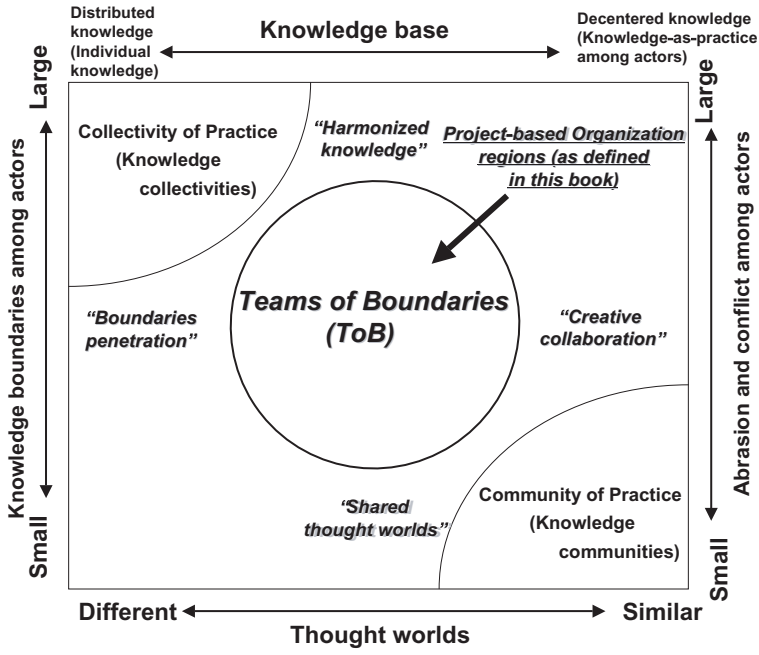

Figure 1.1: Project-based organization framework.

With collectivity of practice, on the other hand, actors with different specializations (large knowledge boundaries among actors resulting in serious abrasion and conflict among actors) possess different thought worlds, and undertake collaboration and coordination on the basis of minimal communal and common knowledge.

So, with the collectivity of practice, the integration of individuals' specialist capacities creates the fruits of the new goal of explicit knowledge. The features of the community of practice and collectivity of practice can be an extreme way of thinking. Organizational classifications can be simplified by saying that a divisional, departmental, or product line group operating in the same work function and specialist area within a company is a "community of practice," while a group working on a temporary project is a "collectivity of practice". In reality, however, can all corporate projects be described as collectivities of practice? From my experience as a project manager and project leader, I believe that actual organizations, including project-based organizations that implement diverse strategies, are still more complex than that. Now, I will itemize and consider these points.

1.4. "Project-based Organizations" as "Teams of Boundaries"

I can clearly recognize, from my experience both as a project manager and project leader, and from informal dialogues with a large number of corporate practitioners, the existence of the collectivity of practice aspect as project behavior. However, I believe that the character of the projects differs considerably according to the culture of the country or company concerned. The behavior of the project members also differs according to the content of the goals of individual projects including the complexity of the business model, ease of new model development, and specific requests from clients.

One point about these different national and corporate elements relates to training methods for project managers and leaders. In US and European companies, career paths are defined more by segmentation of job function and specialization than they are in Japanese companies. US and European companies, for example, clearly define job categories of specialist management personnel, such as project managers, and the engineers and scientists who specialize in science, engineering, and product development.

This US and European personnel training system, known as the "dual ladder system," is backed up by a large body of research (see Bailyn, 1991; Maccoby, 1999; McKinnon, 1987; Allen and Kats, 1986; and Kochanski, 2003). Until now, there have been numerous reports of this system functioning well, especially in the US and Europe (see Gunz, 1980; Omta and van Engelen, 1998). The US 3M Company, for example, famous for its innovative products, provides a dual ladder system to promote innovators.

Project managers confirm the project's progress management and milestones, and take charge as coordination specialists aimed at individual task management and issue resolution. Accordingly, they rarely understand the project's technological details, commit themselves to the field, or discuss progress. The project management mechanisms of Japanese companies, however, differ on these points. In these companies, almost all project leaders and managers go beyond the role of project management to involve themselves in technological details.

A diversity of specializations is required, especially, among the project leaders and managers of the appliance manufacturers, IT manufacturers, and communications companies that feature as case studies in this book. Japanese companies offer a varied career path where new employees

joining the company after graduating from university or postgraduate studies are given experience in a range of job functions and specialist duties. Among appliance manufacturers, graduates and postgraduates from technological universities can follow a path to cultivate engineering skills, which might start, for example, with research into component technologies, move on to system technologies and design, and then proceed to micro- and macro-technology. Among these, there are frequent cases of personnel changes between the factory, product planning, marketing and sales divisions. The project leaders and managers get experience of multiple job roles and specialist fields at the least, and with each promotion, they take on work and gain junior management ability, while refining their ability to make adjustments between relevant divisions, including external partners (this situation was based on discussions with a large number of practitioners and with colleagues working at appliance manufacturers that I first came to know during my postgraduate days). I have had the experience of working at a communications company and followed a career path similar to that of an appliance manufacturer, with experience in a large number of job roles and specialist fields.[2]

I believe that, in this way, project leaders and managers in Japanese companies cultivate more flexibility to grasp matters from the viewpoints of different job functions and specialist areas. For example, project leaders

[2] Among Japan's leading communications companies that I have served, technology employees are assigned, either to the business or the research divisions, after they join the company. Engineers assigned to the business division are rotated to various job functions within the division every two or three years.

An example of a career path following graduation might be to join the technology division with responsibility for the development of communications machinery and services; proceed to the plant as chief clerk or section head of the equipment division; become development manager of the technology division; become general manager of the sales, equipment, or other division at the plant; become general manager of the technology division; become director of the plant; and finally, become director of marketing and sales. Different individuals follow different career paths, such as becoming R&D manager after transferring from the business division. Engineering staff assigned to the research department, meanwhile, might set out by mostly pursuing individual R&D projects and taking over R&D manager duties following the promotion.

Then there is the specialist career path of the scientist or engineer. There are many cases of lively interactions between the research and business divisions where researchers transfer to the technology arm of the business division, or to the marketing and sales division. After gaining experience of the business division, the engineer returns to the laboratory he or she was originally attached to. This is consistent personnel training oriented to research and development directly connected to business, and thereby avoids the "death valley".

and managers from a technology background can propose new technologies from a marketing perspective, while those from a sales and marketing background have a strong desire to learn in general about the technologies and prioritize cooperation to discover connections between the market and technologies. Accordingly, project leaders and managers possess a "thought world redundancy" regarding individual job duties and specializations on the basis of cross-over career paths, which I term as "shared thought worlds" in this book.

Project leaders and managers in Japanese companies, moreover, need wide-ranging specialist technical knowledge, together with management skills, for the resources of people, goods, and money. For project management, especially, project leaders and managers must coordinate and collaborate with existing organizations, and rely on different corporate cultures, while implementing inter-project collaboration. Essentially, projects at Japanese companies are structured formally and informally with participants in "communities of practice" as organizations with multiple existing job functions. The participants share knowledge and expertise with the existing organizations, and mutual knowledge transfer becomes very important. In many cases, the project members might be old friends, or would have worked together in the past as colleagues, superiors and subordinates. In project organizations among Japanese companies, there are relatively few project structures where most members appear for the first time (Lindkvist, 2005, p. 1, 190). In many cases, project members execute project tasks within a framework of a pre-existing shared understanding, mutual knowledge (Cramton, 2001), and common knowledge (Carlile, 2002).

Thus, I feel that knowledge acquired on a project platform in a Japanese company is not simply the domain-specific knowledge of individuals or individual competences reliant on individual skills and expertise, but is also a complete fusion of localized, embedded and invested (Lave, 1988; Wenger, 1998) "knowledge ability" and "competences in practice" as practice within the organization until now. In other words, it is also a fusion of "distributed knowledge," relating to decentered knowledge and connectivity of practice, as a community of practice. In this book, I will call this a project's "harmonized knowledge".

Next, I will discuss the behavior of project members. The greater the subject of the project becomes, the greater the novelty and uncertainty of the project's content, and greater the various issues and problems with the process of execution. Conflict and abrasion among project members

naturally arise, and in many of the cases where time is limited, project members come up with compromises and trade-offs. This is not the only way that a project should be selected. As seen from this book's case study, behavior is observed where project members aim not to compromise, but to reconcile and synthesize seemingly contradictory elements through a thoroughgoing discussion. The practical, yet creative, conflict or abrasion (Leonard-Barton, 1995) and the productive friction (Hagel III and Brown, 2005) among different types of members can also be a resource for the creation of new knowledge. Some senior managers describe projects as "battles".

In Japanese companies, there are many cases of support from other projects and organizations along the lines of having a "lively meeting" and "let's lend a hand". The organizational behavior of this kind of project fuses the rivalry of knowledge relating to this "connectivity of practice" with the harmony of knowledge relating to the "community of practice". I call the simultaneous pursuit of these elements a project's "creative collaboration".

Next, I would like to mention features of the knowledge boundaries necessary for innovation-oriented project management. It goes without saying that knowledge is the source of a company's competitive edge (Kogut and Zander, 1992; Nonaka and Takeuchi, 1995; Leonard-Barton, 1995). I believe that human knowledge is the starting point of strategy formulation and implementation. The tacit knowledge of skills, expertise, and core competence is embedded in individuals (Brown and Duguid, 1991). For the knowledge integration so necessary to project management, in particular, the knowledge held by diverse individuals inside and outside a company transcends organizational boundaries, and needs to be gathered and integrated.

The creation of new knowledge (innovation) has a strong tendency to arise from the boundaries between disciplines and specializations (Leonard-Barton, 1995). Companies are split into various work function organizations and specializations, and numerous boundaries exist, some visible and others invisible, including geographic boundaries as globalisation, industry boundaries as strategy, organizational boundaries as theory of the firm, and human cognition as bounded rationality. As mentioned previously, however, abrasion and conflicts arise in the project, hindering knowledge integration among actors (Leonard-Barton, 1995). Knowledge boundaries, that arise not just from the sectionalism of

organizational boundaries between company actors, but also from each actor's values, background and specialization, also exist (Brown and Duguid, 2001). The reason is that actors with different backgrounds and experience are dominated by fixed mental models (see Markides, 1999; Spender, 1990; Grinyer and McKiernan, 1994) and path dependencies (Rosenberg, 1982; Hargadon and Sutton, 1997), and actors may feel uncomfortable and resist when faced with expressions of this new and differentiated knowledge from organizational boundaries (Carlile, 2002). History tells us that companies and organizations dominated by fixed mental models cannot avoid competency traps (Levitt and March, 1988; Martines and Kambil, 1999) and core rigidities (Leonard-Barton, 1992, 1995), while path-dependent knowledge may result in loss of innovation opportunities (Christensen, 1997).

It follows that in industries subject to changing markets and stiff competition, many companies aiming to create new knowledge and innovation must cross multiple internal and external boundaries (including those with clients), and actors must integrate diverse knowledge and implement strategies. As mentioned, the case studies of this book, companies like Sharp, Canon and Matsushita Electric are responding to rapid technological and market changes in the mobile phone and digital appliance businesses by implementing a range of close collaborations. These collaborations are aimed at technology integration by transcending technology division boundaries, while implementing market-beating strategies through successive new products, which embed marketing, sales, technology and manufacturing divisions simultaneously.

Project members are also sharpening views and thinking from different specializations, and are constantly transcending divisions to share technology and project development roadmaps. Moreover, with innovations that bring about not just technological change, but also new business models, projects must be structured as project networks with various partners (including customers), which transcend the boundaries of organizations, industries and one's own company. The project network formations of NTT DoCoMo mobile telecommunications and Sony games businesses featured as case-studies in this book are good examples of such structures. I will call the organizational behavior of projects that create new knowledge-crossing boundaries as "boundaries penetration".

The project-based organization with the four elements of shared thought worlds, harmonized knowledge, creative collaboration and

boundaries penetration will be termed "Teams of Boundaries (ToB)" in this book. Figure 1.1 compares ToB, community of practice, and collectivity of practice. ToB is positioned as an intermediary between communities of practice and collectivity of practice. I interpret it as the formation of projects having the characteristics of both types.

In this book, from observations of case studies and other fields, ToBs are formed in space and time around the focus of different organizational and knowledge boundaries. Four types of such pattern formations can generally be considered (see Figure 1.2). The first is where the project-based organizations have ToB features (pattern 1). The second is where ToB network development exists in the process background of each job-function organization when members of established job-function organizations form informal project networks in-house (pattern 2). The third is where ToBs are formed among projects, and among project and existing organizations, from the angles of the implementation process for new strategic policies inter-project learning (Prencipe and Tell, 2001), (pattern 3). The fourth is where ToB networks crossing industry boundaries form project networks (pattern 4). I will describe these individual patterns through case studies from Chapter 2 onwards.

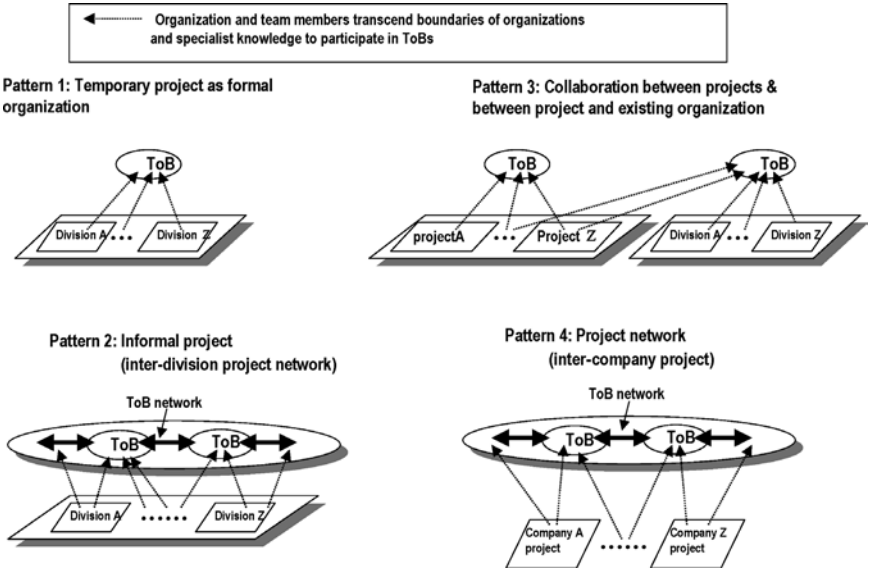

Figure 1.2: Teams of Boundaries (ToB) patterns.

1.5. Teams of Boundaries and Strategic Communities: The Empirical Background

I have presented the notion of "strategic communities" (SCs) through previously-conducted fieldwork. In this chapter, I would like to focus on the relationship between SCs, ToBs, collectivity of practice, and community of practice. To state the conclusion, SCs possess aspects of the two notions of ToBs and collectivity of practice. I want to consider ToBs and collectivity of practice as they relate to two case studies (Kodama, 2002, 2005) previously published in *Long Range Planning* journal.

The first concerned a new product development case of a communications system incorporating world-class technology (Kodama, 2005). It involved the process in which Fujitsu, one of Japan's leading communications equipment manufacturers, rapidly developed a new, improvised system in collaboration with telecommunications carriers. Corporate actors centered on Japan and the US, with globally-advanced technology in relevant fields, shared the time and space parameters of SCs; integrated knowledge in different technological areas including communications, computers, image and voice processing, and software; and had content that achieved a new architectural innovation (Henderson and Clark, 1990).

In this case, under time constraints oriented to communications carrier clients and to goals, the issue was how to integrate competencies held by individual company actors. Actors were already grouped according to specializations in their relevant fields, and promoted collaboration with a minimum of common knowledge through improvised mutual learning. The development process involved multiple SCs formed in chronological order (aggregate of participants from each company's engineers). Task execution within the SCs relied strongly on the knowledge of individual actors' skills and expertise. The development process involved looking at several technology issues and searching for the optimum solution aimed at technology integration through trial and error. These SCs were closer in character to collectivity of practice than to ToBs.

The second case involved the business development of one of the world's most advanced mobile internet services (i-mode) by NTT DoCoMo, a leading Japanese mobile communications carriers (Kodama, 2002). Compared to the new product development cases mentioned previously, this case had few problems with regard to limited time for learning and improvised decision making. The i-mode development project within this large company involved forming SCs from established organizations

and external partners, and aimed to share value, while building a business model and learning from a technological angle (Kodama, 2001). The project members transformed the internal and external conflicts and abrasion into productive and creative outcomes. In other words, creative collaboration functioned very well in the SC. Then the new project team, composed of heterogeneous members gathered from within and outside the company, formed a "project network" through "boundaries penetration" across industries and businesses. "Harmonized knowledge" advanced with the i-mode development project. In other words , project knowledge depended strongly on the knowledge and competencies of individual team members. At the same time, the project team possessed elements of "knowledge in practice" comprising learning among members with the same specializations in the project and established organizations. NTT DoCoMo is a company that has grown from an in-house venture (see Chapter 2 for details). The sharing of information and knowledge from different work functions and specializations was always permeating from large companies, and was established around a core of original members of the "shared thought world" transcending these work functions and specializations. The character of the i-mode development project embedded within and outside the company approached that of a ToB, not "collectivity as practice".

As can be seen, a project's character is multi-faceted, and cannot be explained as a single pattern. We can think of models other than those displayed in Figure 1.1, such as the following cases from actual projects. It has been shown that when the project tasks for specific clients are completed and the project is dissolved, organizational learning through these processes within the project, among projects, and between the project and established organizations, becomes problematic (see DeFillippi, 2001; Keegan and Turner, 2001; Grabher, 2002; Newell *et al.*, 2003; Prencipe and Tell, 2001; Middleton, 1967).

This does not mean, however, that once the fruits of the project are introduced to the client, the client and project-side companies are happy to wrap it up. IT and other large-scale systems, for example, involve a great amount of responsibility regarding subsequent maintenance and upgrades, and realistically, some of the project members who participate from the start must continue to be involved in this business, since they know the project details and possess the required technical skills and expertise. The project stages move from initial exploratory activity to exploitative activity. Business priorities will determine whether the project

continues as it is, or whether its duties are transferred to existing organizations. The handling of the project also depends on the shape of a company's organizational activity and its personnel resources at that time.

Moreover, as mentioned above, the characters of the projects vary as a result of matters such as the complexity of the business model targeted by the project, the ease of new product development, and specific client requests.

Of late, new product development has become path-dependent as a result of past technologies. Even if there is a strong tendency to develop new technology elements, it is because of the members who possess the required technological details and skills.

As the scale of system development grows larger, the system is developed in layers such as customer demand specification analysis, whole system settings (architecture), detailed settings (subsystems, components, hardware and software), and branching out to specialist technical fields. Moreover, the radical and architectural innovations (Henderson and Clark, 1990) are accompanied by several business themes. With the development of this kind of large-scale systems, I do not believe that project structuring among technology members who have met for the first time is a realistic policy. If it becomes possible to build large-scale systems combined with module devices with clear technical interfaces, new specialist teams may be able to undertake rapid development. Generally, product competitiveness hides the contents of individual module devices, module and subsystem connections, fixed software, and the entire system architecture, as in a black box. Engineers who have accumulated expertise as a black box are existing organization members who have studied past path-dependent technology.

With existing research accompanying the dramatic reform of architecture and components, the emphasis should be on new organizations including members possessing new skills, rather than on established-member organizations for new product development (see O'Reilly III and Tushman, 2004; Tushman and O'Reilly, 1997; Utterback, 1994; Tushman and Anderson, 1986).

I believe, however, that these depend on conditions considered from technology viewpoints, such as new product groups in individual industries, scale of development, scale of the development organization, corporate culture, and country. I also believe that architectural innovation is key to achieving technology integration. As you will see in the Sharp (Chapter 3) and Sony (Chapter 5) cases, the way in which in-house members with

different specialist technologies were assembled for a project first of all is important. The creation of new organizations with new members is not a priority. Moreover, cases of radical innovation that greatly transform architecture and components must lead to new concepts from the viewpoint of a range of technologies. In this kind of case (see Mitsubishi Electric in Chapter 4 and Sony in Chapter 5), it is pertinent to activate existing personnel resources, while further introducing external knowledge and competencies as necessary (Leonard-Barton, 1992, 1995). Activating existing personnel resources means accumulating scientific and technological knowledge through daily learning, and emphasizing the experience and expertise of the engineers. This kind of path-dependent accumulation of technology makes it possible to clear the high hurdles of creative radical innovation (in other words, the specializations of science and engineering are fundamentally important).

My philosophy, developed against a background of the conventions of Japanese companies, turns to existing resources and existing organizations. Compared with companies in the US and Europe, the fluidity of the external labor market is low, and an employee's career path as a graduate or postgraduate can offer an experience of diverse responsibilities and specialist technologies.

Moreover, the Japanese company features of lifetime employment and a "crossover" career path, in addition to implicit and internalized control mechanisms for the group and organization, are established among employees by means of a company's common tacit knowledge, norms, values and culture. At the same time, organizational structures based on informal and control mechanisms have come to be structured in-house (see Ouchi, 1980: Nonaka and Takeuchi, 1995). It follows that the project-based organizations of Japanese companies have a strong tendency to be formed from an extension of existing organizations, regardless of formality. As mentioned above, the features of the "community of practice" for existing organizations are more likely to be embedded in a project than they are in the US and Europe. In other words, since common employee behavioural norms and personnel training systems are firmly established in Japanese companies, the thinking around the formation of projects aimed at new product and business developments is, first of all, to prioritize reliance on the resources of existing in-house personnel and organizations. These people have the advantage of being able to quickly establish a project and implement a task.

Various case studies exist on the form and execution process of the project-based organization, including the state of US and European companies' project management. Further research may be necessary in the future. In this book, I would like to analyze distinctive ToB frameworks as project management, which are centered on case studies of Japanese companies.

1.6. Structure of this Book

In Chapter 2, I will take up cases of marketing innovation through the formation of project networks among Japan's fast-developing mobile phone businesses. The introduction of special-duty project organizations that are separate from existing bureaucratic-function organizations, and the formation of exploratory networks that cross industry boundaries, centered on projects within and outside the company, are seen as dynamic processes that have led to the radical innovations of future business strategies.

Moreover, in order to disseminate, reform, improve and establish new business by forming project networks, we consider the exploitative practice as a sustainable routine activity through networks of bureaucratic-function organizations. In other words, this is the incremental innovation aspect of the expansion of existing business and the execution of growth-oriented strategies through exploitative networks. I will also discuss the dynamics whereby the practices arising from the formation of dual exploratory and exploitative networks created dialectically recursive interplays (Giddens, 1984; Barley, 1986; Barley and Tolbert, 1997) between the environment and market (structure) on the one hand, and the organization and individual (practice) on the other, which greatly enlarged the mobile phone business market.

In Chapter 3, I will consider the innovation processes involved in the Japanese development of camera-loaded mobile phones, a world's first, by Vodafone and Sharp, in the context of technology integration crossing organizational and technological boundaries. Further, high-tech companies demanding new business model structures through the fusion of diverse technologies and services must synthesize boundaries existing inside and outside the company from multiple viewpoints, and continually aim to create new knowledge. I will also suggest that the integration

of many of the boundaries inside and outside an organization, in other words, the networked ToBs, can promote knowledge integration and transformation, and create the capability for competitive advantage, while at the same time securing a dominant position in the marketplace.

In Chapter 4, I indicate the basic framework for creating new knowledge from the integration of various organizational and knowledge boundaries crossing different organizations inside and outside the company. Through an in-depth analysis of Mitsubishi Electric, I will consider the dynamism of integrating diverse knowledge from the simultaneous absorption of external knowledge through the horizontal integration of ToBs from strategic alliances among companies, and knowledge integration through the creation of vertical integration networks of ToBs within a company.

In Chapter 5, I will analyze and discuss frameworks for successful project management as corporate ventures among large companies from a viewpoint of knowledge integration and technological innovation. I will take up the game business centering on Sony PlayStation as a case study. Then I will suggest new insights from a new business model relating to large companies' corporate ventures and an in-depth case study regarding an enabler promoting technological innovation.

In Chapter 6, I will consider project strategies in industries in rapidly-changing markets and competitive conditions. High-tech companies that take on the IT field and digital product mass market must simultaneously implement technological reform in response to changes in customer needs and change the market structure in response to technological reform. In this chapter, I will discuss business strategies for digital appliance products as the expansion continues worldwide. Case I will look at Matsushita Electric and Canon's digital appliance strategies, and offer a new viewpoint of common development processes for each company's new products. Each company's vertically-established strategy maintains its dominant position in the global market through the execution of a time-pacing strategy. In this chapter, I would like to indicate the concept of boundaries synchronization for project networks enabling the execution of this time-pacing strategy.

In Chapter 7, I will consider conflict and abrasion between projects and existing organizations, and synergies among projects. I will examine NTT, Japan's largest telecommunications company, as a case study and look at examples from new product and business developments. First, I will consider the process by which new project-based organizations overcome the conflicts and abrasion relating to large companies' various business

customs, and execute new product development. Second, I will look at the integrated management of existing projects aimed at new business development.

In Chapter 8, I will discuss new insights acquired through case studies. One point is the relationship between the project-based organization, the strategy-making process, and implementation. I will consider how project-based organizations are built and mobilized as corporate strategy from the viewpoint of leadership, network strategy, and strategy as action. A second point is the relationship between boundaries and knowledge integration (technology integration and new business model formation). Innovation as an aspect of corporate competitiveness arises from boundaries and the integration of boundaries. I consider the formation of these ToBs (boundaries innovation resources) and ToB networks from the viewpoint of the knowledge integration process. A third point is the relationship between the project and organizational learning. I will consider the state of project management promoting company-wide organizational learning and innovation.

In Chapter 9, amid managerial implications and conclusions, I would like to offer new, practical viewpoints aimed at the structure of the project-based organization.