

Positive Social Evolution in Autonomous Social Network Communities

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Abstract—Network communities have become an emerging channel for human interaction. Network communities create a new form of information service innovation based on massive user collaboration. However, not all network communities may achieve successful collaboration. The ingredients of a network community and its social relationships may influence the development and direction of community evolution and the sustainability of the community over time. We use the theory of Constructionism from the education field to establish an evolutionary model of network communities. The proposed model focuses on social relationships and integration from its participants. It explains the positive social evolution and explores the successful collaboration opportunities within the network community.

The power of positive “Forward Evolution” in social communities is an important factor in the sustained development of a network community. Due to the complexity of network community evolution, this study uses a case study approach to explore the process of evolution and the driving power for each stage. This study focuses on the ingredients of a network community’s and how its social relationships will help the whole community to achieve continuous forward evolution in every evolution stage. A micro-blog is analyzed for clues to supporting positive social evolutions in social network communities. We also explore and verify the logic of a forward social evolution model in a network community to encourage participants to engage in prosocial behaviors, and achieve successful collaboration.

Keywords- *Social network evolution, Community composition structure; Collaboration; Altruism and Prosocial behaviors.*

I. INTRODUCTION

Internet commercialization has led to an explosion in new internet services. Reports of internet research companies indicate internet communities gather more members and experience longer stay times than other internet applications. Social network service (SNS) is an emerging internet application that highlights interpersonal relationships among users in cyberspace. Unlike traditional internet environments, SNS users expect to search for information from all possible connections, especially through outward linkages from their friends. Some features of the internet environment make virtual interactions more complex. Since online users may have anonymous identities, their hidden personal information may enable users to express their ideas freely, but may also cause irrational behaviors. This phenomenon also appears in

social network communities, showing that user behaviors have been changed by the SNS environment. Instead of being concerned with the behavior of individual participants, this study explores the effects of different social community structures on the collective behaviors of users in a social network community and focuses more on a macro view of the impacts of the various attributes of the social network structure which constitute the social network environment.

Social network services accelerate the efficiency of information diffusion and information exchange. The emerging collective power of SNS users is aggregated across a large number of individuals. The goals of participants are both diverse and complex. Despite this, it is not difficult to convince participants to contribute to the community. Due to network effects, social network communities have great potential to encourage user collaboration and have powerful impacts on users. Proper use of this collective power will influence the future implementation of social network communities and is worth investigating. However, this collective power is both fragile and uncontrollable, since individual participants have different value propositions.

Users in social network communities face the dilemma of whether to seek their own benefit rather than contribute for the sustainable development of the whole society. In real social network communities, it is important to enable each participant to benefit from interaction and collaboration. Better outcomes will encourage users to share and to dedicate effort to the social network community.

Not all social network communities experience successful collaboration. Although user participation and dedication are important in the Web 2.0 environment, these efforts cannot guarantee the formation of collective power and positive evolution of the social network community. The network structure of social network communities as well as the relationships between community members might also affect the positive evolution and future development.

This study proposes an evolutionary model of a social network community, focusing on the structure of the network community and its social relationships that may influence the direction of community evolution and the sustainability of the community lifetime. We explore how the network structure of the social network community and its relationships facilitates the healthy development and positive evolution from a macro perspective.

The remainder of this paper is organized as follows. In section 2, we discuss the literature on social network

structure and the development of social network communities. We then propose an evolutionary model of social network community according to the constructionism theory in section 3. The power of positive “Forward Evolution” in social communities will be discussed in section 4, followed by a case study to illustrate the evolution in social network community. Finally, discussions and conclusions will be elaborated in section 5.

II. STATE OF THE ART

Communities in the human world may be divided into two types: those in virtual environments and those in physical environments. The community discussed in this study is an “online social community” existing in a virtual environment. An online community is facilitated by internet technology that eliminates geographic restrictions and allows social interactions to occur virtually. Thus, according to [13], social network communities consist of groups of people with common interests and practices that communicate regularly and for some duration in an organized way over the Internet through a common location or mechanism.

There is wide agreement that virtual communities are capable of providing both interpersonal interactions and access to information [3]. In addition to gathering a certain number of users to join, communicate, and share with others, virtual communities must create a sense of long-term stable interaction [4], not of a place where people go only occasionally or where there are always different people.

The reasons that users are willing to join in the community has been discussed. Hagel III & Armstrong think that users join in the community is to fulfill the needs on four dimensions: interest, relationship, fantasy and transaction.[5] The influence of user’s willingness to join in the community can be unfolded into technological factors, motivational factors, task factors, and system factors. According to the social ties strength and the self-centrality of consumption on discussion issues in the community, the community member can be categorized into four types: (1) Tourist, which has weak social ties strength and low self-centrality of consumption. (2) Insider, which has strong social ties strength and high self-centrality of consumption. (3) Devoter, which has higher self-centrality of consumption but with weak social ties strength. (4) Mingler, which has strong social ties strength but low self-centrality of consumption. Previous researches focus on how to apply the social network studies in the virtual community environment. Those studies identify the importance of social relationships among individuals, but how the relationships influence the evolution progress in social network community is not addressed deeply.

Sociologists and anthropologists have long recognized that people can feel close to distant others and develop common identities with distant others who they rarely or never meet. [6, 7] Internet communication technology has overcome the geographical barrier and will make people more concentrate on individual’s homophily characteristics. The principle of homophily provides the foundation for various social interaction processes. The basic idea is simple: “people like to associate with similar others.” [8, 9, 10]

Homophily user groups are more likely to combine strength from their members to achieve specific objectives. In order to explore which kind of network structure will lead the positive forward evolution in social network community, we would also discuss the influence on the homogeneity/heterogeneity of user groups.

Prosocial behavior is defined as actions that benefit other people or society as a whole [1]. It is characterized by helping that does not benefit the helper. From an evolutionary perspective, early human survival relied strongly on the processes of giving and helping. Those who displayed prosocial dispositions experienced evolutionary success [2]. A combination of altruism and egoism are thus integrated with concern for both society and the self. This situation also appears in modern social network communities, in which users expect to search for information from all possible connections, and require the help and sharing of others. Such sharing behaviors are considered to benefit other users and fulfill the needs of others. This prosocial behavior will drive the positive evolution of social network communities.

III. EVOLUTIONARY MODEL OF A SOCIAL NETWORK COMMUNITY

In order to establish the evolutionary model of a social network community, this study takes as its foundation the theory of “Constructionism” as developed in the field of education. Based on from constructivist theories of psychology, constructionism views learning as a reconstruction rather than as a transmission of knowledge. The idea of manipulative materials is extended to the idea that learning is most effective when as part of an activity the learner experiences the construction of a meaningful product. [14] The major objectives of this study is to understand (1) how various combinations of social network structure will influence the members within communities to interact with each other and (2) what is the success factor to perform continuous positive forward evolutions within the social network communities.

The basic idea of constructionism is learning from direct personal experience instead of being told. Learners are encouraged to learn things through autonomous judgment, discovery and making conclusions, to accomplish the learning objectives. As shown in [11, 12], constructionism includes three concepts. We describe their connections to the evolution of social network communities below.

The starting point of social network evolution is the “autonomy” of individuals. All participants in a social network community are independent identities with their own value propositions, decision policies and objectives. The social network community thus consists of a diversity of autonomous actors, resulting in highly dynamic and complex interaction styles. The direction and development of the interactions and evolution will be generated from the previous experience and knowledge of participants to construct new knowledge.

As constructionism mentioned that recognition functions is utilized for adoption and restructure experience, instead of discovering the reality. In social network community, the

idea implies that each individual restructuring the recognition architecture to explain their experience and associate meanings use their previous experiences subjectively. This will help each individual have better adaptation to the environment they belong to. In the evolution process, the incentive for users to interact with others is to obtain necessary information for adaptation. Through the sharing and experience co-creation process, the interaction intensity will increase and create opportunities for effective information sharing. Moreover, the user groups have the chance to highlight the homophily characteristics of their members to establish strong ties between participants so as to collaborate with others for adapting to the environment.

Knowledge is constructed through a society that individuals exchange and reconciliation with others. The social evolution process will be influenced by cultural and societal factors, and it requires interaction and exchange with others in order to adjust the evolution progress continuously. On the basis of this concept, the maintain relationships between participants and balance the perceived value of each user is benefit for establishing a sustainable social network community. Whether user's need could be fulfill will either lead the evolution toward a successful outcome or crash the stability of current community. How the resources being utilized and managed for maximal effect will involve complex decisions and impact the stability of social network community.

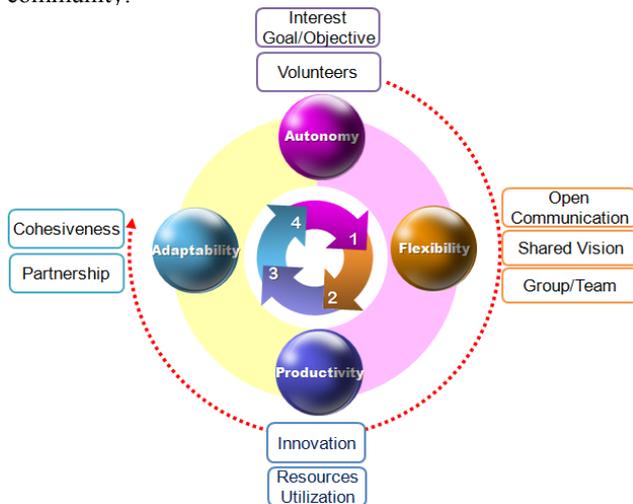


Figure 1. Evolution of a Social Network Community

Following the concepts of constructionism, we propose an evolutionary model for a social network community. There are four phases of the evolutionary cycle (Fig 1): Autonomy, Flexibility, Productivity, and Adaptability. Each phase has its own operational guidelines and objectives. The four phases create an evolutionary cycle for the social network community. The whole community may be affected by its participants, social relationships, cultural factors, and network structure to move toward next phase. We describe each phase in the following subsections.

A. Autonomy Phase

The initial stage of community evolution is the Autonomy phase. The objective of this phase is to establish a fundamental environment for users to begin the evolution of the social network community. Each member autonomously seeks information sources to increase their recognition capability and enrich their experience for reconstruction of their knowledge. Participant behavior in the beginning phase is driven by their internal decision-making process. Through observations of social events and imitating other member's successful behaviors, individuals may gain more experience to improve their capabilities.

Since mutual recognition among individuals is based on their previous experiences, experience-based global factors of the community such as trustworthiness and reputation will impact the possibility of individuals extending their connections. As the autonomy phase is the initial phase in which participants have the chance to encounter others, the existence of incentives to attract users to initiate communication and interaction with others voluntarily may stabilize the community development. Participants who have similar interests and objectives may find their motivation to participate strengthening. In this phase, the major issues include: (1) helping community members overcome barriers such as trust and security; (2) strengthening incentives for interaction, and (3) encouraging participants to engage in interactions autonomously. These will not only stabilize the community development but also increase the probability of the community moving forward to the next phase in its evolution.

B. Flexibility Phase

After the community members start their interactions and establish some initial relationships, the evolutionary process moves into its second phase, Flexibility. This phase focuses on how to adjust and strengthen the social relationships of each user to establish fluid channels for resource exchange. The network structure of the community is the key factor in this phase. Flexibility implies that the autonomous actions of each participant adjust and regulate their attitude, willingness, and correspondent actions. The open communication and initial social relationships established in the previous phase encourage information exchange and create stronger ties between users, increasing their opportunities to access social resources. These interactions also help users to form a group concept that has its own intensive interactions and friendly communication atmosphere. In the flexibility phase, the concept of sharing is the major force that stabilizes members within the community. Through widespread sharing and open communication, ideas, opinions and personal experience diffuse to other community members. This will attract more individuals to the social network community, and enlarge the network size, increasing the utility of those personal information resources. Generally speaking, social groups with certain tie strength have a greater opportunity to create shared vision and trigger the process of co-creation.

C. Productivity Phase

The third phase of social evolution in social network community is noted as “Productivity phase”, which highlights the utility of collective power of community. The social group aggregated from flexibility phase becomes the core of community that influences the operational direction of the whole society. After the previous two phases, members within the community have already exchange their ideas and opinions. This productivity phase is to encourage individuals who own different resources could collaborate with each other and make maximal utility of the resources widely dispersed in the community. During the interaction process, if user could perceive the value obtained from the collaborative user groups is higher than not to collaborate with others, more collaborative actions will be driven for higher benefit. As heterogeneous network structure of community implies heterogeneous information sources, those information sources could bring more creative and valuable resources for higher resource utility.

In addition to the benefits, the tightly connected social network community also encourages various social activities that encourage individuals to concerning themselves with prosocial activities rather than their self-interest. The goal of such prosocial activities is to increase the overall benefit of being a community member and to maintain stable development of the social network community.

D. Adaptability Phase

After user groups aware the collaboration concept, the interaction between community members is progressing to the fourth phase, noted as “Adaptability phase”. This phase has an ultimate goal that keep the social network community in a sustainable development status. Members will gain collaborative benefits from the community continuously and form a stabilized and collaborative social norm. This social norm will guide the behavioral principles for members within the social network community to act correctly so as to keep the community in a healthy status. In this phase, each individuals act autonomously, member will follow the social norm to interact with others and gain benefits from the community as they expected. Since the social norm is established, new member who would like to join in the community will have clear behavioral guidelines to facilitate the interaction as well as the collaboration. The adaptability phase highlights the cohesiveness of the social network community that keeps the evolution progress moving to an ideal status.

IV. POWER OF POSITIVE SOCIAL EVOLUTION AND CASE STUDY ANALYSIS

A. Positive Forward Evolution

In each phase, there exists some force that could impact the community. The basic force is to keep the community continue stay in current phase stably; the energy force is to enable the community moving forward to the next phase. However, once the community cannot merely keep the basic force of the community, the social network community may

have to face the possible backward evolution problems that destruct stability of current community.

On the contrary, once the community could not only keep the basic force to maintain the community operation smoothly but also enable the energy to moving the community toward collaborative environment and stabilize the social relationships between participants, the positive forward evolution will occur and lead the community toward a healthy development status.

In this study we emphasis more on the positive social evolution process and how to encourage and facilitate collaborative behaviors within the social network community. The backward effect is then viewed as the insufficient case that community cannot obtain enough social power for healthy interactions. For managers and service providers, the forward evolution progress is positive leading powers that encourage collaborative actions, but it requires environmental support to facilitate the success. The proper network structure of community then will be treated as the supporting environment.

Basis on different interaction behaviors and incentives, the collaborative behaviors will occur on the upper level evolution, while the fundamental level evolution is more concentrate on how to initiate information sharing, social relationships establishing, and collaborative interactions. The beginning phase highlights the opportunity to encourage the interaction, while the other phases focus on the evolution progress toward a sustainable prosocial situation.

B. Case Study of a Microblog

Understanding the impact of the ingredients of a network community and its social relationships will help the community achieve continuous forward evolution in each phase of its evolution. A case study of a micro-blog is analyzed to shed light on the positive social evolution of social network communities.

For case selection criteria, based on the research problem, we would like to explore the social network community on two issues. The first issue is to find out the suitable ingredients of the community will encourage social evolution progress. This means various content types exchanged within the community will make the interaction different. The second issue is to explore the proper network structure in social network community that could facilitate the positive forward social evolution. It means what type of social relationships could facilitate the social evolution progress most in each evolution progress phases. Therefore, how we determine the proper case is based on a two dimensions matrix for selecting the observation objects: information quality and social relationship. Segmentation of social evolution cases are shown in Fig. 2.

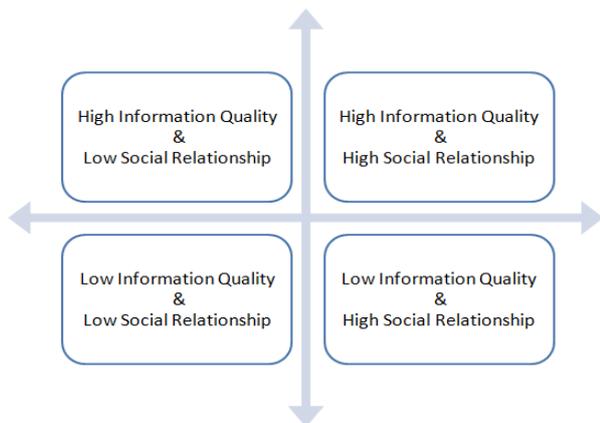


Figure 2. Segmentation of Social Evolution Cases

A micro-blog case in Taiwan is selected for analysis on Plurk. In many social network communities, events trigger interactions. In this study, we selected as the event for observation the typhoon of 8th August, 2009, typhoon Morakot, whose massive rainfall led to floods and landslides that caused 671 deaths and millions in infrastructure damage across southern Taiwan. In the community under observation, the social network consisted of 6550 nodes with two-way relationships and 2354 nodes with one-way relationships.

From the participation rate, event related discussion is much higher than the irrelevant. The gap between participants is 2.31 posts on average. Active users who concentrate on the event discussion and information sharing will cause more response articles. Mainstream views of information exchange rise 80%. This shows there are still users with different opinions, a reasonable conclusion since users may have different value propositions. In the community, 88.68% of contributions provide high quality information. Further, 58.4% of the information content provides social support. The top 20% of active participants account for 65.28% of contributions, while the top 80% of contributions are provided by 36.99% of users. In observing this event, we found that the social network community quality of the information content and the social structure of the community are relatively tightly connected to each other. Before this event occurred, the rate of contribution was lower than average. However, when a natural disaster occurs, information exchange increases rapidly and large numbers of participants join the discussion. Participants are interested in providing their own information and opinions to share with the community to help others to obtain the latest information. These community members rapidly form a group to expand information exchange and maximize the utility of information sources. The prosocial concept leads to evolution of the community toward a healthy configuration and provides useful collaborative power for the whole community.

V. CONCLUSIONS

Based on the case analysis, we found that to maintain social support, cooperation and prosocial behavior in the social network community, higher information quality and intensive social relationships are required.

These findings have several managerial implications. To drive high quality cooperation and prosocial behavior on social network communities, managers should: (1) post interrogative sentences, which will increase participant interactions and contributions; (2) share experiences with participants to encourage contributions from users with similar experiences; (3) post analogous topics constantly to encourage sustained interaction; and (4) non-mainstream opinions come with more information sharing.

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