Theory Development for Organizational Platform of "User Collaboration Innovation Community "*

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Abstract: Recently some scholars began to notice the importance of users' participation in innovation and the development model trend of user communities' participation in the product development of organizations. In the current business environment, manufacturers can no longer independently produce and manage knowledge. They need to co-operate with their customers to create knowledge. For example, many business firms such as Sun Microsystems, Netscape Communications, IBM etc. are experimenting with ways to benefit from innovations that occur in the open-source community like Linux. Therefore, this study proposes the concept of the "User Collaboration Innovation Community", tries to understand this new phenomenon by conducting projects where the opening of source software is the subject of this analysis, borrows the observation variables and propositions adopted by Mintzberg on structures of the innovative organization, and summarizes the opinions of scholars of organizational economics, the relationship between property rights and organization performance. This study further infers a series of conceptual framework and propositions on the relationships among "organization structure, property right, and organization innovation" for "the organizational platform of the user collaboration innovation community". We expect that the construction of this concept framework will function as a concrete description and presentation of the innovation model of the "User Collaboration Innovation Community" and will serve as a clear path to be followed for continuous research in the future.

Keywords: User Community; Collaboration; Organization Innovation; Property right; Innovation Management, Product development

Introduction

Current literatures on organization innovation do not investigate the innovation model which is composed of either "network and alliance between individuals" or "between organizations and user communities". How are the structure design and the

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property rights system of the innovation model operated? What critical factors determine the success of organization innovation? Can the current organization models and theories explain or describe the organization platform of the "user collaboration innovation community"? The meaning of these questions, either theoretically or practically, is waiting to be clarified. Therefore, this research will pinpoint the deficiencies of these literatures and try to answer these questions.

This study first conducts a brief review of some important scholar's research frameworks and observation variables for innovative organizations. After a comparison, this study decides to adopt Mintzberg's observation dimensions and propositions on the innovative organization as a basis for studying the formats of the organization platform of the user collaboration innovation community. A series of propositions on organization structure, regarding organization platforms of user collaboration innovation communities, is developed based on Mintzberg's propositions (proposition 1 to proposition 3) to facilitate the development of a series of hypothesis for verifying the operation of the organization platforms. Thereafter, this study summarizes the opinions of scholars on organizational economics and on the relationship of property rights and organization performance. Then it further infers a proposition (proposition 4) on the property rights system and organization innovation related to "the organizational platform of the user collaboration innovation community". Lastly, a proposition on the interrelationship between organization structure and the property rights system is also developed (proposition 5).

This structure of this article is as follows: The first part is an introduction; the second part is a literature review and analysis. In the third part, this study proposes the conceptual framework of the relationships of "organization structure, the property rights system, and organization innovation" for "user collaboration innovation communities". The fourth part is a series of propositions inferred by this study, and the fifth part is the conclusion and recommendation.

Literature review and analysis

Theories of organization innovation

In regard to the meaning of "organization innovation", there are different definitions based on each scholar's research topics and research subjects. Some scholars defined organization innovation from the point of view of the product (Crawford, 1980; Dougherty, 1995). Some scholars adopted process concepts to

define organization innovation (Amabile, 1988; Johannessen & Dolva, 1994; Kanter, 1988; Scott & Bruce, 1994). In recent years, some scholars have adopted the concept of multiple dimensions to define organization innovation (Damanpour, 1991).

Kimberly & Evanisko (1981) felt that the research approaches to organization innovation could be classified into adoption and diffusion, that is, the two different groups of organization innovativeness and organization innovating. Wolfe (1994) proposed that there were three different research approaches to organization innovation. They are diffusion of innovation, organizational innovativeness, and process theory. Each approach has its own concerned research topic, model, and methods of data collection. Each approach has a level of contribution but also has its major limitations.

In addition, Jen-Fang Lee (1997) proposed "solid innovation" and "network innovation" based on different research fields. Solid innovation emphasizes long-term, cumulative, durable innovation within one organization. In other words, it is organization innovation at the firm level. The concept of the innovative organization platform related to solid innovation includes self-organization form (Baruch et al., 1997), heavyweight development team (Clark & Wheelwright, 1993), spider web organization (Quinn et al., 1996), hypertext organization (Nonaka & Konno, 1993), fractal organization, practice community (Brown & Duguid, 1991; Wenger & Snyder, 2000), strategic community (Stork & Hill, 2000), and global research network (Gassmann & Zedtwits, 1998; Kuemmerle, 1997), etc. On the other hand, network innovation focuses on flexibility and combination. Knowledge accumulates in each actor. The innovation is achieved through the combination of different actors. In other words, it is organization innovation at the industry level. The concept of the innovative organization platform related to network innovation includes virtual organization, network organization, borderless Organization, etc. (Chubin & Hackett, 1990; Davidov & Malone, 1992; Castells, 1996; Hedbear et al., 1997)

The review of related literatures on organization innovation indicates that most literatures focus on innovation behaviors and determination factors for innovation adopted "inside an organization". That is the solid innovation proposed by Jen-Fang Lee (1997). In addition, many literatures also discuss innovation models of network relationships formed by organizations and similar organizations in the external environment, which is the network innovation proposed by Jen-Fang Lee (1997).

The user collaboration innovation community, the focus of this study, makes use

of networks to connect users in various locations. Through knowledge sharing and constructive advice, fragments of knowledge are transmitted between users, so that products can be tested and designed simultaneously. Users of the community assume the role of developers, participate in the entire process of new product development within the organization, and are directly involved in engineering technology and special techniques required for product development. There are innovation behaviors between communities. The exchange between communities involves not only technical issues encountered during the innovation process, but also technical knowledge at the level of intellectual property rights. The most well-know community of this type is the operation model of the Linux community. In addition, the OpenOffice project of Sun Microsystem is also an example of this type of community (Chan, Tzu-Ying & Lee, Jen-Feng, 2004).

In regard to research fields, literatures on organization innovation did not investigate the innovation model composed of either "network and alliance between individuals" or "between organization and user community". What in fact are the differences between these innovation models and the traditional innovation models? How are their organizations designed and the property rights system operated? What critical factors determine the success of organization innovation? The meaning of these questions, either in the theoretical or practical aspect, is waiting to be clarified. Therefore, this research will pinpoint the deficiencies of these literatures and try to answer these questions.

Factors affecting the organization innovation

Organization innovation is critical for enhancing organization competitiveness and the overall management performance of the organization. Most people are concerned about what the driving force is for organization innovation. Therefore, many literatures continue to propose antecedent factors related to promoting or suppressing organization innovation. Wolf (1994) indicated that individual variables, organization variables, and environment consequence variables all contribute to organization innovation. Of these three variables, the organization variable carries the most weight in explaining the organization innovation. In the organization variable, scholars often adopt "organizational structure" to study organization innovation. In his paper titled "Organization Innovation: Review, Critique, and Suggested Research Direction", Wolf (1994) stated "…The main stream of the research tends to investigate the predictability of organizational structure, even though many scholars have studied the predictability of the individual, the organizational, and the

environmental variables on organizational innovation. This is probably because structure variability is the major determining factor for predicting organizational innovation (Damanpour, 1998, 1991; Kim, 1980; Kimberly & Evanisko, 1981)…".

Researchers normally propose different dimensions of organization structure based on different research subjects. Formalization, specialization, and centralization are dimensions of organization structure widely accepted by most researchers. Formalization is related to the implementation of rules and the level of job specification within the organization. Specialization is related to the types of job titles within the organization. It is the number of different job titles or the number of activities performed by different functions in an organization. Centralization is related to the allocation manner of responsibility within an organization. It discusses the distribution of the condition of decision-making power in an organization. A centralized organization is an organization in which the decision-making authority is in the hands of a few people only. On the other hand, if the decision-making authority is assigned to and shared by many people in an organization, the organization will be considered a decentralized organization.

Mintzberg (1979) thought that the essence of organizational design is the manipulation of a series of parameters that determine the division of labor and the achievement of coordination. He proposed nine major parameters for structural design including specialization, behavior formalization, training, indoctrination, unit grouping, unit size, planning and control systems, liaison devices, and decentralization.

This study integrates the nine parameters of organization design proposed by Mintzberg with the three dimensions adopted by many scholars on organization structure and tries to summarize and classify as below:

Table 1 Mapping of the nine parameters of organization design proposed by Mintzberg and the three corresponding dimensions of organization structure

Dimension	**Parameters**	**Definition**
Formalization	Behavior formalization	Level of standardization for behavior or work rules.
	Training	Standardize employees' required skills and knowledge through formal training courses.
	Indoctrination	The process to educate employees, either formally or informally, the social value system, norms, and behavior model of the organization they participate in.

Specialization	Specialization	Number of assignments under a certain job and the control the employees have over these assignments.
	Unit grouping	Based on certain criteria, classify various duties to be under each unit then classify these units to be under units at an even higher level.
	Unit size	Number of duties in a unit.
Centralization	Liaison devices	Promote mutual adjustment mechanisms within or between each unit.
	Planning and control system	Clearly define the generated norms before the operation, then verify whether the goals have been reached afterwards.
	Decentralization	Sharing of decision-making power.

Structure of the innovative organization proposed by Mintzberg

Many scholars have proposed capabilities of organization innovation such as the degree of organization formalization, the degree of organization specialization, the degree of organization centralization, the entrepreneurship, the sources of innovation information, the incentive factors for stimulating innovation, the recognition of the failure of the first organization innovation, and the support of the promise for organization change made by the high level management. All of these are important variables that may affect organization innovation.

From the literature review, we can tell that there are significant differences in the research contents or research directions regarding organization innovation. In addition, the research models and the research methods are different based on different research approaches and different analysis units. Therefore, it is not easy to come up with a consensus on organization innovation. In addition, Meyer & Goes (1988) indicated that most studies on exploring the predicting factors for organization innovation focus more on the individual predictability of different variables, but less on the joint predictability of various variables. As a result, these studies could not provide an overall picture of organization innovation and inhibit the accumulation of research results on organization innovation. Configuration approaches, on the other hand, provided a solution for resolving the problems mentioned above and offered an alternative method for organization analysis. For those scholars who adopted configuration approaches, an organization is a combination of various factors that occurred simultaneously. Thus, parameters for organization design could not be selected independently. Describing an organization through classification may help people understand the world and its orders, and also may help predict the relationships between some organization variables (Meyer et al., 1993; Mintzberg, 1979). Therefore, this study adopts the theory of organization structure proposed by

Mintzberg (1979), based on configuration approaches, especially his integrated analysis on innovative organization structure, as the main analytical framework of this study.

Property rights system

According to related literatures, the theory of property rights (Milgrom & Roberts, 1992) focuses on studying the impact of the definition and the distribution of property rights on people's interactive behavior and organization performance. The important issues for the study of the relationship between the property rights theory and an organization are how to establish a clear property rights framework through a precise contract, a perfect organization, or a system design, so as to clarify the rights and responsibilities of members in an organization, meanwhile reducing the transaction costs between them. Agency theory studies (Alchian & Demsetz, 1972) mainly agency problems (such as moral hazzard and adverse selection) and contract design for risk sharing. It puts more emphasis on problems such as shirking. The theory believes that the reason for an agency organization to exist is because they can resolve the issues better than the market framework. The supervision and management of a hierarchical organization limit the factors that may induce individuals to shirking. Consequently, the productivity of an individual automatically connects with other people's productivity. Therefore, the important issues for studying an organization based on the agency theory are how to supervise and coordinate the behavior of members in an organization through a contract that is carefully designed and established, and how to raise the willingness to work and the sense of recognition of the members of an organization and further enhance the performance of an organization. Transaction cost theory (Williamson, 1975, 1985) discusses the selection of different transaction mechanisms. The basic principal for the selection is to reduce the transaction costs as much as possible. Summarizing the property rights theory, the agency theory, and the transaction cost theory, we know that for an organization, providing decision makers with financial feedback for the results of their decisions, an appropriate combination of "residual control (management rights)" and "residual claims (property rights)", will provide the decision makers strong incentives to maintain the value of the asset (Milgrom & Roberts, 1992).

Jen-Fang Lee (1999) has structured the transaction cost analysis of the organization design. Transaction costs mainly include information costs and impact costs. Their corresponding considerations for organization design include the two large supports of coordination activities and encouragement activities. The

organization design that affects the coordination activities is called work design. The main purpose of organization design is to reduce the information costs included in the transaction costs. The organization design that may affect encouragement activities is called the property rights system or ownership model. Jen-Fang Lee (1999) indicated that the transaction costs would be extremely minimized, the efficiency principle of organization design, when the property rights system and work design reached optimal arrangement. Jen-Fang Lee (1999) further proposed the "three rights hypothesis". He felt that besides the coordination of work design and the property rights system, the consideration of knowledge structure should be added. Three rights should be coordinated with each other including the coordination between the knowledge right and the management right and the coordination between property rights and management rights.

Conceptual Framework

This study constructs a conceptual framework (see Figure 1) based on the research questions and objectives, with reference to the afore-mentioned research background and the initiation of the research motivation, through summarization and comparison of related documents. The logistics of the theoretical framework include the following key points: Consider simultaneously the impact of two antecedent variables, the organization structure and the property rights system, on the dependant variable, the organization innovation, and on the platform of the user collaboration innovation community. The relationship between the two antecedent variables, the organization structure and the property rights system, is also considered.

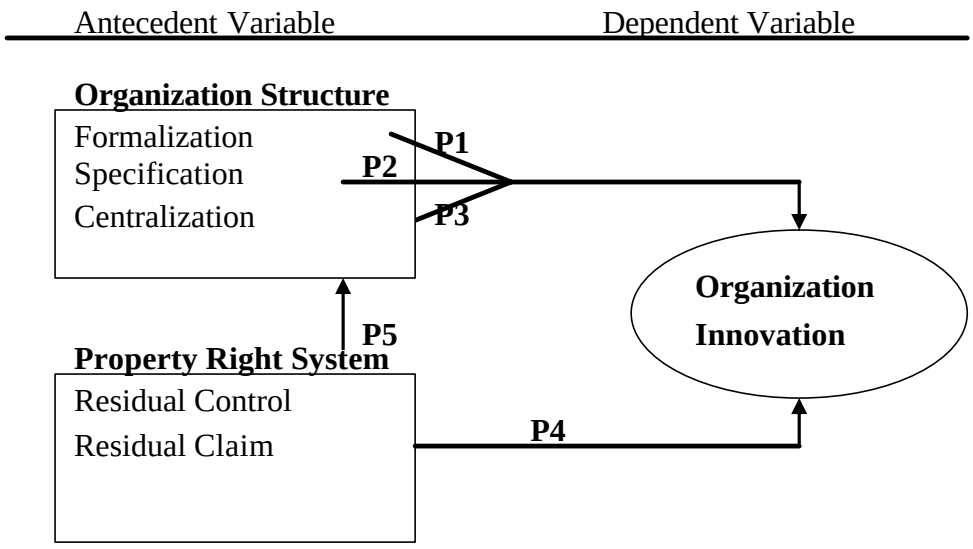

Figure 1. Conceptual Framework

Research Proposition and Induction

This study is trying to answer the question "Can current organization models or theories explain or describe the organizational platform of user collaboration innovation community?" Thus, this study tries to use Mintzberg's observation and induction on innovative organization as a base to further develop a series of propositions on organization structure related to "user collaboration innovation communities" (proposition 1 to 3). Even though Mintzberg used business as the analysis unit, this study uses the individual network as the analysis unit, and this study believes that there will be no difference in the operation model for the innovative organization caused by the difference of participants. The induction of the conceptual framework is listed below:

Dimension	Parameters	Adhocracy structure characteristics
Formalization	Behavior formalization	Little formalization
	Training	Much training
	Indoctrination	A few
Specialization	Specialization of jobs	Much horizontal specialization
	Unit grouping	Functional and market
	Unit size	Narrow throughout
Centralization	Liaison devices	Many liaison devices throughout
	Planning and control system	Limited action plan
	Decentralization	Selective decentralization

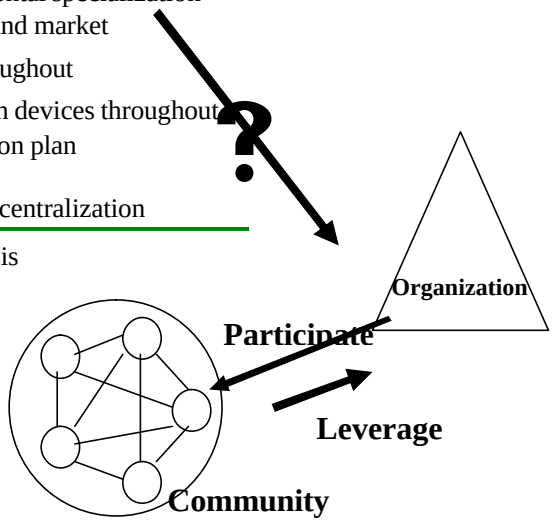

Figure 2. Framework of organization structure analysis for "user collaboration innovation community"

Below is a description of the proposition inferences related to this study which is based on the structure characteristics of the innovative organization proposed by Mintzberg.

Formalization

Mintzberg (1979) felt that innovative organization is a highly organic structure with very few formalized behaviors. Members of this organization all receive formal and strict training to perform assigned work.

Mintzberg felt that innovation means breaking the current model. Therefore, innovative organization cannot rely on any type of standardization for coordination which can only kill innovation. On the other hand, contents of the innovation work cannot be programmed due to the characteristics of complexity, specialization, and innovation. Therefore, it is critical for an innovative organization to provide the personnel who will accept the responsibility with intensive training before the work starts. This also means that these personnel are required to possess standardized knowledge and skills. The organization will select suitable, trained, specialized people to assume responsibility for each job.

Van de Ven et al. (1976) indicated that when the duties within an organization can be analyzed and have less variation, more activities can be standardized and programmed. This type of organization tends to adopt more coordination in a non-interpersonal manner (such as advance planning, scheduling, planning, policies and programmed procedures, etc.). On the other hand, when the situation of unclearly defined duties increases, the non-interpersonal coordination will become more difficult and the organization will tend to make adjustments by employing people or communities. Therefore, when the degree of the standardization level of an organization decreases, the organization tends to coordinate less in a non-interpersonal manner and coordinate more in a feedback manner. Mintzberg also had the same observations. He regarded the standardization of work procedures as one of the six coordination methods within an organization. There are different types of organizations, and each has its own coordination focus. For organizations with higher degrees of standardized and programmed procedures, standardization will become the main coordination manner, and the application of mutual adjustments or other coordination manners will be less. On the contrary, when the degree of standardization in an organization is low, the organization tends to employ the mutual adjustment manner. This is also one of the reasons why other scholars who conduct research on organization innovation reached consensus that work procedures in an innovative organization are loose. They felt that versatile work and less emphasis on work rules might facilitate promoting innovation. A low level of formalization allows openness and encourages new innovation and behavior. This is different from organizations of a mechanical type in which the roles and the responsibilities of each member are fixed. There is a centralized standard procedure, and the operation procedures are highly designed.

Although Mintzberg did not emphasize the role of indoctrination in innovative organization, other scholars who conduct research on organization innovation all

indicated that the basis of organization innovation is effective management of culture and that culture can compensate for the deficiency of formal control. Scholars who study the atmosphere of organization innovation, represented by Amabile (1988), believe that the difference of the culture of the working environment can have a strong impact on organization innovation. However, managed behavior can affect the formation of the work environment and significantly impact the innovation capability of an organization. Amabile pointed out three elements related to the innovative environment of the workers in an organization. They are: 1) The manner in which an organization encourages innovation, 2) Available resources in the area of the work, 3) Management skills for innovation. The higher the level of innovation encouragement in the work environment where members of an organization are situated, the more the available resources are utilized, and the better the innovative management skills are, then the higher the degree of innovation that will exist in that organization.

Proposition 1.	**The lower the degree of formalization, the better the innovative performance of the operation platform of the "user collaboration innovation community".**
Proposition 1-1	The user collaboration innovation community has the characteristics of a low degree of behavior formalization.
Proposition 1-2	The user collaboration innovation community has an informal t raining system.
Proposition 1-3	The informal social control system for the platform of the user collaboration innovation community is very active.

【Explanation of the inference of proposition 1】

Sackman (1966) pointed out that programs designed by experienced programmers are more concise. There are significant individual differences in software engineers. For example, the difference of the programmers in debugging capability can be as large as 18:1, programming capability is 15:1, program length is 6:1, and running time is 13:1. It is hard to find superb and experienced programmers. Technical documents for software are not as simple as those chemistry related articles published in professional journals. In addition to the algorithm, the techniques of computer programs are normally implied in the source codes. Textbooks or classes cannot provide a complete learning process. Based on this, this study concludes that programming is a complex and professional skill. Furthermore, the research subject of this study, the OSS project, focuses on software development. The scope of the OSS project covers all types of software ranging from the application software used by program developers to the software used by end users. The current situation is such

that only commercial, organized development teams with financial motivation can handle large scale and complicated plans. In addition, OSS projects have achieved such a depth of complexity that commercial software enterprises have been created that have the power to control the software market, a situation which constitutes a strict new challenge. For example, open source code software such as TCP/IP, Perl, Sendmail, and DNS constitute the four major foundations for the operation of the current network environment. Apache is a network server that has the largest market share. It is much higher than the IIS by Microsoft. In addition, the market growth rate of the Linux operation system is surprising. From these facts, we can boldly assume that the skills needed for the project platform are complicated, specialized, and need creative thinking.

Based on the afore-mentioned literatures, standard operation procedures cannot be applied to control workers' behavior for complicated, specialized, and innovative work. On the other hand, most participants in the OSS project are volunteers and are not compensated with money for developing software. Therefore, it is almost impossible to assign whom to do what. The distribution of the work and the grouping cannot be clear. Not to mention any formal or written documents to explain the activity procedures for members of the organization. Based on the above inference, this study comes up with the conclusion that "the organization platform of the user collaboration innovation community" has the characteristics of a low degree of behavior formalization (Proposition 1-1).

Based on the literatures, we know that there is a substitute relationship between "behavior formalization" and "training". Since it is impossible to standardize behaviors by an organization, the organization will need to provide intensive training, in advance, to ensure workers are equipped with the knowledge and skills required for the job. In fact, it is impossible and there is no way to standardize participants' behaviors in the operation of the OSS project. However, in order to allow new comers to continuously participate in the operation of this project, and also to assure that the operation of this project will not be affected because some one withdraws from the plan, OSS must have an internal training system. However, participants in the OSS project are spread all over the world. Therefore, it is almost impossible to have a set of formal, intensive training systems. Moreover, in addition to utilizing informal training systems to ensure project participants are equipped with the necessary knowledge and skills, it is necessary to establish a screening process to verify the participants' knowledge and skills. Based on the above inferences, this study concludes that a "user collaboration innovation community" has an informal training

system (Proposition 1-2).

Based on the information in the literatures, indoctrination is also considered to be an alternative for “behavior formalization” and “training”. It is critical that members of a community share a common belief, especially in a group of uncompensated work members spread all over the world, and there is no compensation for their work. Bloor & Dawson (1994) felt that members with common professional backgrounds could easily form specialized sub-cultures because they share unique values, beliefs, and norms and provide similar explanations and judgments for the appropriateness of other people’s behaviors in the organization. In addition, due to the common knowledge and skills, members in the project tend to have a common bond, recognition, and commitment. Based on the above inference, this study concludes that the informal social control system of the organization platform for the “user collaboration innovation community” is very active (Proposition 1-3).

Specialization

Mintzberg (1979) felt that there is a high degree of multiple horizontal specialization between members of an innovative organization. It is common to group experts in each field based on their specialized functions, and they then perform in the manner of a project team. Such organizations rely heavily on project teams and task teams and tend to result in numerous teams. However, the size of each team is small.

Mintzberg believes that an innovative organization must perform technology integration for the specialized technology in each field, so as to innovate new knowledge and skills. Because each professional has his own specialized field and tends to have few assignment and a narrow work scope, the project appears to have a high degree of multiple horizontal specializations. However, an innovative organization does not allow specialists to be over specialized, neither does it allow the specialists’ behaviors to be over-influenced by the diversification of their function unit. Instead, it encourages professionals with different specialties to cross the boundary of specialization and to work collectively with each other. Thus, each team is formed to adapt to a certain specific plan. Professionals with different specialties form a technology integration team to propose innovative solutions to tackle specific complex problems. In order to allow sufficient inter-adjustments and interaction between team members, it is necessary to keep the size of the project team small. As a result, there are many projects in an innovative organization.

The inferences on specialization generated from the study of organization innovation felt that more numbers of specialists in different fields can provide a wider range of knowledge base and may increase the flow of innovations. In fact, research results also indicated that teams with high heterogeneity in capability, skills, and knowledge are more innovative than teams with homorganic characters. Overall speaking, researches indicated that "teams consisting of individuals with diversified skills, knowledge, capabilities, and viewpoints normally perform better when dealing with complex and non-routine problems, the situation when some innovation is needed." Simply speaking, the diversification of the team and the following creative abrasion are critical when divergent thinking is required.

Proposition 2. The higher the specialization, the better the innovation performance of the organization platform of the user collaboration innovation community.

Proposition 2-1 The organization platform of the user collaboration innovation community has the characteristics of a high degree of multiple horizontal specialization.

Proposition 2-2 The organization platform for the user collaboration innovation community proceeds in the manner of a project team.

Proposition 2-3 There are many project teams in the organization platform for the user collaboration innovation community, but the scale of each team is very small.

【Explanation of the inference of proposition 2】

The items of software development work can be classified into development, testing, debugging, and maintenance. In the human resource area, take Microsoft as an example, in 1995, it employed 3900 engineers to be responsible for testing and customer services, had 1859 software design engineers, and 400 project managers and product planning specialists (Cusumano & Selby, 1995, p51). The human resources needed for big and well-known projects at OSS can only be compared with Microsoft. Based on the afore-mentioned literature, we can tell that the work of an innovative organization has a high degree of multiple horizontal specialization. Therefore, we can infer boldly that for the organization to be able to operate, the versatility has to be maintained between the members. Each member has to be an expert in his specialty. The work responsibilities have to be few, and the scope of the work has to be narrow. Based on above inference, this study comes up with the conclusion that "the organization platform for the user collaboration innovation community has the characteristics of high degree multiple horizontal specializations (Proposition 2-1)."

Based on the literatures mentioned above, we can tell that an innovative organization normally assigns specialists into different groups according to their specialties, and then proceeds in the manner of project teams. The organization relies heavily on project teams. Thus, this study infers that in addition to grouping based on functions, such as development team or testing team, OSS also tries to reflect product structure on project structure when it constructs a project. Based on the above inference, this study concludes that "the organization platform for user collaboration innovation community is processed in the manner of project teams (Proposition 2-2)".

Based on the afore-mentioned literatures, we can tell that project teams in an innovative organization must be maintained at a very small scale for coordination. It indirectly results in numerous numbers of projects. In addition to the information indicated in the above literatures, this study believes that the coordination manner between works that are remote to each other is higher. In order to reduce the cost for the coordination between members of a team, this study boldly infers that the scale of the team has to be even more minimized. Of course, this will result in numerous teams. Based on the above induction, this study comes up with the conclusion that "the organization platform for the user collaboration innovation community has numerous project teams, and the scale of each team is very small (Proposition 2-3)".

Centralization

Mintzberg (1979) felt that there are various liaison mechanisms within teams or between teams in an innovative organization to promote mutual adjustments. Power is separated selectively in these teams, and the styles of the power division are selective vertical decentralization and selective horizontal decentralization. Planning and control systems are not strict, and the information flow and the strategy process are very flexible and very informal.

Mintzberg felt that because the work items of the members in an innovative organization are all very special and are performed in the manner of project teams of technology integration, the scale of project teams is very small, and the quantity is large. Therefore, the derivative question is: how to perform the coordination within and between the project teams. I mentioned before that because the works are highly complicated and innovative, standardized and directly supervised coordination is not appropriate. The coordination has to be performed by specialized staff who are knowledgeable and are actually responsible; therefore, an innovative organization can only rely on mutual adjustments as the major coordination mechanism. An innovative

organization will automatically utilize a large volume of liaison mechanisms that are meant to promote mutual adjustments. In addition to being equipped with basic mechanisms such as liaison tools and liaison staff, the innovative organization has to rely on the assistance of various integration managers to promote the coordination within and between project teams. On the other hand, it also has to release a certain degree of power to the project team. Power is separated between the members of the team.

Each project team has to assign a manger. Because of the numerous quantity of projects and the structure of functional managers and the integrative mangers, an innovative organization is full of managers. Most managers have to spend a lot of time on communication and discussion to horizontally deal with coordination problems within different work teams and the problems between work teams and function units. These managers are specialists themselves, and they also participate in project teams to work with other specialists. They become members of project teams, and their roles are more like colleagues. Their impact mostly comes from their professional knowledge and skills of inter-personal relationships, but not from the power based on their position. The emphasis is on the professional power, but not on position power. This type of organization is a combination of selective vertical decentralization and selective horizontal decentralization. "Selective vertical decentralization" means the organization authorizes power to work groups at different levels. "Selective horizontal decentralization" means the distribution of power between managers and non-managers in a work group is based on who possesses the required special knowledge every time a strategy is made. The main reason for "decentralization" is because the volume of information that can be handled by one single person is not sufficient, and one person cannot control everything that he has to know. On the other hand, it is also because decentralization allows an organization to rapidly respond to conditions in different areas. It can be regarded as a stimulation factor for encouragement, which allows members in the organization to make an effort to operate their tasks. Therefore, the principle of allocating power in an innovative organization totally depends on the characteristics of strategies and the professional knowledge needed for resolving specific problems. Power can be authorized at any level in an organization.

The same as the behavior formalization, the efficiency of the "planning and control system" tends to be used as coordination for work that is inter-functional in the structure. An innovative organization has purpose or objectives for its actions. However, the method to achieve the objective is so vague that you cannot really tell.

Therefore, it cannot precisely arrange a series of future activities in advance. It can only draft incidental plans based on the situation with the trial error method. A wide range and flexible guidance has to be established to leave the project team plenty of room to think, then further come up with detailed policies to allow the strategy to gradually come into shape. As a result, the power to set up strategies for an innovative organization is separated everywhere in the organization. No individual can say that the strategies of an organization are completed in his hands. Every member in the organization has some impact on the formation of the strategies, and they can accept the situation that sometimes the strategies have no focus. Occasionally they would intentionally allow the appearance of issues that are divergent and have no focus. They tolerate extremely long periods of divergent and uncertainty. Mintzberg (1979) felt that the formation model of strategies for this type of organization is the "adaptive model". The process of the formation of strategies is like a silkworm nibbling, but not like a whale engulfing. It flows like a stream of water. It starts with supplemental strategies that gradually attract peoples' attention, then become strategies that everybody focuses on. Strategies emerge or form gradually through hundreds of complicated strategies. Therefore, they definitely are not established through the traditional two-way method of establishing and operating. What I have to explain is that Mintzberg & McHugh (1985) discovered that even though each strategy of this type of organization emerges gradually, in terms of the direction of the strategies, it appears to be a periodical cycle of contraction and dispersion. Mintzberg concluded that this type of formation of strategies for an organization is the "grassroots model" which is different from the traditional "greenhouse model".

Mintzberg felt that even though highly ranked mangers who are in the strategic level of an innovative organization do not spend a lot of time on establishing precise strategies, they have two ways to control the formation of strategies. One way is to try to manage the process of forming the strategies. They may establish a structure that encourages a certain behavior and hire employees who are willing to participate in the group, and they may also handle appropriately the continuous disturbances that occur during the process of selecting strategies. The other way is to try to provide an overall direction for strategies. It defines some boundaries that cannot be crossed when specialists form a strategy, i.e. an umbrella strategy. Therefore, the strategic level of an innovative organization controls the process and the boundary during the process of forming the strategy, but does not control the contents and the actual quality. In addition, because it is extremely hard to appropriately control an innovative project, highly ranked managers have to devote plenty of time to supervise and guide the operation of the project.

Other scholars who studied organization innovation also felt that the decentralization is necessary for innovation. For example, Moch & Morse (1977) concluded that the degree of centralization in an organization has a negative relationship with the initiation and utilization of innovation. Scholars felt that the centralization of strategic power interferes with the resolution of innovation problems. A work environment that lacks participation may reduce members' recognition, commitment, and devotion to the organization; therefore, it may suppress innovation. Heyek (1945) felt that idiosyncratic knowledge is necessary for establishing the best strategy. However, the knowledge is distributed, and the transfer cost is very high. Therefore, it is not feasible to centralize strategy. The value can be maximized through the coordination of knowledge power and strategy power (pass the strategy power to knowledgeable people). Jensen & Meckling (1998) further expanded Heyek's idea about distributed knowledge and knowledge transfer cost. They further developed the idea into the contents of an organization and felt that organization design is a choice made between the concentration and distribution of resource allocation. In addition, as to the planning and the control system of an innovative organization, Lynn et al. (1996) employed four successful cases of discontinuous innovation to investigate the differences between the development process of discontinuous innovative products and traditional new products. The research discovered that the major process of discontinuous innovation is to probe and to learn. It puts more emphasis on experimental logic and is different from the traditional concept. Under the traditional concept, a new product is developed through six clear steps, of which analysis is the major step. The traditional concept expects that the most accurate model of combinations of strategy can be established right the first time.

Proposition 3	**The lower the degree of centralization, the better the innovation performance of the organization platform of the user collaboration innovation community**
Proposition 3-1	There are many liaison mechanisms in the organization platform of the user collaboration innovation communities.
Proposition 3-2	The organization platform of the user collaboration innovation communities have the characteristics of selective vertical and horizontal decentralization
Proposition 3-3	The planning and control system of the organization platform of the user collaboration innovation communities is the grassroots model.

【Explanation of the Inference of Proposition 3】

Based on the afore-mentioned literature, we can tell that there are various kinds of liaison mechanisms within teams or between teams of an innovative organization to promote mutual adjustments. This study boldly infers that because there are many project teams in the organization, there must be liaison mechanisms to coordinate the operation between each team. In addition to project managers in each team and coordination staff, such as testing mangers and product mangers, the organization also needs the assistance of information technology to coordinate their simultaneous and disperse work manner. Based on the above inference, this study concludes that "there are many communication mechanisms within the organization platform of user collaboration innovation communities (proposition 3-1)".

From the above literatures, we know that the power of an innovative organization is selectively separated in these teams. The styles of decentralization are selective vertical and horizontal decentralization. The sticky information proposed by von Hippel (1998) means when information is transferred from one place to another, costs will be incurred due to the structure and characteristics of the information, or the information absorption capability. The higher the transfer cost is, the stickier the information is. Conversly, the lower the transfer cost is, the less sticky the information is. The sticky characteristic of the innovation information will affect the location of the innovation. Therefore, under the consideration of encouragement and the transfer cost of innovation information, this study boldly infers that the organization will release tremendous power to teams at different levels. Power is divided among members of the team, and the allocation is totally based on the characteristics of the strategy and where the professional knowledge is for resolving specific problems. Power may be authorized at any place at any level in the organization. Based on the above inference, this study concludes that "the organization platform for user collaboration innovation communities has the characteristics of selective, vertical and horizontal divisions of power (proposition 3-2)".

According to the afore-mentioned literatures, we can tell that the formation of the strategies of an innovative organization is the "grassroots model", which is different from the traditional "greenhouse model". The plan and control system is not very strict. The information flow and the process of determining strategies are very informal. Therefore, this study boldly infers that the plan and the control system of the organization are also operated based on the key points of the "grassroots model". From the above inference, this study comes up with the conclusion that "the plan and control system of the organization platform of a user collaboration innovation

community is the grassroots model (proposition 3-3)".

Property rights system

Currently there are more than 40 types of license agreements issued by OSS. These agreements are different based on the restriction on whether the source code can be read, revised, or distributed. The difference between an OSS project and commercial software is the difference of the license system. Therefore, this study feels that it is necessary to particularly look into these license agreements.

Alchian (1965) studied from the aspect of property rights. He felt that the value of any property is based not only on the technical characteristics of the property itself, but also on the property rights the property possesses during the transaction process. Because the property rights accompanied by property may affect individual choices, when you perform economic analysis, you cannot overlook the impact of property rights on economic behaviors.

From the perspective of property rights analysis, the difference of manufacturers' organization behaviors is nothing but the change of the "encouragement-punishment system". Encouragement factors are human factors. It means the degree of possessed property rights. That is, it investigates problems on whether the property rights (exclusiveness and interference) are slashed and the degree of the slash. Different slashes of property rights will lead to different encouragements and will further impact different economic behaviors. Punishment factors mean the amount of responsible transaction costs (information costs and management, supervision costs). The size of the scope of exchange is determined by the size of transaction costs. When transaction costs are reduced, the scope of the exchange will be expanded. Therefore, the existence of transaction costs will also affect the operation of economic activities. The complete property rights analysis can be concluded as the decision makers' pursuance of the greatest efficiency under certain limitations (depending on the encouragement-punishment system). The efficiency function is different based on different decision makers. Therefore, we sum up the structure diagram of the flow of the analysis on the "property rights system to the organization performance". Refer to Figure 3.

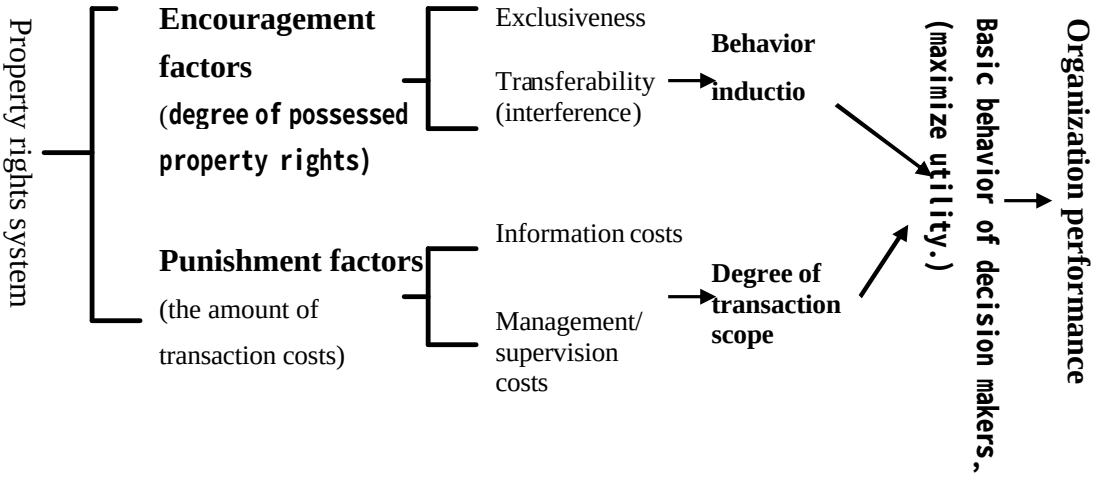

Figure 3 Structure diagram of the flow of the analysis on property rights system to organization performance

Based on the above literatures, we may know that the property rights system may affect the encouragement incentive of the members performing the work and the transaction costs of the interactive behaviors between the members. This determines the behavior model and the activity range between members. Accordingly, this study infers that the smooth operation of the organization platform of the user collaboration innovation communities is highly related to the design of the property rights system. If the property rights system may facilitate encouraging members' individual innovation motivation (knowledge creation), if the property rights system may assist constructing joint sharing and joint innovation behaviors (knowledge added value) between communities, and if property rights system is beneficial to external members' willingness (knowledge diffusion) to adopt innovation, then better innovation performance will be expected.

The analysis of property rights emphasizes single analysis by decision makers. The utility function may change based on different decision makers. Accordingly, this study feels that the operation of the organization platform of the user collaboration innovation community has a close and un-separable interactive relationship with the individual participants, the communities, and the external members. The utility preference function of each individual is different. Therefore, this study suggests that the analysis of the organizational platform of the user collaboration innovation communities cannot simply focus on the utility preference function of individual participants, but should discuss individually and collectively from the three levels of individual participants, community, and external members. Refer to figure 4. The reason and the inference process are explained as follows.

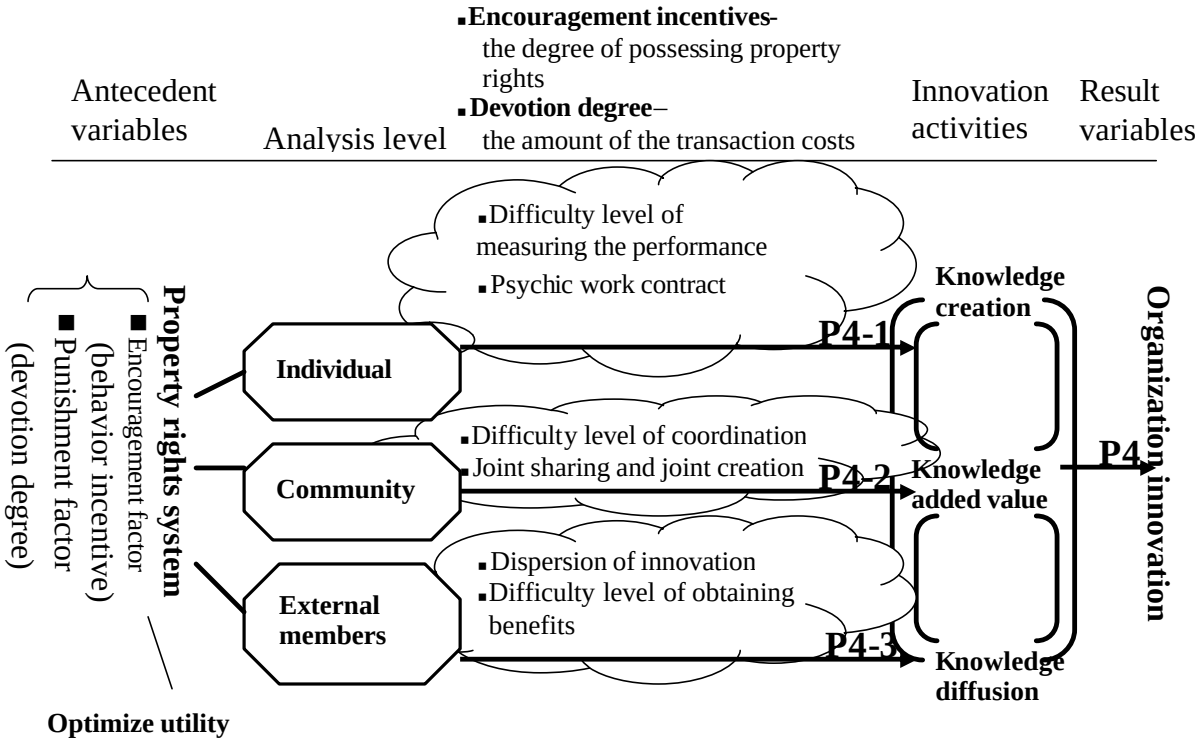

Figure 4 Analysis structure diagram of property rights system to the organization innovation of the user collaboration innovation communities

Based on the above literatures, we can infer that the property rights system may affect individual users' motivation for participating in the OSS project. In other words, the property rights system may stimulate individual users' passion to participate in the organization. Whether these users will participate in the operation of the organization will depend on the compensation he can obtain from the activity. The participants' personal objectives are the largest goal of the utility of the combination of monetary compensation and non-monetary compensation. However, based on the afore-mentioned literatures on the theory of innovative work motivation, we can tell that for members who participate in innovative work, the utility of non-monetary compensation is more than monetary compensation. In addition, most participants join the organization platform of the user collaboration innovation community voluntarily and without compensation and there is no agency problem referred to in the analysis of traditional property rights. Therefore, this study assumes boldly that if the property rights system can create better "psychological work contracts" for individual members and allow them to have expectations for the work environment and also receive more psychic income, then the stronger the encouragement incentives will be. For example, these encouragements include whether the property rights system allows members to have sufficient autonomy in the

work and whether the property rights system may assist evaluating members' individual work quality to completely reflect their psychic income, such as reputation. The stronger the encouragement of the property rights system towards each individual member, the stronger the members' individual will to participate in innovation. Furthermore, it is more possible to lead to better knowledge creation for the organization platform of the user collaboration innovation community due to the variety of communities and the stability of the development force.

The exclusiveness characteristic of the property rights system may affect the freedom and the possibility of the participants' and other peoples' innovation. Simply speaking, the property rights system restricts a member's ability to freely stimulate innovation through adverse engineering and imitation, restricts a member's ability to cultivate the previous innovation and continue to improve, and restricts a member's ability to freely adopt predecessors' innovation for further combination. In addition, the transferability (interference degree) of the property rights system may limit individual participant' s rights to exchange terms freely. That is, a restriction on whether the member may possess the innovation, transfer it, and make profits, further prohibits the behavior of free rider.

In addition, analyzing from the perspective of transaction costs, the property rights system may affect the costs that individual participants have to spend for obtaining information. For example, whether an individual participant can obtain the resources needed for innovation with low costs. The property right system may affect individual participants' management and supervision costs. For example, whether it is easy to measure the result of the performance. I would like to especially propose that in user collaboration innovation communities, there are no transaction costs associated with the agency problem discussed under the traditional property rights theory, especially the shirking problem, because there is no agency behavior between members in the community. Therefore, for individual participants, the property rights system focuses on the design of "the contract of psychological work". It hopes to enhance the internal motivation in the work environment, but not to focus on the design of "suppressing the incentives of shirking" which is emphasized traditionally.

This study infers that the difference in property rights systems may affect individual participants' innovation motivation and the degree of devotion. Based on the above inference, this study concludes that property rights may affect knowledge creation of the organization platform for the user collaboration innovation

communities (proposition 4-1).

People often base on tragedy of the commons the proof that public property is lack of efficiency. Most documents support the argument that if there is no private ownership, then the free rider problem and the external public problem will cause innovators to have a lack of will to innovate. Therefore, the purpose of the IPR system is to encourage the will to innovate. The government bestows on inventors a certain scope of exclusive rights within a certain period of time. It is hoped that these incentives may encourage inventors to disclose their invention. Through the above- mentioned interactive measure, the development of the industry is promoted. Simply speaking, applicants are given legal monopoly power.

However, the success of OSS software challenges the idea of privatization of public property. Heller & Eisenberg (1998) pointed out that when too many people own the exclusive rights for scarce resources, public property is in the status of tragedy of the anti-commons, and it stops the possibility of further development. In recent years, scholars have noticed that the social costs paid for encouraging the copyrighting of innovation and invention has surpassed the rewards that can be obtained. IPR has threatened the innovation and knowledge sharing in the rapidly developing industry. In addition, copyrighting is mostly applied for the purpose of defending, the purpose of the protection being not that clear. It is no wonder that Pamela Samuelson, a professor at the University of California, Berkley campus, expressed that "even though the current IPR system proves to be effective for the economic system of production and manufacturing, it is questionable whether the system also has the same effect on the knowledge economic system." Similarly, Mullaney (2000) once expressed that "the IPR system seems to ignore some facts about new economic entities."

Based on the above literatures, we can infer that traditional intelligent property rights are used to protect innovation ideas. However, the management structure of traditional intelligent property rights does not seem to be appropriate for the innovation development model that is centered around the community. The property rights system of the organization platform of the user collaboration innovation community needs to assure joint innovation and joint sharing of knowledge to assure everlasting innovation and to disperse the knowledge required for innovation.

Because the property rights system stipulates someone's rights and obligations (exclusiveness and interference) to use something, this research further infers that the

system may affect the will of joint innovation and the joint sharing between members in the community. The more the property rights system will affect the will of joint innovation and the joint sharing between members in the community (the stronger the encouragement incentives), the greater the cohesive force of joint innovation and joint sharing will impact the organization platform of the user collaboration innovation community, and the better the knowledge added value is.

In addition, analyzing from the aspect of transaction costs, we may conclude that if property rights system may assist communities reduce the costs of obtaining the required resources for innovation and is also beneficial for managing the coordination behaviors (reducing management and supervision costs) between members, then it will facilitate enhancing the interaction between communities, further make the organization platform of the user collaboration innovation community be equipped with better knowledge added value.

Based on the above inference, this study concludes that "property rights will affect the knowledge added value of the organization platform for the user collaboration innovation community (proposition 4-2).

According to the afore-mentioned literatures, we can tell that property right system is an exclusive right. Therefore, we may infer that property rights system may affect community members' will to hide privacy and further impact the diffusion of knowledge. In addition, property rights system may also affect whether the innovation developed by community members may be accepted by the public and further lead to the cycle of knowledge innovation, added value, and circulation. The reason of the inference is as follows. Moore (1995) wanted to surpass the big gap of life cycles adopted by technology. In the mainstream market, manufacturers should set a specific group of customers as the target, by applying pragmatism, and develop a complete line of products that are suitable for this group of customers. Especially when the value of the technology comes from the inter-connection, the expansion, and compatibility between different technologies, external members appear to be more important. Therefore, as for the innovative products that are developed by the organization platform of the user collaboration innovation community, property rights system will affect external members' (such as commercial companies) utilization manner of the innovation. Take the external members' products and their compatibility as an example. Whether external members are willing to develop complete products, based on the development of the innovation, and provide customers with complete resolutions will affect the acceptability of the innovation by

general users. In addition, the innovation diffusion rapidly and extensively, which further incurs the width and the depth of the expansion of a series of knowledge. Based on the above inference, this study suggests that property rights will affect the knowledge diffusion of the organization platform for the user collaboration innovation communities (proposition 4-3).

Proposition 4 Property rights system will affect the innovation performance of the organization platform of the user collaboration innovation communities.

Proposition 4-1 Property rights will affect knowledge creation of the organization platform of the user collaboration innovation communities.

Proposition 4-2 Property rights will affect knowledge added value of the organization platform of the user collaboration innovation communities

Proposition 4-3 Property rights will affect knowledge diffusion of the organization platform of the user collaboration innovation communities

From proposition 1-1, we can boldly infer that the organization platform of the user collaboration innovation community has the characteristics of low degree of behavior formalization. Since an organization cannot standardize behaviors, it will utilize beforehand, intensive training and social control system, that has been preset in the organization for a long time, to assure workers possess knowledge and skills required for their work. From proposition 1-1, we infer proposition 1-2, the user collaboration innovation community has an informal training system, and proposition 1-3, the informal social control system for the platform of the user collaboration innovation community is very active. If all the above propositions are correct, another interesting question is "How are the informal training system and the social control system operated in an organization?" In other words, "What mechanism causes the two mechanisms to be able to operate?" This study feels that property rights system may affect the resources that can be utilized by members of an organization during innovating. The more the technology can be shared, improved, verified, and passed on between members of the organization, the better the informal training system may be operated. In addition, property rights system may also affect the incentives of individual innovation and the incentives of joint innovation and joint sharing between members of an organization. It further leads the behavior and the culture of an organization. The higher the degree of innovation encouragement in the work environment where members of an organization are situated, and the higher the degree of joint sharing and joint innovation between members of the organization,

the easier the informal social control system may be operated. Based on the above inference, this study concludes that property rights system may affect the formalization of the organization platform of the user collaboration innovation communities (proposition 5-1).

From proposition 2-1 to 2-3, we can infer that the organization platform of the user collaboration innovation community has the characteristics of a high degree of multiple horizontal specialization, proceeds in the manner of a project team, there are many project teams, but the scale of each team is very small. If all the above propositions are correct, another derivative question that worth investigating is that "How are the specialization of members' role in an organization and the specialization of the functions between project teams be implemented and operated in an organization?" In other words, what mechanism facilitates the operation of the two specializations? This research feels that property rights system will affect the motivation of members in an organization to participate in a project and further promotes the variety and specialization of members' role. In addition, property rights system may also affect the costs (manners) of communication and coordination between members. Moreover, it will impact the specialization of the functions between different teams. Based on the above inference, this study suggests that property rights system may affect the specialization of the organization platform of the user collaboration innovation communities (proposition 5-2).

From proposition 3-1 to 3-3, we can infer that there are many communication mechanisms in the organization platform of the user collaboration innovation communities. The organization platform of the user collaboration innovation communities has the characteristics of selective vertical and horizontal decentralization, and the planning and control system of the organization platform is not very strict.

If all the above propositions are correct, what worth thinking is that how is the decentralization implemented and operated in the organization? In other words, what mechanism makes the decentralization possible to be operated? This study feels that property rights system regulates the allocation of the residual control between members of the organization. It further affects the degree of the decentralization between members of an organization when the members participate in strategy making in an organization. In addition, property rights system may affect the difficulty level of evaluating members' innovation achievement. It will further affect the strength and the weakness of the control function and attain more

transparent allocation of residual control. Therefore, property rights system may strongly affect the degree of decentralization in an organization. Based on the above inference, this study concludes that property rights system may affect the decentralization in the organization platform of the user collaboration innovation communities. (proposition 5-3).

Proposition 5 Property rights system may affect the work design of the organization platform of the user collaboration innovation communities
Proposition 5-1 Property rights system may affect the formalization of the organization platform of the user collaboration innovation communities.
Proposition 5-2 Property rights system may affect the specialization of the organization platform of the user collaboration innovation communities.
Proposition 5-3 Property rights system may affect the decentralization in the organization platform of the user collaboration innovation communities.

Conclusion and Suggestion

This article tries to construct a conceptual framework for the organization platform of the user collaboration innovation communities and infer a series of propositions to facilitate continued development of hypothesis for the verification of the operation of the organization platform. Therefore, the reliability of the propositions is waited to be tested and revised by the constructed hypothesis and the research design.

The conceptual framework proposed by this research considers only the relationship between "organization structure, property rights system, and organization innovation. The other variables that may be considered to be included in the future are:

1. Consider the interference effect of "technology strategy" to "the relationship between organization structure and the organization innovation of the organization platform of the user collaboration innovation communities" and "the relationship between property rights system and the organization innovation of the organization platform of the user collaboration innovation communities.

As to the meaning of practical operation, how are the user collaboration innovation communities be operated by business companies? How do companies operate the user collaboration innovation communities to make profits? How do manufacturers employ customer communities to accelerate customers' participation in each stage of the development of product innovation? How to adjust the organization structure, business model, customer relationship model, project coordination manner, and knowledge sharing manner, so as to maximize the efficiency of the communities' leverage operation and create a different product innovation process for customers. What is the meaning of an innovative organization and what are its strategies? The user collaboration innovation communities may provide business organizations with the opportunity to utilize the surprising creativity of their customers. In addition, manufacturers should re-examine the management of the user collaboration innovation communities and inspect the innovation governance structure adopted by the communities. Will the technology characteristics, the competition position, and the technology strategy of the company affect the leverage operation of the user collaboration innovation communities and further impact the adopted organization structure? Therefore, this study suggests that we have to consider the interference effect of "technology strategy" to "the relationship between organization structure and the organization innovation of the organization platform of the user collaboration innovation communities"

In addition, how to balance between the challenges faced by the company under the protection of property rights system and the open strategy, so as to obtain the greatest profits and adapt to the property rights management structure in the innovation development model that is centered with communities. Currently the hybrid property rights management structure is still under experiment. We still don' t know what kind of mechanism should be adopted for replacement, and the feasibility and the effect of the operation are also waited for further investigation and verification. Therefore, how can manufacturers consider commercial profits, providing feedback, and also manage communities? How to utilize the design of property rights system to encourage the participation and the innovation of communities? What is the appropriate timing for utilizing property rights system? What is the design of feasible hybrid property rights system in the future? Simply speaking, how are the user collaboration innovation communities be utilized by business companies? What are their meanings in the aspects of innovative organization and strategy? These are all practical issues that future research needs to investigate in depth. Therefore, this study suggests that we should consider the interference effect of "technology strategy" to

"the relationship between property rights system and the organization innovation of the organization platform of the user collaboration innovation communities".

2. Consider the interference effect of the "technology characteristics of the industry" to "the relationship between organization structure and the organization innovation of the organization platform of the user collaboration innovation communities" and "the relationship between property rights system and the organization innovation of the organization platform of the user collaboration innovation communities".

Even though this study adopts the OSS projects as subjects for studying "user collaboration innovation communities", whether the "user collaboration innovation communities" can exist only in the operation of information goods? Or the "user collaboration innovation communities" can also be operated in other fields? If it is operated for non-information goods, what are the characteristic of the system and the property rights structure of the "user collaboration innovation communities"? Are the propositions proposed by this study correct? Therefore, we suggest that the continuous study should consider the interference effect of the "technology characteristics of the industry" to "the relationship between organization structure and the organization innovation of the organization platform of the user collaboration innovation communities" and "the relationship between property rights system and the organization innovation of the organization platform of the user collaboration innovation communities". As a result, we may know what kind of technology feature and system characteristics are suitable for the operation of the innovation models of the user collaboration innovation communities. We also propose what industry field is appropriate for this model and how to adapt to this model to obtain innovation efficiency.

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