

# How the Activities of Federal Virtual Community Impact the Characteristics of Knowledge Worker Team – A Case Study Approach

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**Abstract:** In a quest to find out how the use of virtual communities may impact the characteristics of knowledge worker teams, a novel kind of virtual community is discovered – the federal virtual community (FVC). Unlike conventional centralized virtual communities, FVC adopts a distributed community structure. Ourinet, an open source software community and an FVC, is examined to uncover the strengths of an FVC and what it takes to ensure the quality of project output from members. A conceptual model is derived from the literatures and then modified according to the case analysis. The model infers that clear positioning and advanced communication mechanisms alone, are not sufficient in operating such a virtual community. Effective face-to-face communications and formal contracts from the physical world are still necessary in assuring good output quality.

## INTRODUCTION

Knowledge and intellectual properties, which are embodied in knowledge workers, are the new sources of business profit in the New Economy (Barsky & Marchant, 2000). Dickeson (1999) has defined “knowledge workers” as the people in companies who possess the business know-how and know-why, and they make decisions to achieve business goals. Therefore, effective management of knowledge workforce is undoubtedly of great importance in today’s knowledge-based economy.

It has been observed that knowledge workers are increasingly using the virtual communities on the Internet as a means of communication. Virtual community refers to “a group of people who communicate with each other via electronic media (Romm, Pliskin, and Clarke, 1997).” With a case study approach, this research attempts to explore the relationship between the characteristics of virtual communities and that of the knowledge workers who are members of the communities.

## LITERATURE REVIEW

Various definitions of virtual communities have been offered; each emphasizes a unique aspect of the communities. Figallo (1998) pointed out that different dimensions investigated gave rise to diverse definitions of virtual community. The focus of this research is on knowledge worker teams in the context of a virtual community. Thus, the definition drawn upon is *a group of knowledge workers who communicate with each other via electronic media to complete a collective goal*.

Based on a thorough literature review, three general types of activities inside virtual communities are summarized in Table 1.

Type of activities	Content of activities
Management activities	Access mechanisms, encompassing interpersonal knowledge, interactive broadcasting, breakout and reassemble (B&R) system, cooling-off mechanisms and civility, memory (Etzioni & Etzioni, 1999), restriction on dysfunctional activities (Romm et al., 1997 & Carroll, 1996), and restriction on linguistic interruptions (Romm et al., 1997).
External intervening activities	Intra- or inter-organizational effects (Weston, 1996 & Romm et al., 1997).
Social activities	Creating and using unique language (Romm et al., 1997), developing communion (Michalski, 1995), and democratizing effect (Romm et al., 1997).

**Table 1: Activities in virtual communities.**

The purpose of management activities is to keep the virtual community a friendly communication space. When a virtual community's operations are intervened by the strategies or operation methods of other virtual communities or organizations, we call the strategies or methods external intervening activities. Social activities describe the interactions that occur while members develop bonding.

Janz, Colquitt, and Noe (1997) categorized the characteristics that impact the effectiveness of knowledge worker teams into four groups: (1) contextual variables, (2) design variables, (3) process variables, and (4) job motivation.

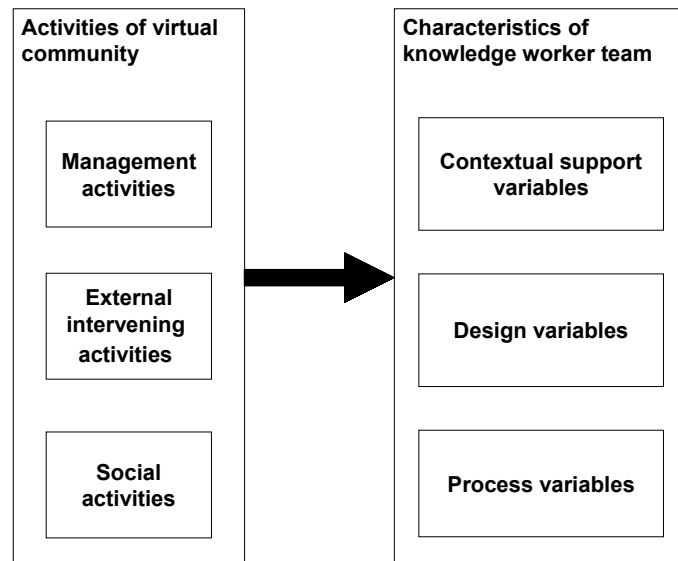
Types of variables	Variables
Contextual variables	Information transmission efficiency, feedback frequency, quality of the team's goal, and time pressure presence.
Design variables	Autonomy, interdependency (outcome interdependency and task interdependency), and team development (team coordination and team unity), and mission clarity.
Process variables	Sharing of ideas and information, helping behavior, and innovation.

**Table 2: Characteristics of knowledge worker team.**

The conceptual model to be presented in this research aims to uncover the variables, which could be manipulated to enhance output quality, in the construction of a knowledge worker team. Job motivation is heavily influenced by the coherence among an employee's personality, his/her job functions, and job reward system. It is thus effectively unaffected in response to the activities of virtual communities. Since the focus of this paper is on how virtual communities impact a knowledge worker team, job motivation is not considered in forming a conceptual model.

## RESEARCH FRAMEWORK

Most researches on knowledge worker teams assume the need of face-to-face interaction, ignoring the possibility of a virtual work place. This paper asserts that the interaction via virtual communities could potentially impact the characteristics of knowledge worker teams. The conceptual model in Figure 1 illustrates this concept.



**Figure 1: Conceptual model under investigation.**

A case study approach is adopted to enhance the explanatory value of the theory. The case under examination, Ourinet, develops open source software via work-oriented virtual communities. The author has personally joined the virtual community of Ourinet to gain first-hand experience. In-depth interviews were also held with Ourinet's executives to explore the internal workings of the company.

## CASE ANALYSIS

### Case Introduction

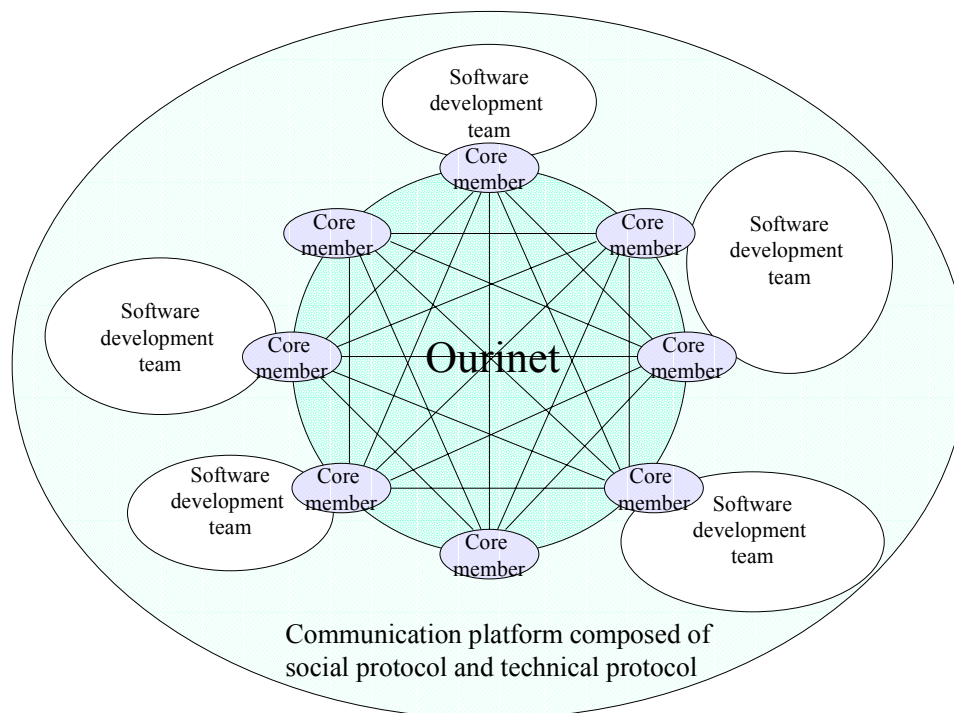
Ourinet is a content and service provider established in July 2000. It offers services in software development, technology integration and consultation, and system maintenance. At the heart of Ourinet is open source software. Anyone in the world who is interested in Ourinet's source codes can apply to be a member of Ourinet's online R&D community and use the codes freely for their own projects. When software developers use the codes, they do not need to share with Ourinet the monetary profit from their own projects. However, the software developers do need to contribute back to Ourinet any enhancements they have made to the original codes. This is a form of reciprocity.

Ourinet does not have a physical workplace. Open source software developers simply join and work in a virtual community on the Internet. This mechanism, in effect, works as if the software developers around the world are part of Ourinet's R&D team. Ourinet consider itself to be the technology supplier of software companies. It is committed to make the imprecise boundaries among software integration, software supporting, and the research and development of software more distinct. On the basis of this idea, it provides the integrated information system solutions for software companies, which in turn are the software outsourcers of other businesses.

### Structure of Ourinet's Virtual Community

The memberships of Ourinet are not open to anyone who is interested. Ourinet selects its members carefully by assessing the candidates' ability and reviewing their track records. Rapid growth in size is not among Ourinet's goals. Strict selection of core members has given Ourinet the reputation of excellence in technical expertise. The candidates who pass the strict criteria become the "core members". Core members are themselves freelancers or leaders of software development team, and they possess outstanding ability in system analysis, project management, or have profound domain knowledge. Most of them even have stable sources of customers. Ourinet tries to attract these people to be its core members by augmenting their expertise with Ourinet's deposited tools and software. What the core members can expect from joining the Ourinet is a bigger profit due to increased project opportunities, convenient collaborations, and readily usable software packages.

Ourinet's core members form a tightly connected community. For those who are leaders of software development teams, their teams form the outer peripheral of the Ourinet virtual community (see Figure 2). These peripheral members are loosely connected to Ourinet through the core members. In other words, a core member who has obtained open source codes from Ourinet can share the codes with his/her software development team, making his/her team indirect members of Ourinet. However, only core members are under the direct supervision of Ourinet.



**Figure 2: Ourinet's community structure.**

Ourinet provides a communication platform consisting of social and technical protocols. Social protocols govern how the software development teams receive projects and collaborate. Technical protocol serves as an interaction mechanism to facilitate

various communication functions on Ourinet.

## **Federal Virtual Community**

A common believed golden rule states that virtual communities would reap business value only when a critical mass of members is reached. However, this assertion has few proofs in reality. Community organizers often fail to foresee the large expenses accompanying a large number of members, and the main source of these skyrocketing costs is the centralized community structure.

Ourinet subverts the golden rule and adopts a distributed community structure. Instead of carrying out all tasks within a single centralized community, the development teams can use Ourinet's service or management mechanisms in many different sites of communities. Ourinet provides a communication platform that allows the development teams to interact without the restriction of community boundaries. This type of structure allows Ourinet to contain the management costs and equipment expenditures. As the virtual community grows, Ourinet does not need to incessantly seek out capital sources like most other dot-com companies.

Although Ourinet does not consider the software development teams as core-members, the teams can still use all the mechanisms provided by Ourinet. At the same time, the teams enjoy total autonomy. For this reason, this research coins a term, federal virtual community (FVC) (Figure 2) to describe this type of virtual community.

## **CONCEPTUAL MODEL ADJUSTMENT AND PROPOSITIONS**

### **Conceptual Model Adjustment**

FVC is an exciting discovery of a novel concept of virtual community. Its distributed community structure demands that the initial conceptual model (Figure 1) be adjusted. This is because a distributed community structure is beyond the scope of the existing literatures from which the initial conceptual model is derived. One pivotal activity that FVC needs to provide is the "access" and "interactive broadcasting" across the autonomous virtual communities. Most other management activities are provided by the individual communities, which the software development teams reside and are not controlled by FVC. Hence, the management activities in the initial conceptual model should be divided into two parts: the management activities provided by FVC and those provided by each autonomous community. As for how members choose which part of activities to participate at what point of time, it really depends on the environments that FVC and each autonomous community provide, and the inter-community communication effects. These external (external to development teams) intervening activities moderate the choices between the two parts of management activities.

One essential goal of management activities is to build a friendly communication environment and to restrict dysfunctional activities among members. Ourinet's mission is to achieve this goal with a highly disciplined interactive space. Social activities among members are directly related to the management activities provided by FVC or other communities. Also, since members have the freedom to choose workplace and their mobility is unrestrained, social activities can be developed across autonomous community boundaries. Thus this flexibility of workplace choices moderates different facets of social activities.

There are three types of activities in the FVC environment: (1) the management activities provided by FVC, (2) the management activities provided by other communities, (3) social activities. Project contracts are found to be imperative in controlling output quality. Given that a project contract exists, better information transmission efficiency, team development and development process characteristics could improve output quality further. There are five output attributes: (1) quality of the team's goals, (2) time pressure presence, (3) outcome interdependency, (4) task interdependency, and (5) mission clarity.

Information transmission efficiency (a contextual variable) is determined by the management activities provided by FVC as well as the autonomous communities where the software developers choose to reside. Inter-community transmission is the responsibility of that community, while intra-community transmission is controlled by FVC. Not only do core members have the freedom to choose workplaces, they also enjoy unrestrained mobility in moving among different workplaces. Such scheme aids both information transmission efficiency and knowledge diffusion.

In the initial conceptual model, team coordination and team unity (traits of team development) are two important characteristics in measuring the maturity of team development. It is observed that members in FVC often initiate social activities, especially during face-to-face meetings, in order to promote the spirit of coordination and unity. Similarly, sharing of information and idea, helping behavior, and innovation (process variables) are also the goals of social activities.

Since each software development team can be viewed as an independent unit, and there is no centralized management that controls how the teams operate, the term "feedback" of feedback frequency (a contextual variables) cannot be defined as the feedback from a centralized management institution to the software development teams. This research attempts to explain the sources of feedback as other software development teams' help activities. Software development teams provide feedbacks at their free will. For the same reason, the autonomy (a design variable) mentioned in the initial conceptual model is not interfered by a centralized management institution. In conclusion, neither feedback frequency nor autonomy is affected by the activities provided by FVC. Therefore, these two variables are removed and not shown in the adjusted model. Figure 3 illustrates the adjusted conceptual model. All variables found in the initial model (Figure 1), except autonomy and feedback frequency, are present in the adjusted model (Figure 3). However, through the case analysis, the relationships among the variables are better represented.

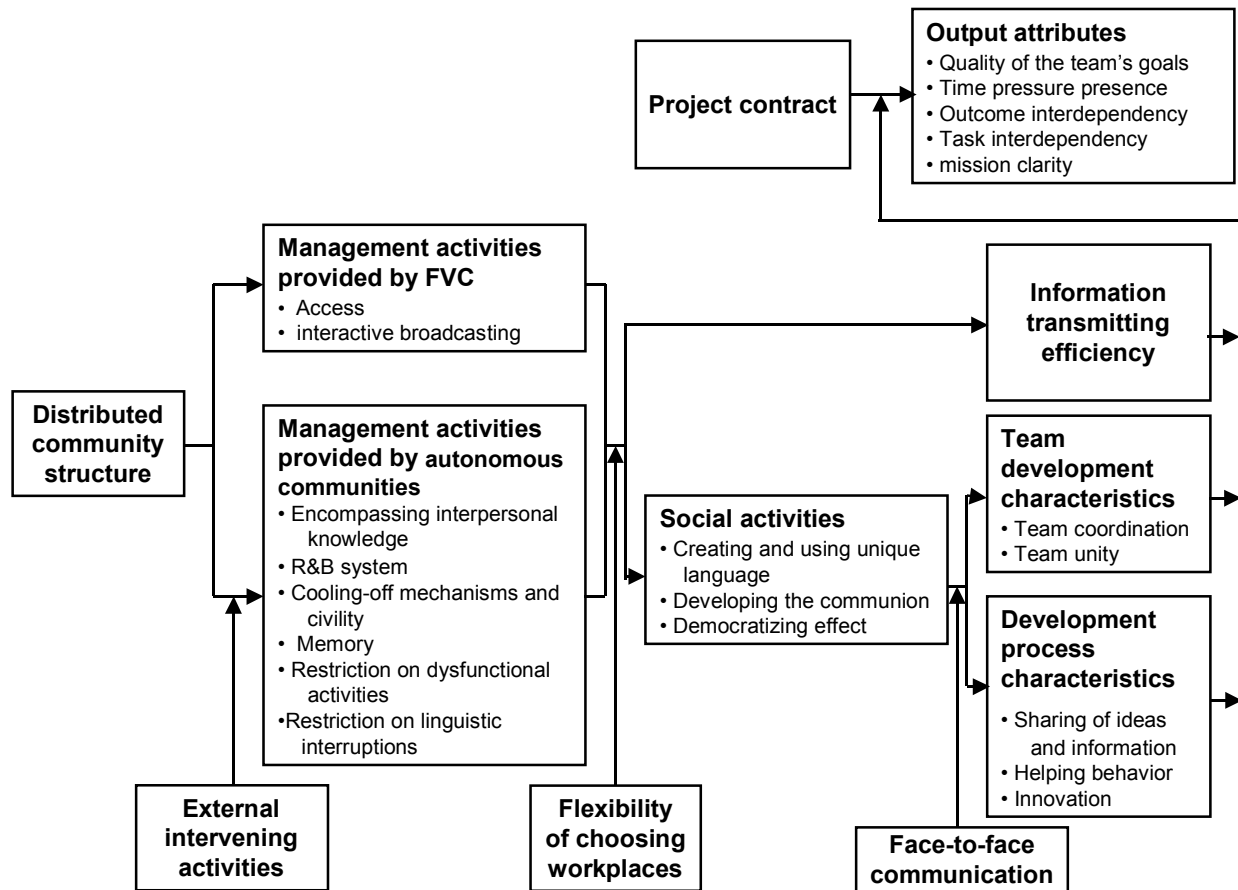


Figure 3: Adjusted conceptual model.

## Propositions

1. Under the distributed community structure, access and interactive broadcasting activities across autonomous communities are the essential mechanisms that FVC must provide to its members. Activities determined by individual autonomous communities compose the other type of activities of the distributed community structure.
2. Given the freedom to choose workplace and unrestrained mobility, management activities provided by FVC and autonomous communities increase information transmission efficiency.
3. Management activities provided by FVC and autonomous communities influence social activities among members. As a result of mobility among workplaces, one community's unique language can spread to other workplaces within FVC, so can the communion development and democratizing effects.
4. Social activities via face-to-face communication impact the characteristics of team development. Familiarity resulted from physical meetings impedes coordination but increase unity.
5. Social activities via face-to-face communication impact the development process characteristics. Democratizing effects strengthen the sharing of ideas and information and promote innovation. When members from different communities meet face to face, the use of unique languages will restrain the sharing of ideas and information. Trust is the basis of the helping behaviors.
6. To ensure the effectiveness of project development in FVC, output attributes need to be controlled by project contracts.

## CONCLUSION

The research has found three key criteria in integrating the knowledge worker teams' work force via FVC. First, a FVC must facilitate its members with flexible avenues to interact across the encompassing communities, which is the foundation of a distributed community structure. At the time of interviews, the capability of dynamic information transmission across communities is being

considered for the next major release of Ourinet's technology platform. Currently members need to set up static routes to the communities they want to send or receive messages. It is a pressing agenda for Ourinet to make this mechanism automatic and dynamic. By extending the instrumentation and the scope of information transmission, members are empowered with higher levels of information searching ability, and thus are capable of undertaking larger number and wider range of projects

Second, the case company has found the face-to-face communication an integral part of knowledge worker teams in a FVC. Shortly after Ourinet came to existence, regular physical gatherings have been scheduled and held in downtown Taipei for its members to chat informally in person. This effectively cultivates understanding among its members. Yet the increased closeness leads to both pros and cons. On one hand, the familiarity fostered in physical gatherings promotes knowledge worker teams' unity; on the other hand, it decreases the effectiveness of coordination. The latter is somewhat enigmatic. The truth is that it is culture-specific; in other words, in another culture, familiarity may not have an adverse effect on coordination. Ourinet painfully discovered this unwanted effect. Wishing to keep the good side of physical gatherings, it resorted to a tight control of project development by carefully devising the contents of project contracts in order to decrease the negative effect of familiarity. Ironically, if occasional physical gatherings are necessary, the physical span of the members is limited. Accordingly virtual communities are yet to overcome the physical boundaries.

Third, an electronic audit system of the features and the quality of project output need to be established. Reducing the negative impacts of familiarity through tight contracts is one way; the other way is to fabricate a comprehensive digital authorizing portfolio, which can electronically track the project progress and help ensure that the outputs match the contract terms.

Core members are at the heart of a FVC; nevertheless, aggregating them is not easy. First, the FVC needs to position itself clearly in the overall operation. Also, the FVC needs to sustain its attractiveness by always setting members benefits at a higher priority.

Although all members in FVC can interact across different communities, for the present time, individual knowledge worker teams tend to work in one workplace only. This is because most encompassing communities, which are not governed by Ourinet's social and technical protocols, adopt centralized community structures. Except for the communication across different communities, members are restricted under the individual centralized community structure. Within the individual community, there are centralized management mechanisms of project development, such as site-specific version control system or site-preferred programming language. Once task integration or translation tools are available, developers will no longer be confined to any one community, since tasks produced in any environment can be integrated or translated easily. Each development team will thus be transformed from a centralized to a distributed environment, allowing each knowledge work team to work in various workplaces simultaneously.

## Restriction and Suggestion

The major restriction of this research is that FVC is not a general concept. Therefore the effectiveness of knowledge worker teams in such a community cannot be measured objectively. External validity needs to be verified with more cases. This restriction provides a good direction for further research as more cases come into sight. The merit of this research is the discovery of a new type of virtual community. This discovery points to the possibility that the development of virtual communities is becoming as diversified as physical ones. We expect more types of virtual communities to emerge and hope there are constant innovations of their functions.

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