

# Can Insights into the Evolution of Natural Communities Move Forward Research on Human Community Dynamics?

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## CHALLENGE

Human communities are places where people interact in some way. These places can be in the real world such as a neighbourhood community or in the virtual world such as a community in the WWW. Organizations have learned that communities are structures that can have a positive impact for example to solve problems or to enhance knowledge sharing. Successful communities can therefore provide a strategic advantage and organizations are therefore interested to support community building. To provide an appropriate organizational and technological infrastructure, it is necessary to understand how communities work and how they react upon different influences.

Analogously to a human community, a natural community consists of plants or animals in a particular habitat that are bound together by some interaction. Examples for a natural community are food webs. The interaction that is observed here is how a living thing gets its food. Most animals are part of more than one food chain and eat more than one kind of food in order to meet their energy requirements. These interconnected food chains form a food web similar to a web of interacting people in a human community.

Natural communities as well as social communities have been studied widely in the last years and several attempts have focused on properties that different types of networks have in common (see, e.g., [10, 1]). It has been observed for example that the chains in most food webs have no more than four or five links [5] and that the number of links depends, for example, in lakes on the size of the habitat [7]. Furthermore, the majority of species in a habitat are highly connected; they are in average just two links apart. Analogously, the diameter of social networks (the maximal shortest path) is usually very short and people are connected over just a few links, too. The latter observation has been named by Milgram in 1967 as the “small world phenomenon” [6]. Thus, small worlds can be found in animal as well as in human communities. It is therefore of interest to study if besides the graph characteristics (degree, density, shortest paths, etc.) structural equivalences between both types of communities exist. This leads to the question, if a structural equivalence between both types of communities exist and if this allows transferring insights into the evolution of animal communities on human communities. This knowledge may be used to set up hypotheses about dynamics of human communities.

Moreover we are interested to study whether the factors that influence community dynamics are transferable to the dynamics of human communities. In natural communities it can be observed that, for example, monocultures can only survive with high costs whereas a diversity of species often leads to a more stable and productive and thus cheaper to maintain environment [9]. Plants can have positive effects on each other (see, e.g., [2]). For example, the accumulation of nutrients, provision of shade, amelioration of disturbance, or protection from herbivores by some species can enhance the performance of neighbouring species. Thus the distribution of plants is not independent of other species. In online communities we assume that people interact because they share a common interest. But the people may play different roles in the community. The classification of roles depends on the type and the aim of the community (see, e.g., [4, 8]). Is it possible that similar to natural communities the diversity of human community members determines the stability and success of the group? We aim to study the evolution of human community structures and relate it to the success of the community. By this we want to determine promising member structures which lead to a sustainable and effective community.

For this, insights into the temporal or spatial dynamics of natural communities caused by predation, succession or epidemical spreading or disturbances caused by natural disasters or the intrusion of humans are of interest. They may demonstrate what types of impacts on the development of the community exist. The observation of natural communities shows that some communities are more stable or flexible than others and the question is, whether these insights can help to project how a human community reacts on different events. Furthermore, it is of interest to distinguish between actions that can be actively taken by the organizations and those that can not be influenced such as reports in mass media. This knowledge may be used to successfully build and manage communities.

We think that research on natural communities will very likely provide deeper insights into the dynamics of human communities. Our aim is to use these insights to model the impact of external and internal factors on the development of human communities. So far we are able to detect dynamics of human communities on different levels along the time axis [3]. Further research needs to be done to find the triggers of community dynamics and to explain the developments. To know how and why a community reacts on specific triggers is the key to determine appropriate measures to support and manage community building.

KEYWORDS: Networks, human and natural communities, community dynamics, graph mining.

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## STATEMENTS

- Research in the area of natural communities will strongly bring forward research on human communities.
- Communities have proven to be of strategic importance for organizations.
- The analysis of community dynamics is important to study the impact of external as well as internal influences.
- Methods to foster community building require more attention.
- A group of people might be considered a community, even though the members highly fluctuate.