

From “Localized” to “Networked:” A Transformation in Community Structures

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Abstract

Communities are undergoing a fundamental transformation in structure. This change in social organization has implications for group formation, loyalty strength, and the flow of information and resources through social networks. Both the former and new structures have unique advantages as well as particular weaknesses. This paper explores both sets of community structures, and examines how various technologies facilitate the transformation by increasing access to diverse human capital. It also examines the uses of this model in sustainable development projects.

0. Outline

Section 1 introduces a basic question and establishes the context of this article.

Sections 2 and 3 provide background material on social capital and transaction cost, briefly discussing how they interact with social structures.

Sections 4 and 5 describe two very different fictional communities as poles on a spectrum, touching on the characteristics and strengths of each.

Sections 6, 7, and 8 discuss the unique strengths and particular weaknesses of both Localized and Networked structures.

Sections 9 and 10 discuss the roles of technology in shifting communities from Localized structures to Networked ones. Section 11 describes the shift more generally, and Section 12 discusses economic incentives for the shift.

Section 13 describes why these considerations are important in sustainable development projects.

Section 14 summarizes and concludes.

1. Introduction

Scholars and laypersons alike are noticing a steady and definite change in the social operation of their neighborhoods and communities. One describes it this

way: “When I was a child, I would walk around in our village and see many people outside, playing or walking or talking to one another, things like that. These days, I walk down the same streets and don’t see people outside much anymore. Most of them are inside on their computers, working or playing video games or navigating the Internet. There isn’t as much interaction anymore, not as much community” [1]. Does less interaction indeed mean less community? As people spend more time using Information and Communications Technologies (ICTs) and less time on in-person communication, does that actually weaken civil society by breaking down communities?

While describing what he sees as a collapse in the United States’ civic life, Putnam [2] states, “There is reason to believe that deep-seated technological trends are radically ‘privatizing’ or ‘individualizing’ our use of leisure time and thus disrupting many opportunities for social capital formation...Is technology thus driving a wedge between our individual interests and our collective interests? It is a question that seems worth exploring more systematically.”

The question Putnam poses has long been a topic of interest in academic circles. Barry Wellman, a respected scholar in the field, wrote in 1979 that “The Community Question has set the agenda for much of sociology” [3]. He continues by exploring how social capital is affected by the societal changes accompanying progress in infrastructure. Has community been Lost, Saved, or Liberated?

As the engineers who are designing and deploying ICTs in communities across the globe, we should be aware of the impacts these technologies have on social structures, and then guide our work towards those technologies that facilitate the development of strong, sustainable communities.

2. Social Capital

“More is different” [4]. When people come together and interact in ways that makes the capacity of the entire group different than the sum of its parts, the difference is termed “social capital.” When combined with physical

capital (money, equipment, land, materials), human capital (education, labor hours), and technology (a way of combining forms of capital to produce output), these concepts describe an economy's capacity for production.

Although economists have long had convenient measures for quantifying physical and human capital and explaining their effects on production, the concept of social capital has remained more nebulous, in large part because of the changing nature of how it operates - a change explored in this paper. For this paper, let us accept Coleman's statement that "...Social organization constitutes social capital, facilitating the achievement of goals that could not be achieved in its absence or could only be achieved at a higher cost" [5]. We supplement this definition with Putnam's, defining social capital as "networks, norms, and trust that facilitate collective action" [2].

3. Transaction Costs

When people to come together and interact to make their team effort different than what they could accomplish individually, there are two important components in this difference.

First are the gains from specialization and the gains from being able to attack a problem from multiple different angles simultaneously. There are also gains resulting from the "critical mass" effect: that sufficient resources are needed in order to overcome particular barriers: water poured into a cup must reach a minimum threshold before any of it can go beyond the limits of its present container. This is why our ancestors hunted woolly mammoths in packs.

Counterbalancing these 'positive' effects are the transaction costs involved with bringing people together. They are the costs of finding information, establishing relationships, building effective communications channels, forming and enforcing contracts (including tacit contracts), and maintaining connections. Coase [6] identified transaction costs as the reason why firms and organizations exist.

The ideal size and structure of an organization is a function of the group's goals and the transaction costs involved. A stable group size is where the marginal gains from specialization and multiple "angles of attack" outweigh the marginal transaction costs of bringing more people together.

As the group gets larger, the transaction costs involved with managing relationships grows - much faster than the group size, if everyone in the group must communicate with a majority of other members. At a certain point, the transaction costs exceed the benefits of increasing group size, which is why, for example, adding people to a late software project makes it even later [7].

Because transaction costs are important in how and why groups form, a change in technology that significantly alters transaction costs will alter our social structures in some significant way.

Clay Shirky describes a change in social structures almost exclusively as a function of decreasing transaction costs. "When we change the way we communicate, we change society...The current change, in one sentence, is this: most of the barriers to group action have collapsed, and without those barriers, we are free to explore new ways of gathering together and getting things done" [8].

Shirky also notes that when transaction costs fall, the value of small contributions to a collective action project can exceed the transaction costs of securing and integrating that contribution. (For example, a single grammatical edit on Wikipedia adds value). A collapse in transaction costs, part of the philosophy of interactive "Web 2.0," allows for newly effective structures and norms for social organization, creating new forms of "social capital" as defined above.

A decrease in transaction costs, made possible by new technologies, is changing society - but how?

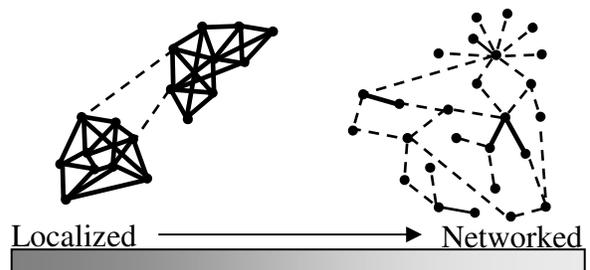


Fig. 1: A Spectrum of Network Structures

4. The Localized Community

On one end of a spectrum, let us consider a fictional small-town community where everybody knows everybody. Social networks are highly clustered (see Fig. 1 for an illustration). This place, which is still a physical place as much as it is a social one, resembles Garrison Keillor's Lake Wobegon [10]. Its boundaries are strong and rarely crossed: someone who leaves physically leaves socially (at least temporarily). People know who is in the community and who is an outsider, making barriers to entry high.

It is home to Handyman Dad, Dr. Mom, and a host of other "generalists" who will tell you that "the secret to success in life is knowing how to do at least a little of everything you need." If you have a leaky pipe, you fix it yourself.

In the Localized community, strong ties are the norm and relationships run deep. As a further subdivision of

social capital, Localized communities are high in “bonding capital” which is useful for the transfer of **value**. Other forms of capital, including social capital, can be shared across these strong bonds that are the beams and cabling of Localized social structures. Organizations can call for solidarity and complete loyalties of their members, the bonds of brotherhood are not necessarily restricted just to biological relations, and good friends would perish to save one another. This strong-tie network base serves to distribute gains and losses throughout the community, as an informal social insurance based on the norm of reciprocation. (See Coleman [4], for a discussion of how this norm may represent social capital in the form of unwritten ‘credit slips.’)

Collective action in the localized community relies on the solidarity discussed above, using general labor in events like barn-raising and bucket brigades. It may be hard for a person in a Localized community to find someone with specialized *skills* to help them with a particular problem, but because of the stronger ties it is easier in a Localized community to find someone with the *willingness* to help. The low average number of ties means that this search process can, within a reasonable period of time, identify whom one can/should ask for assistance with a particular issue, or conclude with relative certainty that nobody in the searcher’s network can provide the desired assistance.

Tradition plays an important role in the Localized community. The fact that something has been done in a particular way for a long time is often sufficient reason to continue doing it that way. This may be related to the strong ties, deep social base, and communications cost of coordinating change. As a result, change (including the adoption of innovations) is often slow.

5. The Networked Community

On the other end of the spectrum, let us consider a different fictional community where nobody knows everybody, but everybody knows a cluster of people who have related interests, skills, and/or experiences- a “hub and spoke” relational model. Open triads (A knows B and C but B does not know C) are common. As a result, individuals do not know exactly who is in and out of the social network except on the basis of whether or not a person subscribes to the particular norms that allow the Networked social structures to function well.

This place is really more just a “social space” that cannot be pinpointed to any specific geographic area, although Barry Wellman’s Netville [11] may not be far off. It is home to specialists in every field, including highly educated individuals who will tell you that “the secret to success in life is knowing how *./=* to do one very

specific thing better than anybody else in the world.” If you have a leaky pipe, you call a plumber.

In the Networked community, weak ties (acquaintance-level relationships) are the norm. As opposed to the “bonding capital” of a Localized community bonds, Networked social structures are high in “bridging capital” which is useful for the transfer of **information**. Maintaining these relationships takes less time and resources on average than the average relationship in Localized communities, so each person can maintain a relatively large number of social connections. Although having many ties increases the probability that an individual would have an acquaintance with any particular skill or resource, the number and strength of these ties makes difficult the task of precisely identifying that person and obtaining their help, especially if that skill or resource is outside the contexts where an individual’s social relationships were formed. Effective search in social networks is a key challenge for Networked communities, one that social networking sites (Facebook et al.) are now trying to solve.

In mostly localized communities, weak ties serve as bridges between clusters rapidly decreasing the “degrees of separation” between people in different clusters [12] and allowing us to roughly quantify the value of “bridging capital.” As described in Granovetter, weak ties are powerful precisely because of the social separations they bridge. Weak ties open direct channels for the flow of some resources and information. For certain change objectives (such as finding a job), weak ties serve far better than strong ties because they provide access to more novel information [13].

In the Networked community, decisions are made through a present day analysis that looks more forward in time than back in time. If a new tool or method for accomplishing a particular goal is technically or economically superior to the old, there is a good chance that it will be adopted. People are relatively open to new ideas, new perspectives, and new ways of looking at things, because being open to these ideas is more effective in solving problems and coping with the diverse environments they are surrounded with. As a result, change happens relatively quickly. Collective action in the Networked community is accomplished by bringing together a group of people with a particular interest or skill set. Special-interest organizations and projects (*e. g.* the Sierra Club or open-source software community), which ask only for loyalty on particular issues, dominate in Networked structures.

6. Handling of Natural Disasters

Localized and Networked structures each have unique strengths that help in challenging situations, but they also

have weaknesses which make them prone to particular kinds of disasters.

The individualism and anonymity offered by Networked social structures means greater individual freedom, but that some people may fall through the cracks if they have not built a strong local support web. In the event of a personal disaster or a natural event (such as a heat wave), these people may be overlooked, unable to find help (or unbelieving that they would find help if they sought it), and left to suffer or die alone – even in large numbers [14]. Localized communities are better at handling geographically localized natural disasters, because they can mobilize people in the affected areas relatively quickly to achieve even large collective action projects.

Other natural disasters (such as hurricanes), however, can be best handled by evacuation. In these cases, individuals who have social networks spanning significant geographic distance are best prepared.

7. Network Disasters

The strong bonds in Localized social structures can sustain a relatively high degree of conflict tension before breaking. However, if sufficient conflict is introduced so that a schism does begin, an analog to whiplash may result from the breaking of strong bonds. Localized structures amplify the effects of a schism but reduce the probability of such a split.

Networked structures are subject to the same failure modes as tightly coupled engineering systems, where no single viewpoint is sufficient to fully understand the interconnections of a networked system, and where change can happen in that system very quickly. (*e. g.* a power grid, where a single event can quickly cascade into a large blackout.) Effects of a disaster in one part of a network can propagate quickly through informational, economic, military, and social channels to impact other parts of the network in very significant ways. Because of the complexity and size of the networks involved, those particular channels are often not revealed until it is too late to add insulating buffers. For example, a Thai currency decoupling in 1997 propagated through unexpected economic channels and nearly triggered a world financial market failure [12]. Underlying sentiments and hidden networks of military alliances caused the 1914 assassination of an Austrian Archduke to escalate into World War I. Our current financial crisis was arguably triggered by a relatively small number of failed investments, whose effects propagated through a fast-acting, globally connected economic system to cause some of the largest bank failures in US history. We do not yet know along what other channels this crisis will continue to propagate.

What we can learn, however, is that although Networked social structures may allow faster economic gains, they are also subject to a kind of network disaster that we may not yet be prepared to understand or deal with. If we desire sustainability in the technical and social infrastructure for the coming century, we need to account for the unique weaknesses that we may be introducing through new social and economic structures, enabled by technology.

8. Public Works, War, and Loyalties

Individuals and solidarity groups in Localized communities can more easily be mobilized for projects requiring complete loyalty and devotion, such as taking up arms in national conflicts. The unity of a Localized community is very important to its members. The interest of maintaining unity may even claim greater weight in a community's decision than a clear, objective evaluation of possible externalities. Members of a Localized community value their relations with one another (and other members' perceptions of them) much more than they care about what happens to people outside the community, and they can easily distinguish between the two.

Those in Networked communities may be far more reluctant to express complete devotion to group ideals. It is relatively hard to mobilize Networked community members to arms as a solidary group, especially if individuals have social ties with their nation's purported enemies. (“With a friend in every country, who can go to war?”) Networked communities lack a clear way to define “us” and “them,” a necessary distinction for large-scale conflicts as we know them. The same group distinction (of “us”) helps mobilize effort for large public works projects (including disaster cleanups), which for local projects may be more difficult with Networked structures.

9. Role of Telecommunications

Available, inexpensive, reliable and effective telecommunications technology can remove geography as a major factor in choosing one's friends and acquaintances. Today's phone network make it almost as easy and cheap to place a call to somebody halfway around the world as it is to call a colleague across the hall. Technologies like e-mail, instant messengers, and VOIP, now free [9] to anyone with internet access and equipment, completely disregard geography in how they connect people. The world's cellular network also means that people can be reached with little regard to their physical location. To reach somebody and to be reached is now orders of magnitude easier than it was just a

couple decades ago. This fact facilitates the development of Bridging capital (although it may also support maintenance of pre-existing ties that contain Bonding capital) and so enables Networked communities to thrive.

However, today's most accessible channels transmit only voice and/or text, elements which form a surprisingly small percentage of communication in a face-to-face exchange. Our eye contact, gestures, tone of voice, context, and other body language often does most of the communication, carrying emotional messages that add a richness to a conversation which is part of the human experience (as distinct from the "life" of a machine). This fact may be a reason why social connections in the Networked community (which often rely on telecommunications) are predominantly weak ties. Critics of Networked social structures decry the diminution of nonverbal communication as a significant loss of value [15].

As higher-bandwidth communications technology becomes more accessible and allows telecommunications to include nonverbal cues, this criticism will dampen and Networked structures community structures may be able to capture some of the strengths and benefits associated with strong-tie social structures. Video chat is now free [9] over broadband computer-computer connections between people with the appropriate equipment, and 3D holographic communication has been demonstrated [19]. Reducing the cost, improving the performance, and increasing the availability of these technologies will improve conditions for the shift to Networked communities. Tools enabling effective search in social networks and collaborative production would further take advantage of Bridging capital and may accelerate the shift.

10. Roles of Transportation & Density

Advances in transportation technology (such as reducing costs, expanding range, and increasing reliability) also facilitate the development of Networked communities. These technologies bring people together for face-to-face meetings where the current capabilities of telecommunications still falls short [15]. Their ability to efficiently transport goods and services enlarges markets, raising the maximum efficient degree of specialization. Transportation advances also reduce the importance of geography as a consideration in locating steps for business or manufacturing processes.

Urban density can have a similar effect in promoting Networked structures. Where people and resources are clustered together, simpler transportation technologies (*e. g.* feet) are sufficient to bring people together. Now, for the first time in history, half of the world's population lives in urban areas [16].

11. The Shift

Communities in stable areas, especially in the developed world, are mostly shifting from Localized toward Networked structures. The statistics and details of this shift are beyond the scope of this paper (but can be found elsewhere, under various names), with effects ranging from changes in family structure to economic globalization. Richard Florida [17] illustrates this conversion by describing a "creative capital" which forms at the expense of "traditional social capital." I believe that the shift can be represented by the changing form of social capital, from structures dominated by Bonding capital to structures dominated by Bridging capital. Various combinations of these allow a full spectral range.

We have long been making progress in telecommunications (*e. g.* postal service, HAM radio, internet) and transportation (*e. g.* animals, carriages, boats, trains, cars, planes), and the recent growth of cities is only a chapter in global history. While these changes do not directly *cause* the shift from Localized to Networked communities, they do *enable* that shift [8]. The shift from Localized to Networked community structures has been happening right along with advances in the enabling technologies [11] – the only difference now is that we are developing and deploying advances in those technologies much more rapidly than we used to.

Based on a year of literature review and conceptual modeling, I believe that the common factor which allows communities to move from Localized to Networked structures is *access to diverse human capital*. This access is enhanced by transportation technologies and urban density. It is also greatly enhanced by telecommunications technology and by information technologies (which are not discussed in this paper), to the degree that these technologies can be used effectively.

Each step toward making search in social networks easier enhances our ability to capture benefits from social networks, though the effect is more pronounced in Networked community structures than in Localized ones because the present deficit is more pronounced in Networked communities than in Localized ones. As we build better solutions for search in social networks, I predict that the shift from Localized to Networked community structures will accelerate.

12. Economic Incentives

Although full bandwidth communication and strong bonds may provide or enhance real value in human life experience, a larger number of diverse acquaintanceships provides more raw economic efficiency. They are structured for productivity, allowing direct flow of

information and resources (up to efficiency limitations determined by transaction costs such as search in social networks).

In our current system of quantifying economic value, we omit value that is stored in personal relationships. This is likely due to the inherent difficulties of assessing, describing, and transferring this stored value. Most technology is engineered with the goal of capturing direct economic benefits, and their success or failure is often, at least in the short run, measured in economic terms.

Because Networked communities are better for capturing economic value under the current system of assessment, technologies which facilitate the development of Networked communities is in high demand.

Telecommunications companies can also shape the nature of communications through economic incentives to customers. Low cost (but high profits) and easy payment structures brought SMS (text) messages into popularity [20]. Today, it remains one of the cheapest communication channels. At 160 characters per message, SMS also represents the most limited-bandwidth form of communication that is readily accessible.

SMS's asynchronous nature, like e-mail, has productivity benefits, especially in logistics and coordination. The limited amount of information that each message can convey also allows individuals to deliberately avoid wider-human-bandwidth forms of communication. This reduces the potential awkwardness and uncertainty that people face by not knowing exactly what messages they are sending through a higher-bandwidth channel [21]. Allowing and economically encouraging this social avoidance may have further implications for our future society, but those implications are beyond the scope of this paper.

In conclusion, current communications technologies and the economic incentives around them facilitate the efficient coordination of resources and information flow. While technological advances *enable* the formation of Networked community structures through enhanced access to diverse human capital, it is economic incentives that actually drive the shift.

13. Sustainable Development

At a recent "Technology for Humanity" workshop co-sponsored by SSIT, Gertjan Van Stam presented advice for Westerners seeking sustainable success with development projects in areas like Zambia. "People in the West tend to think *rationally*, engineering development in economic terms – but in these areas, that just doesn't work. People in southern Africa think *relationally*, in terms of how a particular development will affect the people and relationships in their community. Those things are the most important. If you want a development

project to be sustainable, you must think relationally in how you design and frame your project" [18].

For sustainable development projects to succeed, the projects must integrate with existing structures of social relations. Understanding where a community is along the Localized-Networked spectrum at the beginning of a project, and understanding where they would like to be at the end of it, will allow project designers to choose appropriate technologies to meet the community's goals. Because a community's placement on the spectrum yields insights into their speed and motivation for adopting change (including new technology), the Localized/Networked paradigm can also help designers write effective and sustainable plans for implementation.

Discussing possible impacts that a proposed development project may have on a community's relational structure with that community (especially if they are closer to the Localized end of the spectrum) can increase the likelihood that a development project will be sustainable. They will feel that the project developers share their assessment of significant value in personal relationships, even if our current economic systems cannot quantify that value. A community's trust that a developer will examine all issues that the community counts as important is essential for social sustainability [22]. Such dialogs can also raise important questions early in a 'sustainable development' project, when changes can still be made to increase the sustainable benefits that the project can yield.

14. Summary and Conclusions

Communities can be placed along a spectrum of social structures, from clustered strong-tie solidarities on the Localized end to hub-and-spoke webs of geographically distributed relationships on the Networked end. Localized social structures are dominated by the Bonding type of social capital (which allows a relatively high degree of intimacy, emotional support, and the transfer of value), and Networked communities are dominated by the Bridging type of social capital (which cross the boundaries of common social 'circles').

Communities in stable areas, especially in the developed world, are (on average) moving along this spectrum from Localized toward Networked. *Access to diverse human capital*, as provided by telecommunication technologies, information technologies, transportation technologies, and urban density, enables this shift. Economic incentives drive the shift, as Networked structures more efficiently capture benefits measured in our current economic system.

Both Localized and Networked social structures have their own unique strengths and are each prone to different types of crises. If we seek sustainable development, we

need to consider these potential weaknesses and design for them. ICT designers, deployers, and policymakers are encouraged to consider the social-structural impacts of their technologies, and the Localized/Networked Bonding/Bridging model is offered as a qualitative approach to these considerations.

If used as a quantitative evaluation tool, the basic model introduced in this paper will need to be refined and quantified through further research.

For social sustainability, development projects must be designed mindful of the social structures in their target community(ies). The Localized/Networked paradigm may be useful for evaluating the social relevance and impacts of a proposed project. As presented here, the model can be used to conceptually model impacts and spark discussions with community members about desired social outcomes of sustainable development projects.

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