Community: Issues, definitions, and operationalization on the web

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ABSTRACT
This paper addresses the concepts of *community* and *online community* and discusses the physical, functional, and symbolic characteristics of a community that have formed the basis for traditional definitions. It applies a four-dimensional perspective of space and place (i.e., shape, structure, context, and experience) as a framework for refining the definition of traditional offline communities and for developing a definition of online communities that can be effectively operationalized. The methods and quantitative measures of social network analysis are proposed as appropriate tools for investigating the nature and function of communities because they can be used to quantify the typically subjective social phenomena generally associated with communities.

Categories and Subject Descriptors
K.4 [Computers and society]: Miscellaneous

General Terms
Theory, Measurement

Keywords
Community, space, place, web, social network analysis

1. INTRODUCTION
Mitra [29] observes that "the notion of community has become a central construct in thinking about the way humans organize their lives" [29: 55]. Although humans appear to have a natural affinity for community, one primary factor inhibiting the study of communities is that what constitutes *community* is difficult to define [10]. Even though the concept of community is widely used in domains ranging from sociology, psychology and anthropology to economics, biology and complex systems, it has no single, accepted definition; and this lack of consensus on a definition has been the impetus for numerous debates as to what a community really is and how it should be operationalized.

The focus of *community* varies from domain to domain. Sociologists approach a community as a cultural construct or social context. Psychologists emphasize individual members of a community. Anthropologists concentrate on interaction among the members of a community and the development of shared value and symbol systems. Economists are interested in how the organizational structure of a community contributes to its production, distribution and consumption of goods. And political scientists investigate collective practices for achieving common goals. With such wide-ranging and diverse interpretations, *community* is an ambiguous and abstract concept that does not lend itself easily to scientific analysis.

With information and communication technology (ICT) playing an increasingly significant role in today's networked society, the idea of a community is no longer tied to a geographical locale: Regardless of their physical location, individuals can share their common interests by gathering virtually in the online communities associated with social bookmarking sites, blogs and forums; but the emergence of such online communities makes community detection and the analysis of communities even more complicated. In light of these developments, it is important to re-consider the various definitions of *community*, to revisit issues affecting traditional perceptions of offline communities, and to investigate how the development of electronic mediation and new modes of interaction and communication can affect the operationalization of communities on the web [6].

These concerns raise two important questions: How should we define a community in the environment of the web? And how can we detect, generalize and operationalize these online communities? Using a four-dimensional perspective of space and place[45], this paper examines and refines traditional concepts of *community* as well as the concept of *online community*. Working within the perspective of social network analysis, it endeavors to shed light on the nature and function of web communities and on their detection and operationalization. In light of computer-mediated communication technologies, this work has implications for the design of semantically interlinked online communities (SIOCs) [4] that "allow the creation of explicit and implicit connections between sites by both humans and computers, and to create a data infrastructure between different community sites" [4: 272].

2. TRADITIONAL PERCEPTIONS OF OFFLINE COMMUNITIES
Delanty [12] argues that "the popularity of community today can be seen as a response to the crisis in solidarity and belonging that

has been exacerbated and at the same time induced by globalization" [12: x.] Nonetheless, it seems impossible to clearly define what is meant when one speaks of community. Controversial debates surrounding definitions of *community* generally concentrate on four essential questions: Is community a social entity or a collective imagining? Is community geographically bounded? Is community static? Is community communication?

2.1 Is community a social entity or a collective imagining?

Based on empirical observation, Wenger [42] defines community as a self-contained entity. For Wenger, communities are "relatively small groups, such as neighborhoods, based on mutual interdependence and common forms of life" [42: 41]. From this perspective, a community is an entity constituted by both a group of individuals who have some "thing" in common and the set of social relations that obtain among them. Sarapin [36] characterizes this as a "real-world planned community" [36: 24]: Channels of sociability that are embedded in a physical framework and embody the guiding principle of human-scaled living. He contends, however, that many studies that rely on this understanding of community frequently fail to connect their empirical findings to theory. These studies focus on the phenomena associated with a community — on observations and expressions of community -- but they lack an appropriate theoretical argument. Such an approach to the definition of community is problematic because it regards community-related phenomena as the nature of community.

Other researchers regard community as a figment of imagination embedded in the natural human desire for belonging. For example, Anderson [1] claims that a community is a collective imagining rather than a specific form of social interaction. Similarly, Cohen [9] regards community as a symbolic structure rather than a set of social practices. He argues that a community is whatever people think it is. In this sense, the definition of community shifts from an entity comprised of a collection of social interactions and social practices based on locality to an imagining embedded in meaning, sentiment and ideology.

Nancy [31] rejects the idea that community has either a concrete form or an institutional or spatial structure. Following Anderson [1] and Cohen [9], Nancy argues that community can only be experienced -- that community exists in individuals' perceptions (or imaginings) of human experiences. Nancy places emphasis on the relational and experiential nature of community: Members can only construct, invent or reinvent their identities in a relationship with other members, and the community thus constituted can only be experienced through a communicative relationship rather than a common tie, however strong. Block [3], too, contends that community is the experience of belonging: "The social fabric of community is formed from an expanding shared sense of belonging" [3: 9]; and it is this non-material and invisible fabric of belonging that produces the visible phenomena associated with the traditional concept of community.

Olwig [32] rejects the idea that communities should be concrete, physical entities situated in particular places. He argues that communities are "cultural constructions that provide important symbolic as well as practical frameworks of life" [32: 124]. Similarly, Delanty [12] claims that "community is shaped by cognitive and symbolic structures that are not underpinned by 'lived' spaces and immediate forms of social intimacy" [112: xii]. Both Olwig and Delanty regard community as a cultural construction with a strong symbolic or imaginative flavor; and they consider a community's cognitive capacity to imagine itself to be one of the most significant features of community. For them, community does not exist as an entity or "a collective unit encompassing individuals" [32: 125]. Rather, communities are "culturally-defined units of meaning" [12: xi] that are "constructed through the negotiation of meaning among interacting persons" [32: 125].

Although defining a community as the product of a collective imagination is attractive in its simplicity, such an approach ignores the realistic and practical dimensions of community. Communities are not simply imagined by members or conceptualized by scholars; they exist -- and persist --through the daily reifications of their members [23].

2.2 Is community geographically bounded?

Debates over the reality of communities are closely associated with another question: Is community a location-oriented entity or a deterritorialized imagining?

Traditionally, the emergence, evolution and eventual decline of an offline community are considered geographically bounded. Sarapin [36] associates community with physical locale -- with those "places in which their residents can enjoy a 'sense of community'" [36: 24]. It is this "sense of community" that Delanty [12] identifies with "the foundation for a sense of belonging based on shared experiences, a common language and kinship ties and, above all, a sense of inhabiting a common spatial lifeworld" [12: 41]. Building on the idea of a sense of belonging, Block [3] claims that "physical space is more decisive in creating community than we realize" [3: 151], and he suggests that "we are in community each time we find a place where we belong" [3: xii]: Members of a community should share a certain degree of spatial proximity, be it a village, a neighbourhood or a university.

Ethnographers, in particular, reinforce this association of community with physical location, viewing community as how "a group of people refer to their special and shared relation to a geographical space and the place-making practices that create it" [20: 40]. Indeed, Gray [20] substitutes a "sense of place" for "sense of belonging" when he describes community as a distinctively social spatialization in which "place-making and the resultant sense of place are an essential part of how people experience community" [20: 40].

But the geographical orientation of community has been challenged by a process of globalization in which the human experience of proximity and distance has been radically redefined by ICTs. Community has become deterritorialized -- scattered by the multiplicity of non-traditional forms and places with which it is now identified [12: 117]. These new forms and places are not regarded as embodying territorial implications but as exemplifying various types of social relations. In this sense, the emphasis on physical boundaries that characterized more traditional definitions of community has been replaced by a focus on belonging: It is not the power of constructing boundaries that distinguishes community but the symbolic nature of community that leads to the creation of a sense of belonging.

Thus, although spatiality continues to be a significant component in defining community for some researchers, reliance on physical proximity as the predominant characteristic of community has diminished. As Howell [21] observes, "While communities in many cases consist of people linked through a particular locality, they may also consist of spatially and socially dispersed people

who nevertheless regard themselves as profoundly related, but through shared experiences and symbols rather than localities" [21: 89].

2.3 Is community static?

Discussions of community as a geographically bounded entity often consider community to be a cultural construction that is static and enduring. Culture has typically been assumed to be a stable structure, embedded in a long social history and maintained and inherited through language. The persistence and pervasive authority of culture have been assumed to exert a strong influence shaping the structure and duration of community.

However, even as early as the late nineteenth century, communities were viewed as more organic formations [15: 226] -- as potentially dynamic alignments rather than static structures. Community was increasingly understood as a loose, ephemeral collection of individuals that was constantly shifting due to group practices: a dense and multi-dimensional network of innumerate connections, continually negotiating an ever-changing commonality [12]. And, by the early 1960s, McLuhan [28] was predicting that the development of electronic communication technologies would eliminate the confines of space and time and replace them with a fluid and boundless "global village": Community would no longer be considered fixed or static but would be seen as situational and thus mutable.

As a significant contributor to social development, community has been viewed as a "creative force" [11: 532] that evolves over time. However, by escaping the limits of space and time, groups of people who share a particular concern, a set of problems, or a passion for a topic can deepen their knowledge and expertise by interacting with each other on an ongoing basis [42: 4], regardless of their physical locale.

This view of community as shifting and dynamic contributes significantly to Bauman's [2] discussion of the liquid nature of late modernity. However, this change in how community is perceived raises the question of whether community is anything more than an arena for interpersonal communication?

2.4 Is community communication?

The growing emphasis on community as involving interpersonal interaction leads to questions about the centrality of communication in community formation and evolution. Delanty [12] suggests that "community is essentially social; it is expressed in communicative contexts and is the basis of social recognition of the other" [12: xiii]. He identifies and discusses various types of communities: urban communities, political communities, postmodern communities, cosmopolitan communities, and virtual communities. However, Delanty's view of community as communication formed through collective action is ultimately limited by his functionalism: Although communication can be regarded as one of the functions realized by community, it is not the only function of community nor is it necessarily the most important. Furthermore, this simplification obfuscates the uniqueness of the concept of community in that it lumps communities with other kinds of social groups: Because all social groups can function as communication, what is it that makes community unique?

In fact, a community is very different from other types of social gatherings (e.g., party goers, conference attendees). German sociologist Ferdinand Tönnies [38] uses two separate terms -- *Gemeinschaft* ("community") and *Gesellschaft* ("society" or "association") -- to describe different levels of social cohesion. On the one hand, *Gemeinschaft* indicates an embedded "unity of will" such that the actions of members of the community will demonstrate a level of unity rather than an individual bias. Each member of the *Gemeinschaft* displays high loyalty to the community; and this unity of will leads to the shared common values that can affect both the identity of individual members and the degree of social cohesiveness within the community. On the other hand, *Gesellschaft* demonstrates a lower level of cohesion and a higher level of chaos than *Gemeinschaft*. *Gesellschaft* lacks the high level of shared morés and the embedded unity of will, leading individual members to act in their own self-interest and display less loyalty to the community as a whole. Similarly, Chavis and McMillan [8] have investigated the "sense of community" from a psychological perspective, and they suggest that four elements are essential to establish a sense of community: committed membership, influence of the whole, integration and fulfillment of needs, and shared emotional connection.

While it is obvious that the concept of community is built on a set of social relationships that support communication, the realization of a community actually involves multiple components (e.g., a sense of common character, identity or interests; a sense of belonging) that extend beyond the simple function of communication. Additionally, under the conditions of modernity, communities are becoming increasingly discursive, often creating a very fragile kind of belongingness or demonstrating only loose "weak ties" [19] among members. It seems obvious that communication, although an important function of community, is not the most important or significant function that characterizes community in the modern environment.

The competing views of community have triggered numerous debates; and traditional social theories have been powerless to achieve any semblance of consensus on the definition of a community. Indeed, *community* has become such a general and superficial concept that it is often represented by a collection of observable social phenomena: membership, relationships, commitment and generalized reciprocity, shared values and practices, collective goods, and duration [16]. Situational characteristics such as depth of interaction, level of affection, and the growth of relationships are often relied upon to distinguish a community from other temporal social gatherings, but there is little research that offers an appropriate method for measuring such vague concepts. These characteristics are more often used to represent subjective, emotional and implicit engagements rather than measurable connections. The resulting focus on the subjective makes it difficult to operationalize community for scientific investigation. Worse yet is the fact that the weakness of such subjectivity becomes even more obvious -- and more insidious -- when attempting to investigate the emergence of online communities.

3. Debates and confusions surrounding online communities

Although definitions of a community are diverse and, at times, vague, the concept of *community* has frequently been adopted to describe social practices in cyberspace. This extension to the non-spatial environment of the web has not only complicated how a community is to be defined but has also raised issues as to how online communities are to be operationalized for detection and investigation.

One component of all debates regarding online communities is whether it is appropriate to use the term "community" to refer to social activities and formations in the online social environment.

Are there differences between offline and online communities? If so, what are these differences? What is it that specifically distinguishes an online community? One of the more contentious issues in the debate over online communities revolves around the nature of the web itself, leading to the question "Is an online community a reality or a virtuality?"

3.1 Is an online community a reality or a virtuality?

According to Giddens [18], virtuality is a product of modernity that constantly "displaces" [18: 140] individuals from the places and everyday life with which they were familiar: Individuals are re-located in different contexts, in which "familiarity and estrangement are recombined" [18: 139]. Similarly, Rheingold [35] regards the web as a distinct world that is detached from reality even though it has the capacity to transform society. He describes communities on the web as "virtual communities" because they do not exist in everyday life: They are "social aggregations that emerge from the Net when enough people carry on those public discussions long enough, with sufficient human feeling, to form webs of personal relationships in cyberspace" [35: 5]. If virtuality is the opposite of reality, it follows that a virtual community on the web cannot be regarded as the same as -- or even similar to -- a traditional offline community. Because the online environment can only provide the illusion of reality and because a virtual community exists online, it is not part of the real world and thus cannot be understood or even discussed as a real world community might be.

However, Castells [7] offers a different perspective based on the argument that virtuality is a part of the real world. Because experience of the web is itself a part of modern reality, communities on the web constitute an aspect of reality and can therefore be viewed as extensions of offline communities. Castells does not consider virtual communities to be online counterparts of real-world, offline communities. Unlike real-world communities, virtual communities are "ephemeral" [7: 362] or "thin communities" [39] -- networks of sociability that support existing relations but rarely create new ones. Burnett [6] also contends that communities on the web can be understood as real communities. He contends that virtual, online communities are neither illusive nor imagined but exploit a new system of communication to sustain themselves. They are a mode of social interaction that makes use of text-based discourse in the form of public performances of writing, reading and interpreting texts.

To resolve the question of whether "virtual community" or "online community" is the more appropriate referent it is necessary to clarify the meaning of "virtual." According to The Free Dictionary [37], this term has two primary definitions: "1. Existing or resulting in essence or effect though not in actual fact, form, or name . . . 2. "Existing in the mind, especially as a product of the imagination." The argument adopted here is that a virtual community should be understood in terms of the first definition: The "virtual" in virtual community does not mean that the community is an illusion or that its activities are imagined. Rather, it indicates that a virtual community simulates the communities experienced in the real world.

Yale [43] points out that there are generally two types of communities on the web: those that interact with already established communities and those that have no basis in traditional social relations but have been entirely constituted via the web. Following Yale's argument, an online community can be an extension of an offline community that offers an alternative approach for conducting offline activities: The social body and primary activities of such an online community are still based on the reality of face-to-face interaction. However, virtual communities such as Facebook, Twitter, and Myspace are based on online activities. Although individuals who are friends in real life can maintain a friendship via such a community, supporting interactions among strangers who have never met in real life -- and may never meet in the future -- constitutes one of the main functions of such services. In this way, virtual communities -- communities where web users, most of whom are strangers in real life, gather to construct a community based on little more than a shared interest -- are relatively independent of life offline.

It seems evident that one reason why Rheingold [35] describes online communities as "unreal" is that he tends to emphasize the spatial dimension as a characteristic of community. Thus, within the context of the web environment, the original question regarding the spatial nature of community -- "Is community geographically bounded?" -- must be rephrased as "Are online communities bounded?"

3.2 Are online communities bounded?

With the rapid development of ICTs, a shared physical space is not an essential criterion for identifying or building communities, whether on the web or in the offline world. Geographic distance has become mediated distance, and physical proximity is less prominent in defining relationships between people than the nature and strength of relationships they develop and maintain via ICTs [34]. Social interactions are increasingly shifting from non-mediated to mediated because technology is becoming a more flexible medium for building and re-building humans' expressions of their own identities and their social relationships.

Instead of being bounded by geographical proximity, communities on the web are bounded by other forms of proximity: by proximity of emotions, by proximity of shared interest, by proximity of common goals, etc. Because such web communities are initiated and maintained in a digital environment, locale in the sense of physical space is neither a necessary nor a sufficient criterion for community. Rather, shared commonplaces, instead of physical or geographical territories, become priorities. It is the commonplaces shared by participants that determine whether they will constitute a community. Established via forms of communication and interaction supported by the platform of the web, the emergence and evolution of an online community will depend on the number of users involved and their passion rather than their physical proximity. Crossing both geographical and national boundaries, web users who share common interests, habits, values, or goals can come together to exchange information and conduct interaction though they may be bound by weak or "ephemeral" [7] ties.

The building of an online community is not unconditional. It will depend on certain common factors that bind members together, and each virtual community will possess a set of objectives, subjects, norms and values that are specific to its members as a whole. This approach to online communities necessarily implies that the interactions and mutual ties among members will play a significant role not only in building but also in identifying and maintaining online communities. As such, it points to a question posed earlier: "Are online communities static?"

3.3 Are online communities static?

Although lacking geographical boundaries, it is possible to identify an online community when members and non-members

are distinguished by a particular type of proximity. However, even those online communities which demonstrate a discernable proximity are neither static nor strongly bounded. They are, in fact, fluid, changeable and dynamic: Members not only join and leave, but they also become members of multiple different communities simultaneously [30]. As Turner [39] proposes, such "thin communities" are based on weak ties and thus are often very fragile assemblages of strangers. In this situation, interpersonal interaction among members seems more important than the technology itself [22]. Interaction and communication are, perhaps, the most important criteria for identifying an online community, thus posing the question "Is online community communication?"

3.4 Is online community communication?

Based on the assumption that "community is communication", Wellmann and Gulia [41] propose that bulletin boards and mailing lists can be identified as online communities since they provide an interactive, collaborative space for members to contribute or locate interest-related or regional information. Similarly, Yale [43] defines an online community as any group of individuals who interact with one another on a regular basis via computer mediated communication, pointing out that such communities only exist based on the communicative and information-based structure of cyberspace (e.g., websites, chat rooms). The implication here is that communication -- interactive communication -- is the primary criterion for identifying online communities.

Erickson's [16] approach tends to be more radical. He regards online communities as little more than "long term, computer-mediated conversations amongst large groups" [16: 13]; but he also suggests that such conversations may be better viewed as instances of a participatory genre, a mode of communication, or a type of online discourse rather than as a community. Unfortunately, this approach is limited by its functionalist reductionism: If communication is stipulated as the sole purpose and thus the defining characteristic of an online community, it negates any possibility of distinguishing between communities on the basis of common interest, complexities of structure, or the degree of relationship among community members.

Another approach adopted by some researchers is to focus on the sense of belonging associated with physical communities, but this focus is radically reshaped by the role of ICTs in building a more fluid form of community. From this perspective, online communities exemplify "a form of community mediated by a highly personalized technology" [12: 136) and distinguished by a new kind of individualism that has emerged because of the "ephemeral realities and de-massified social relations" [12: 137] possible on the web. This new form of individualism weakens the role of communication in online communities: As Britt [5] observes, "People join online communities for self-expression rather than socialization" [5: 94]. For example, personal blogs represent an extreme form of community that emerges around the individualism and self-expression of one person. And the presence of lurkers, who track the activities of a community but contribute nothing to it, weakens the argument that communication is the defining feature of an online community.

Obviously, the intellectual confusions that characterize discussions of offline communities are intensified when considering online communities, which are more intangible than traditional communities. Without the geographical boundaries of physical proximity associated with offline communities, how is online community to be operationalized, given its multiplicity of features, interactions and relationships that are often transitory, fluid, and even invisible? The confusion emanating from the inability to define and operationalize online communities poses serious difficulties for both the identification and investigation of such communities.

4. Operationalizing online communities

It is obvious that the concepts of *community* and *online community* are both vague and, at times, ambiguous. Nonetheless, they are widely applied in research investigating complex social phenomena.

The debates surrounding these two concepts can be regarded as an ambitious endeavor to exhaust all possible variables of social phenomena so as to provide a comprehensive likeness of what a community might be. However, such a comprehensive reflection of community seems impossible to achieve. The provision of a new and explicit theoretical framework as well as applicable measures to model and operationalize these social phenomena will be more useful than the suggestion of abstract and often fuzzy assumptions. Thus, in order to define *community* and *online community*, we offer a theoretical framework based on a four-dimensional approach to space and place [45]. This framework also provides a foundation for operationalizing communities and online communities in terms of social network analysis.

4.1 Theoretical operationalization: Four-dimensional perspective on space and place

Vague definitions of a community do not simply generate intellectual confusions. More problematically, they lead to difficulties in identifying communities. Basically, the question of how to define a community is essentially a question of boundaries, whether those boundaries are spatial, occupational, or emotional. Previous debates over the nature of *community* can be understood as attempts to define the particular boundary (or boundaries) that distinguishes what it is to be a community. Various types of boundaries have been put forward (e.g., spatial, temporal, affective, imagined, experiential); but, unfortunately, consensus among researchers has proved to be elusive.

We reconsider the boundaries of *community* and *online community* from a perspective based on space and place. The concepts of *space* and *place* are closely related to the most visible and immediate type of boundary-- that of physical boundary -- and can thus be understood as the intellectual foundation of notions of boundary. However, space and place are necessarily independent notions, both literally and linguistically: Place is not a derivation of space -- it is not simply a "specified" space; and space is not defined by place, even though, in terms of human experience, place appears to be naturally prior to space. In other words, physical space is not the foundation of place, because space does not equal (or require) a physical environment; and place does not require physical space to be contained. Epistemologically, then, space and place are imbued with different literal connotations. However, they are intertwined both practically and experientially because they constitute mutually complementary roles and functions in human life. It is the interaction of these two concepts that structures the human experience of spatiality, location, identity, belongingness, and a sense of place. In this sense, notions of space and place are essential to any definition of *community*.

A framework for understanding space, place and their interrelationships is summarized in Table 1. The different dimensions of space and place indicate the different levels of

engagement and immersion that affect spatial references. Space and place are generally independent of each other in the dimensions of shape, structure and context; however, in the dimension of experience they are intertwined. Application of this framework can help to clarify some of the confusions surrounding the notions of community and online community.

Table 1. Four-dimensional perspective on space and place [45]

	Space	**Place**
Shape	Spatial; neutral; objective.	Spatiotemporal; affective; intersubjective.
Structure	Undifferentiated; without boundary.	Distinct; bounded.
Context	Incomprehensible; a collection of possibilities; without behavioral constraints; conceptually unconstrained.	Known; recognized opportunities; with behavioral guidelines and expectations; conceptually constrained.
Experience	Uninhabited; potential mental framework for human experience; unfamiliar and unknown.	Inhabited; everyday classification/representation of human experience; familiar.

The dimension of shape can be used to refer to the emergence and origin of a community. On this dimension, community evinces a definite spatiotemporal connotation. Shape provides an affective and intersubjective framework for understanding community that acquires meaning based on "configurations of social actions" [14: 284]. Offline communities have traditionally been related to physical environments such as neighborhoods, villages, and cities. But the spatial characteristic of community also manifests a temporal shape: Communities are, by nature, fluid, dynamic and evolving, appearing, disappearing and even reappearing over time.

When considering the online communities of the web as well as the recent emergence of dispersed offline communities, the spatial dimension of community appears to be weakened; but this does not mean that online communities are without spatial dimension. Rather, an online community is a "spatial cueing" [40: 130] domain that is not bounded by spatial proximity but by a spatial-like proximity. Waterworth et al. [40] point out that individuals "are embodied beings, [and] meaning ultimately resides in bodily experiences" [40: 125]. They argue that humans "have evolved to act in the physical world, and how we are able to understand abstract information is derived from that capacity. … We experience the physical world as a three-dimensional space, with gravity holding our bodies, other people and things onto horizontal surfaces" [40: 125]. For this reason, the absence of spatiality may weaken the individual's sense of belonging or cause members of online communities and dispersed offline communities to feel "lost." Nonetheless, community in the digital age is imbued with a spatiotemporal metaphor derived from the individual's three-dimensional model of the physical world. And, because this spatiotemporal metaphor supports the extension of "spatial experiences … to abstract, non-spatial domains of experience" [40: 139], it facilitates the possibility of community in the online environment of the web.

Although the dimension of structure applies to specific formats of community, it is also epistemological: As knowledge requires the creation of structure, a world without structure is incomprehensible. Community is distinct and socially bounded, associated with order, familiarity and expectations. Preece [33] observes that offline community and online community both share three primary criteria: people socially interacting with each other in order to perform specific roles or realize individual goals; a shared purpose that provides a reason for the community's existence; and policies that guide people's behavior (e.g., rules, rituals, protocols). In this sense, traditional communities are constricted by "patterns of social action and accountability" [14: 284] and by the "social connotations" or "code[s] of conduct" [14: 299] represented in the dimension of context. The primary difference between traditional offline communities and online communities is that the latter are bounded by computer systems – "Different technical settings of group communication on the Internet have different supporting mechanisms and communication processes" [25] -- that support and facilitate sociability and a sense of togetherness, while offline communities are usually bounded by physical proximity. Thus, an online community is not an uninhabited or undifferentiated network without boundaries but a collection of possibilities and opportunities [27]. It is a familiar and recognizable "neighborhood" imbued with personal identities, social interactions, and a sense of belonging.

The dimension of context refers to the practice of community -- to the contextual and social aspects of community. Any community is governed by behavioral guidelines and expectations. Thus, the context and functions of a community shape the actual behavior of members and impose expectations and guidelines for their behavior. In addition, a community can engender various contexts based on the "appropriate behavioral framing" [14: 284] embedded in social connotations and codes of conduct: A community enables its members to coordinate, cooperate, and collaborate with one another by adjusting its features to promote emotional and affective interaction and to foster the acquisition of social capital. Thus, both offline and online communities are closely related to Heidegger's notion of *Being-there* (i.e., a bounded context with implied connections): They are situationally and contextually constructed so as to create community boundaries and to establish barriers to unauthorized entry. Thus contextualization functions as a gatekeeper to "provide and encourage an environment of hospitality, sharing, honesty, empathy and growth for exchanges between two people and between large groups of people" [36: 27].

The dimension of experience represents the interactive role of community in human experience. Community is a fundamental component of cognitive processing because human beings apprehend their existence based on the attachments associated with a sense of belonging: They live socially, they think intelligently, and they act based on "a shared understanding of appropriate behavior" [13: 311]. Thus communities, whether offline or online, play a functional role in everyday experience: Web users inhabit cyberspace through "embodied" and "semantic" navigation [14: 276] created by online communities in the web environment, which allows them "to explore virtual worlds of information using cognitive processes similar to those with which

they explore the real world" [40: 148] of offline communities. In addition, the boundaries associated with community inform a user's ability to categorize the environment -- to "split" and "lump" [44] -- which allows the individual to invent (or reinvent) her personal identity to reflect the feelings of belonging that emerge from an association with a community. In this way, community not only supports the individual's awareness of and interaction with others but also encourages development of a sense of security.

Based on application of the dimensions of shape, structure, context and experience, it is obvious that a traditional offline community is a "place" imbued with a sense of boundaries while an online community is a metaphor for such a "place" that triggers (or cues) human experience. Offline and online communities are not mutually exclusive, nor are they hierarchically or temporally ordered. Rather, they are mutually complementary. This interpretation of communities is logically supported by the dimensions of space and place. Furthermore, this framework can serve as a theoretical foundation for operationalization of the concept of *community* in terms of social network analysis.

4.2 Structural operationalization: Social network analysis

Whether they are viewed as places or as metaphors of place, communities -- and especially online communities -- appear to be subjective and thus immeasurable using scientific and objective methods. Liu [25] conducted an empirical research to test the presence of online community, proposing that the boundary of such a community could be determined by the channel where it resided and by the conditions of "sustained stable membership" and "sustained level of co-appearance" [25]. However, his operationalization of an online community is neither comprehensive nor well defined.

Given the definition of *community* as either a place or a metaphor for place in terms of shape, structure, context and experience, the application of social network analysis (SNA) offers an efficient and productive approach for the operationalization, detection and investigation of communities as complex social phenomena. Using the diagnostic tools of SNA, it is possible to capture the structure and function of communities and to provide a relatively objective interpretation of these "subjective" phenomena.

Marin and Wellman [26] define a social network as "a set of socially-relevant nodes connected by one or more relations" [26: 2). Nodes are units connected by the relations; and "any units that can be connected to other units can be studied as nodes" [26: 2]. Marin and Wellman provide examples of nodes used in previous research: web pages, journal articles, countries, neighborhoods, and departments or positions within organizations. As these examples illustrate, a social network is not necessarily a community. Similarly, a community is not necessarily a social network; but, given that a community is a bounded place (or metaphor for place) with a specific shape, structure, context and experience, it can be operationalized by the explicit mathematical models of SNA. In addition, SNA also provides an approach for analyzing the subjective (or qualitative) criteria of community in an objective (or quantitative) manner that can capture the embedded structure of communities while maintaining their rich social contexts. For example, major communities can be identified using community detection algorithms; and network properties (i.e., number of nodes and edges, network density, average path length, clustering coefficients) can suggest the durability, reciprocity, intensity, density, and strength of a community.

Across all four dimensions, there are two crucial criteria for identifying a true community: that every member is similar to another or shares common values, interests, or intentions; and that strong ties exist among members. By relying on qualitative analysis, it is difficult, if not impossible, to measure whether members are truly similar, at what level they are similar, and how strong the relationships between members are given that collected data (e.g., demographic information, surveys, interviews) are usually interpretative and biased. It would seem more reasonable to simplify this situation by analyzing shared nodes or indispensable edges. There is an ancient Chinese which states that "Birds of a feather flock together." In real life, people with similar interests, goals, or values also tend to congregate: The more interests, goals, or values that are shared -- or the more specialized those interests, goals or values -- the more likely it will be for individuals to interact with each other, and this will be indicated by the more nodes and/or edges that they share. Furthermore, stronger, more critical or more indispensable relationships will be indicated by a greater number of shortest paths between nodes. In this case, SNA measurements of vertex similarity and edge betweenness would be useful for quantitatively identifying the existence of a true community.

In contrast to the social theories discussed previously, the methods of SNA would be able to identify and interpret a community based on its structural properties rather than by relying on subjective characteristics. According to Fortunato [17], a community can be structurally operationalized as a group of nodes that are densely connected to each other but sparsely connected to other dense groups in the network. Structural features are crucial in the analysis of communities because their presence or absence, their frequency, and their organization can be used to investigate and interpret a community.

With SNA, multiple, otherwise subjective criteria can be operationalized as mathematical measures of a community. For example:

• Committed memberships can be operationalized as relatively high frequencies of ties among members when compared to nonmembers. A higher frequency of ties among the members of a proposed community than among non-members would validate the existence of a community quantitatively by indicating a greater number of contacts.

• Influence can be operationalized as the closeness or reachability of community members. Analysis of the distance between any two nodes would also provide a quantitative measure for the vague term "social distance:" By determining the distance between any two members of a community, qualitative assessments of social distance (i.e., intimate, close personal, far personal, close social, far social and public [24]) could be quantitatively demonstrated.

• Integration and affective connections among community members can be operationalized as the mutuality and frequency of ties between nodes. Affective connections could be analyzed as the strength of reciprocal directed edges among members, which would provide a visualization of how the members of the community are connected to each other. Analysis of the frequency of ties among nodes would indicate that each member had links to at least k others in the community. Although the intensity and strength of these links would not be determined using SNA measures, a large number of links between members would indicate frequent contacts and the possibility of strong social cohesion.

Figure 1 illustrates the process of operationalizing and analyzing community using SNA. To identify a true community, the qualitative criteria that every member of a community shares common values, interests, or intentions and that strong ties exist among members can be quantitatively calculated by two SNA measurements: vertex similarity and edge betweenness. Once a community has been identified, its social or qualitative properties can be analyzed using quantitative SNA measurements: Integration and shared emotional connections can be analyzed by mutuality (i.e., cliques) and nodal degrees (i.e., k-plex and k-core); influence as a whole can be analyzed by the closeness between nodes (i.e., k-clique, k-clan, and k-club); and committed memberships can be analyzed by the relative frequency of within and outside ties (i.e., LS sets and Lambda sets).

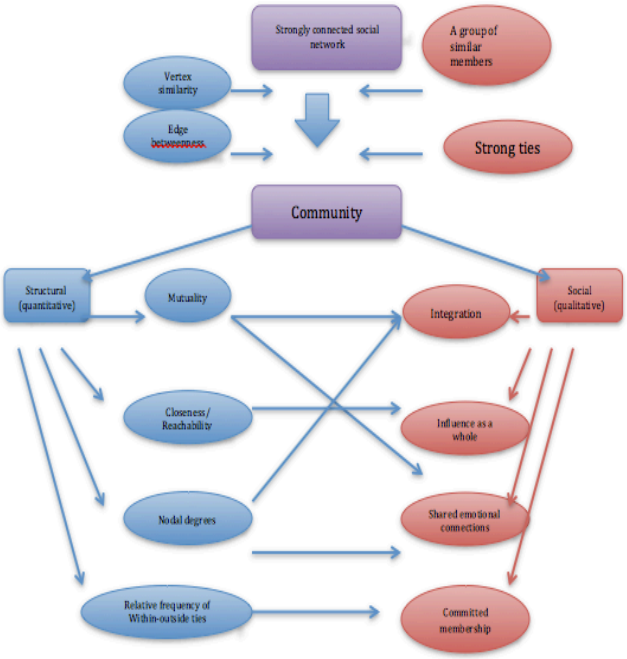

Figure 1. Process of operationalizing *community* using SNA

5. Conclusion

In order to operationalize the concept of *community*, we discussed various social science approaches to defining community and the issues and confusions that surround these approaches, especially with respect to the web environment. We argued that it is not appropriate to depend on qualitative analysis, which focuses on subjective understandings of community. In order to operationalize the notion of community, we applied the dimensions of shape, structure, context, and experience as a framework for understanding the fundamental nature of community; and we defined *community* as a "place" with an inherent sense of boundaries and *online community* as a metaphor for such a "place" that triggers human experiences, behaviors and expectations. We also suggested that the application of social network analysis would shed light on the nature and function of communities because it offers quantitative methods that can be used to operationalize and measure the subjective social phenomena associated with communities.

However, social network analysis may not be the final answer for problems of operationalizing community because it cannot account for the dimension of time. Analysis of the development of ties among community members demands a history of interactions over an extended period of time. Furthermore, the strength of community ties may increase or weaken over time; but it is difficult for current methods used in social network analysis to analyze the evolution of a community, indicating the need for more sophisticated measures that can account for dynamic processes of change across time.

6. REFERENCES

[1] Anderson, B. (1983). *Imaginary communities: Reflections on the origin and spread of nationalism*. London: Verso.

[2] Bauman, Z. (2004). *Identity: Conversations with Beneditto Vecchi.* Cambridge: Polity Press.

[3] Block, P. (2008). *Community: The structure of belonging.* San Francisco: Berrett-Koehler Publishers.

[4] Breslin, J. G., Decker, S., & Harth, A. (2005). An approach to connect web-based communities. *Proceedings of The 2nd IADIS International Conference on Web Based Communities* (pp. 272–275). Carvoeiro, Portugal

[5] Britt, B. C. (2011). The invisible man: Speaking into the online void. In S. A. Matei & B. C. Britt (Eds.), *Virtual sociability: From community to communitas* (pp. 84-100). Indianapolis: InterAcademic Press.

[6] Burnett, G. (2002). The scattered members of an invisible republic: Virtual communities and Paul Ricoeur's hermeneutics. *The Library Quarterly*, 72 (2), 155-178

[7] Castells, M. (1996). *The Rise of the Network Society.* Oxford: Blackwell

[8] Chavis, D. M., Hogge, J. H., McMillan, D.W., & Wandersman, A. (1986). Sense of community through Brunswick's lens: A first look. *Journal of Community Psychology*, 14(1), 24-40.

[9] Cohen, A. (1985). *The symbolic construction of community*. London: Tavistock.

[10] Cooley, C. H. (1983). *Social organization: A study of the larger mind.* New Brunswick: Transaction Books.

[11] Cox, A. (2005). What are communities of practice? A comparative review of four seminal works. *Journal of Information Science*, 31 (6), 527–540

[12] Delanty, G. (2010). *Community*. (Second edition). New York: Routledge.

[13] Dieberger, A. (2003). Social connotations of space in the design for virtual communities and social navigation. In K. Höök, D. Benyon & A. J. Munro (Eds.), *Designing information spaces: The social navigation approach* (pp. 293-314). London: Springer-Verlag.

[14] Dourish, P. (2003). Where the footprints lead: Tracking down other roles for social navigation. In K. Höök, D. Benyon & A. J. Munro (Eds.), *Designing information spaces: The social navigation approach* (pp. 273-291). London: Springer-Verlag.

[15] Durkheim, E. (1960). *The division of labour in society*. New York: Free Press.

[16] Erickson, T. (1997). Social interaction on the net: Virtual community as participatory genre. *Proceedings of the 13th Hawaii International Conference on Systems Science* (pp. 13-21). January 7-10, Wailea, Hawaii, USA. CA: IEEE Computer Society Press.

[17] Fortunato, S. (2010). Community detection in graphs. *Physics Reports*, 486, 75-174

[18] Giddens, A. (1990). *The consequences of modernity*. Cambridge: Polity.

[19] Grannovetter, M. (1973). The Strength of Weak Ties. *American Journal of Sociology*, 78 (6), 1360-1380.

[20] Gray, J. (2002). Community as place-making: Ram auctions in the Scottish borderland. In V. Amit (Ed.), *Realizing community: Concepts, social relationships and sentiments* (pp. 38-59). New York: Routledge.

[21] Howell, S. (2002). Community beyond place: Adoptive families in Norway. In V. Amit (Ed.), *Realizing community: Concepts, social relationships and sentiments* (pp. 84-104). New York: Routledge

[22] Jones, Q., Ravid, G., & Rafaeli, S. (2004). Information overload and the message dynamics of online interaction spaces: A theoretical model and empirical exploration. *Information Systems Research*, 15 (2), 194–210.

[23] Kempny, M. (2002). Cultural islands in the globalizing world: Community-cum-locality of the Cieszyn Silesian Lutherans. In V. Amit (Ed.), *Realizing community: Concepts, social relationships and sentiments* (pp. 60-83). New York: Routledge

[24] Kress, G., & van Leeuwen, T. (1996). *Reading images: The grammar of visual design*. London: Routledge.

[25] Liu, G. Z. (1999). Virtual community presence in Internet relay chatting. *Journal of Computer-Mediated Communication,* 5(1). Retrieved on January 2, 2012 from http://jcmc.indiana.edu/vol5/issue1/liu.html

[26] Marin, A. & Wellman, B. (2010). Social network analysis: An introduction. In P. Carrington & J. Scott (Eds.), *Handbook of social network analysis* (pp. 1-23). London: Sage.

[27] Massey, D. (2005). *For space*. Los Angeles: Sage.

[28] McLuhan, M. (1964). *Understanding Media: The Extensions of Man.* New York: McGraw-Hill.

[29] Mitra, A. (1997). Virtual commonality: Looking for India on the Internet. In S. G. Jones (Ed.), *Virtual culture: Identity and communication in cyberspace* (pp. 55- 79). London: Sage

[30] Morris, P. (2011). Glimpses of community on the web. In S. A. Matei & B. C. Britt (Eds.) *Virtual sociability: From community to communitas* (pp. 45-58). Indianapolis: InterAcademic Press.

[31] Nancy, J. L. (1991). *The inoperative community*. Minneapolis: University of Minnesota Press.

[32] Olwig, K. F. (2002). The ethnographic field revisited: Towards a study of common and not so common fields of belonging. In V. Amit (Ed.), *Realizing community: Concepts, social relationships and sentiments* (pp. 124-145). New York: Routledge.

[33] Preece, J. (2000). *Online communities: Designing usability, supporting sociability*. West Sussex: John Wiley & Sons.

[34] Preece, J., & Maloney–Krichmar, D. (2005). Online communities: Design, theory, and practice. *Journal of Computer–Mediated Communication*, 10(4), retrieved on January 2, 2012 from http://jcmc.indiana.edu/vol10/issue4/preece.html

[35] Rheingold, H. (1993). *The virtual community: Homesteading on the electronic frontier*. New York: Addison-Wesley.

[36] Sarapin, S. H. (2011). Front porches and public spaces: Planned communities online. In S. A. Matei & B. C. Britt (Eds.), *Virtual sociability: From community to communitas* (pp. 20-44). Indianapolis: InterAcademic Press.

[37] The Free Dictionary. (2012). Retrieved on February 4, 2012 from http://www.thefreedictionary.com/virtual

[38] Tönnies, F. (1887). *Gemeinschaft und Gesellschaft*. Leipzig: Fues's Verlag

[39] Turner, B. (2001). Outline of a general theory of cultural citizenship. In N. Stevenson (Ed.), *Culture and Citizenship* (pp. 11-32). London: Sage.

[40] Waterworth, J. A., Lund, A., & Modjeska, D. (2003). Experiential design of shared information spaces. In K. Höök, D. Benyon, & A. J. Munro (Eds.), *Designing information spaces: The social navigation approach* (pp. 125-149). London: Springer Verlag.

[41] Wellman, B., & Gulia, M. (1999). Virtual communities as communities: Net surfers don't ride alone. In M. A. Smith & P. Kollock (Eds.), *Communities in Cyberspace* (pp. 167-194). London: Routledge.

[42] Wenger, E. (2001). Supporting Communities of Practice: a survey of community-oriented technologies. Retrieved on January 2, 2012 from http://www.ewenger.com/tech

[43] Yale, R. N. (2011). Welcome to I-berspace: Media gratifications in successful virtual communities. In S. A. Matei & B. C. Britt (Eds.) *Virtual sociability: From community to communitas* (pp. 101-118). Indianapolis: InterAcademic Press.

[44] Zerubavel, E. (1991). *The fine line: Making distinctions in everyday life*. New York: Free Press.

[45] Zhang, G., & Jacob, E. K. (In press). Reconceptualizing cyberspace: "Real" places in digital space. *The International Journal of Science in Society*.