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The Evolution of the Children's Television Community, 1953-2003

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Understanding the organizational history of the children's television community is essential to understanding why children's television has evolved in the way that it has. A theoretical model is developed to focus on the evolution of communication networks linking the major organizational populations that comprise the children's television community. Additionally, a stage model of four community evolution phases is proposed: emergence, maintenance, self-sufficiency, and transformation. The model specifies the changing levels of competitive and cooperative networks that should occur in community evolution. Six hypotheses test the relative efficacy of competitive and cooperative networks across these four phases and the role of major environmental events. Data from interviews, network analysis, and historical records are combined to create networks representing the relationships among eight organizational populations over 50 years between 1953 and 2003. The analysis shows that the empirical data fits the curves specified in the theoretical model fairly closely. Also, several of the hypotheses are supported, including those that specify the preeminence of mutual networks over competitive ones in the early phases of the community, the increase in competitive networks with an increase in density, and the decline of both as the community entered a period of transformation, changing from the children's television community into the children's media community.

Recent scholarship in organizational evolution has identified four major theoretical and research issues. The first is the need to understand organizational evolution from the community level rather than the population level (e.g., Aldrich, 1999; Astley, 1985; Baum, 1996; Carroll & Hannan, 1999; DiMaggio, 1994; Ruef, 2000). With few exceptions, research in this area has focused on the evolution of organizations or populations of organizations rather than the communities to which they belong (Hunt &

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Aldrich, 1998). The second issue is the need to more systematically understand the complex ecological relationships within organizational communities (Baum, 1996) because few studies have employed an ecological framework to study organizational communities. Although the tenets of community ecology, discussed later, identify possible types of relationships between organizational populations, to date, the research conducted in this area has focused on only one or two (Hunt & Aldrich, 1998; see Powell, White, Koput & Owen-Smith, 2005 for an exception that examined multiple relations).

The third opportunity, the need to incorporate network analysis in the study of community ecology (DiMaggio, 1994; Monge, Heiss & Margolin, 2007; Monge & Contractor, 2003), arises from DiMaggio's (1994) critique of the field of organizational evolution and its approach to more macro levels of organizational change. DiMaggio (1994) highlighted the importance of understanding the *relationships* between populations as a pivotal locale of evolution. Moreover, he argued, "network analysis and organizational ecology can be combined to their mutual advantage" (p. 447; see also Kauffman, 1993). The fourth issue is the need to develop a multilevel understanding of organizational communities because communities are inherently multilevel, comprised of populations which are, in turn, comprised of organizations. Monge and Contractor (2003) developed a Multitheoretical Multilevel (MTML) framework to study communication and organizational networks. This framework incorporates multiple network levels, both the entire network as well as its dyadic, triadic, and group components. This article addresses these four issues in differing degrees by developing an integrated theoretical framework for studying the evolution of organizational communities. It tests this model with data from the children's television community (CTVC).

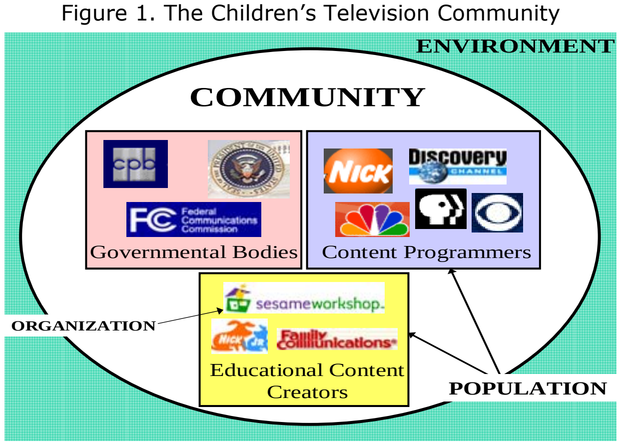
Studying the changes that have occurred in children's television through a community ecology framework provides a better understanding of *why* the community has evolved as it has. This understanding contrasts with the current norms in the literature which explain changes that have occurred by focusing on one particular mechanism within the environment or the population and extracting an explanation from this single event. Moreover, this research adds to the organizational communication literature by advancing the community as an important unit of analysis, thus shifting attention away from the myopic level of the individual organization. Further, the inclusion of communication network theories and methods in the study of community ecology offers organizational change scholars a new set of tools for trying to analyze the relatively abstract and often seemingly intractable community level of organizational evolution.

Children's television programs are the end product of processes of communicating and organizing. These take place within the CTVC, a coordinated set of organizational populations that function to create, distribute, defend, and support children's television. The process unfolds through the interactions of these populations, the co-evolution of which has produced what five decades of American children have seen on their television screens and what recent generations of children have seen around the world as a growing part of the global information society (Castells, 2000).

Figure 1 provides a representation of the multiple levels of the CTVC. Multiple organizations like Sesame Street and Nick Jr. make up the Educational Content Providers population. This population relates to the other populations that constitute the community, including the two shown, the Government

Regulators and Content Programmers. The community, in turn, relates to the environment. In all, eight populations have been essential to the evolution of the community: educational content creators, entertainment content creators, content programmers, toy/licensed product manufacturers, advertisers, advocacy groups, governmental bodies, and philanthropic organizations. Educational content creators create programs that are explicitly educational, such as *Sesame Street* (Sesame Workshop), while entertainment content creators create programs that are *not* explicitly educational, such as *Mighty Morphin Power Rangers* (Saban Industries).[1] Content programmers program children's television shows (e.g., ABC Family, Discovery Channel, Nickelodeon). Toy tie-in and licensing companies create and manufacture toys or other products that are associated with children's television programs, either through direct sponsorship of the programs such as Barbie in the 1950s, or by licensed products such as Strawberry Shortcake in the 1980s (e.g., Mattel). Advertisers promote their child-targeted products, such as cereals or toys, during children's programming (e.g., General Mills, American Girl). Governmental bodies enact, carry out, and enforce legislation and regulations pertaining to children's television (e.g., Corporation for Public Broadcasting, FCC, Congress). Advocacy groups monitor and advocate for changes in children's television (e.g., Action for Children's Television, MediaScope). Finally, philanthropic organizations financially and otherwise sponsor or support children's television programming (e.g., Markle Foundation, Ford Foundation). These eight populations are a diverse group. Each has a unique history with regard to its emergence, entrance into the CTYC, and relationship with other populations within the community.

Figure 1. The Children's Television Community



[1] Although there is some overlap between these two content creation populations, particularly within larger media companies like Nickelodeon, which produces both original educational programming through its Nick Jr. brand and original entertainment programming through its Nickelodeon brand (and would be considered primarily a content programmer); they have been separated out in this manner because each has a different set of resources and environmental pressures, they often function differently within the community, and their relationships with other populations overtime have been different. Most content programmers do not create very much original programming, either educational or entertaining, and instead acquire those programs from production companies.

A Communication Networks Approach to Community Ecology[2]

The evolution of an organizational community depends in fundamental ways on the evolution of the community's communication network (Monge, Heiss & Margolin, 2007). This section presents the theoretical perspective of community ecology. The following integrates the network perspective.

The basic premise of community ecology is that *populations* of organizations (or organisms) do not evolve as a closed system. Instead, *communities* of populations evolve. These communities are situated within ever-changing environments and both react to and actively change those environments.

Approaching organizational change from a community-level perspective is the intellectual progeny of two disparate theoretical and disciplinary parents: the bio-sociological version of community ecology articulated by Amos Hawley (1950, 1986) and population ecology in organization and management theory (Aldrich, 1999; Hannan & Freeman, 1978). Hawley's "community ecology" emphasized the relationship between populations of humans and other species and the environments they share, focusing on the collective level of the community instead of the independent behavior of individual populations. The behavior of the populations in the community hinges on two processes, *symbiosis* and *commensalism* (Hawley, 1950, 1986). Symbiosis is "mutual dependence based on functional differences," in essence, populations of different species that support each other much like specific species of anemone and clown fish in aquatic communities. Commensalism is mutual dependence derived from "the existence in the population of common interests or similar tasks that can be pursued more effectively when two or more like-acting units pool their energies" (Hawley, 1986, p. 36). Commensalist relations can vary from fully cooperative to fully competitive.

Campbell (1968) is generally credited with introducing the notions of social-cultural evolution to the social sciences and, along with Popper (1963), an evolutionary epistemology (Campbell, 1974; Baum and McKelvey, 1998). Campbell (1965b) argued that socio-cultural evolution operates according to three guiding principles, succinctly summarized as variation, selection, and retention (See also, Hawley, 1950, 1986). As Campbell (1965a) says,

> for an evolutionary process to take place there need to be variations (as by mutations, trial, etc.), stable aspects of the environment differentially selecting among such variations and a retention-propagation system rigidly holding on to the selected variations. The variation and retention system(s) are inherently at odds. Every new mutation represents a failure of prior selected forms (p. 306).

These processes operate on multiple levels, including that of the community. *Variation* focuses on alternative possibilities, both those available in the environment and those generated by human choice. For example, Delacroix and Carroll (1983) show that the episodic occurrence of social upheavals over a 100-year period in Argentina and Ireland lead to the emergence of alternative newspapers originally

[2] Those familiar with evolutionary theory may wish to skip this introductory theoretical section.

focused on those issues. Similarly, Anderson (1999) describes how venture capitalists support entrepreneurs who create new organizations to exploit new ideas.

Selection is the process of accepting one or more alternative variations and rejecting the others. Miner and Raghavan (1999) show how mimetic processes often lead organizations to select the routines and practices of others they deem successful, thereby rejecting a host of alternatives. In the case of strategic alliances, this may mean choosing a partner that other successful firms have already chosen. *Retention* is the process of institutionalizing a selected variation, establishing it as an ongoing characteristic of the organization and maintaining it over time. Nelson and Winter (1983) examined the role of routines as a retention mechanism for institutionalizing organizational procedures. March, Shultz, and Zhou (2000) examined the academic rules set that had been selected and retained, and in some cases, modified and then retained, by Stanford University from 1891-1987. Retention of routines and rules provide continuity to organizational communities and populations.

Hannan and Freeman's (1977) article, which introduced the ideas of population ecology to the organizational sciences, has been followed by extensively-published researchers. For the most part, these studies have focused on three themes in trying to explain organizational foundings and failures: demographic processes, such as age and size dependence; ecological processes, such as niche-width dynamics, density dependence, and population dynamics; and environmental processes, such as institutional or technological processes (see Baum, 1996 for a summary of studies). Although early work in population ecology (Hannan & Freeman, 1977) acknowledged that a community level of analysis existed, subsequent work in this area (e.g., Carroll & Hannan, 1989; Hannan & Freeman, 1977, 1989) did not explore this level (Aldrich, 1999; Astley, 1985). Astley (1985), however, strongly advocated Hawley's perspective to the community of organizational scholars, arguing that in order to truly understand how populations emerge, evolve and dissolve, one must use a community ecological framework.

According to Astley (1985), several areas of the contemporary population ecology literature fall short in explaining organizational change and this fact should lead us to change our level of analysis from the population ecology perspective to the community ecology perspective. First, evolution under the population ecology framework is a relatively path-dependent process with the variation, selection, and retention mechanisms functioning to maintain equilibrium rather than foster change. Second, population ecology sees organizational evolution in terms of gradual change, not allowing for explanations of radical change, such as those described in the punctuated equilibrium model of evolution (Tushman & Romanelli, 1985). Third, population ecology is less thorough as an explanation of organizational change because the "motor" of change between entities in population ecology is *prescribed* as competitive selection (Poole, Van de Ven, Dooley, & Holmes, 2000). Finally, the population ecology perspective assumes that variation is based on changes in the environment instead of being created by processes that occur within or between the populations themselves (Astley, 1985).

The community ecology approach to organizational evolution, however, handles each of these issues (Astley, 1985). First, instead of focusing on variation, selection, and retention mechanisms as equilibrium-maintaining — community ecology views coevolution of organizational populations as a variation-driven process, with the introduction or emergence of new populations as the mechanism of variation. In addition, instead of focusing solely on homogeneity and stability within the population, community ecology subsumes this perspective under a framework of diversity between populations and the symbiotic and commensalistic relationships that both encourage and cultivate change. Second, rather than focusing solely on incremental change, the community ecology framework is also commensurate with the punctuated equilibrium model (Eldridge & Gould, 1972; Tushman & Romanelli, 1985), thus including both gradual organizational or population change and radical transformations.

Third, instead of simply incorporating the *prescribed* motor of change between entities as competitive selection, community ecology is augmented with the *constructive* motors of commensalism and symbiosis that illuminate change between entities and allow for both competitive and cooperative relationships over time (Poole et al., 2000). Finally, the community ecology perspective puts primary emphasis on the variation stage of evolution (instead of on the selection stage), purporting that selection in fact impedes organizational or population-level evolution, so that "selection is the regulator of evolutionary change; variation is the dynamo" (Astley, 1985, p. 240).

Another key perspective of community ecology is that populations within a community both cooperate and compete on the basis of their similarities and differences. Aldrich (1999) [working from Brittain and Wholey's (1988) original categorization] describes seven different types of relationships that are possible between populations in a community, one that is symbiotic and six that are commensalist. These are classified by whether the relationships for each population in the pair are beneficial (+), neutral (0), or harmful (-). For example, (+,+) means that the relationship is beneficial to both populations and (-,0) means that the relationship is negative to the first population and neutral to the second.

A symbiotic (+,+) relationship occurs between two populations that operate in different resource niches or provide different functions. Two symbiotic populations benefit from one another when the growth of each population aids the growth of the other population. The six commensalist relations vary from full mutualism (+,+, also called cooperation) to full competition (-,-). Full mutualism (+,+) describes the same sort of mutually beneficial relationship as symbiosis, but between populations that are in the same resource niche or provide similar functions within the community. This congruence in resource niche or function is the hallmark of the commensalist relationship and differentiates the singular symbiotic relationship from the six commensalist relationships. Partial mutualism (+,0) describes a commensalistic relationship in which the presence of one population benefits another population, but this benefit is asymmetrical in that the first population receives no benefit (nor any detriment) from the presence of the second. Neutral (0,0) relationships occur when two populations within the community have no effect on one another. Predatory competition (+,-) arises when one population benefits from the detriment of another population. Partial competition (-,0) is the converse of partial mutualism, where the presence of one population negatively affects the other population, which in turn has no effect on the first. Finally, full competition (-,-) describes a relationship in which the growth of each populations is detrimental to the other.

Commensalistic and symbiotic relationships form the basis for the emergence of communities. The community, in turn, is the regulator of *open spaces* (Astley, 1985), and functions as a buffer between the incorporated populations and the environment, especially with regard to resources (described in more detail below). As changes in the environment restrict or free up resources for the population, the community helps to redistribute the resources. In this way, populations that would normally have become extinct because of the sudden exhaustion of vital resources due to changes in the environment will instead rely on the resources contained within the community. In essence, the benefits to populations of creating such communities may far outweigh the costs.

An important aspect of the multilevel perspective inherent in community ecology is understanding why populations would voluntarily trade market independence (or some other form of) for community interdependence. The most important reason is that the community buffers populations from the environment (Barnett, 1994; Hawley, 1950, 1986). Ironically, this implies that the creation of the community produces a certain amount of self-sufficiency. Hawley (1950) described the community as a "collective response to the habitat" or environment (p. 67). Organizations and populations within the community are sheltered from major environmental changes (technically called density-independent changes; see Brittain, 1994; Brittain & Wholey, 1988). Therefore, inclusion in such a community is especially important for populations upon whom the environment places strict or numerous constraints, or for whom environmental changes are unpredictable. In such situations, the community can act as a buffer from these constraints and changes and can increase the number and amount of resources to which the populations have access.

Although the work in community ecology has added a much greater understanding of multilevel organizational evolution, there are also several limitations to the current research. First, current explications of commensalistic and symbiotic relationships (e.g., Aldrich, 1999; Baum, 1996; Brittain & Wholey, 1988) have tended to simplify the symbiotic relationships between populations, classifying all relationships between populations with different functions or within different resource niches as symbiotic. Moreover, most of the community ecology research has focused on only one of these relationships. Only a handful (Brittain, 1994; Carroll & Swaminathan, 1992) have dealt with more than one of these relationships (Baum, 1996). This paucity of research is unfortunate, since a full understanding of community coevolution would include most (if not all) of these relationships. In addition, community ecology research has not explicated evolutionary models that can help us explain the specific stages of community coevolution.

Finally, community ecology research has not yet acknowledged the importance of the *relationships*, or networks, between the populations as units of analysis. As Fombrun (1988) says, "Networks are the building blocks of communities" (p. 234). By understanding the interpopulation networks as the locales of evolution, we can garner a better understanding of the changes in the community structure. Similarly, DiMaggio (1994) argues that "network analysis and organizational ecology can be combined to their mutual advantage" (p. 447).

Integrating a Communication Networks Perspective

Analyzing an organizational community requires first identifying the two parts of its structure: the individual parts that make up the whole and the configuration, or interrelationships, between the parts

(Hawley, 1950). With regard to organizational communities, the parts are the populations of organizations. Understanding the interrelationships, however, is more complex and requires the addition of communication networks to the analysis. Organizational communities are "networks of organizations that exist with properties of their own" (Baum & Singh, 1994, p. 381). Studying organizational communities is in essence studying the many levels of network interdependence between and within populations. Communication networks subsume other networks vital to community survival, including intangible (for example, knowledge) and tangible (e.g., money, technology) resource networks. The linkages vary from personal, to representative, to institutional (Eisenberg et al., 1985). Over communication networks flow information, knowledge, and competencies (McKelvey, 1982). Therefore, the creation, maintenance, and transformation of communication networks is a key mechanism by which communities emerge, evolve, and collapse. In short, communities evolve in part on the basis of their communication networks. Within this framework, ecological processes such as density dependence, open environmental space, and punctuated equilibrium can be understood in network terms.

Density Dependence

According to Hawley (1950), the key to understanding community growth can be found in Durkheim's notion of *social density*, or "the frequency of contacts and interchanges among members of a population" (p. 196). Populations can physically occupy the same open environmental space, but unless these populations communicate, no community can be formed. Previous research in community ecology has held density dependence arguments similar to those of population ecology where density is measured by the number of populations within the community or the number of organizations within the population. The population-level line of reasoning also says increases in density within a niche will correspondingly increase competition between populations, since resources will become scarcer (Hannan & Freeman, 1977). Transcribed to Hawley's community model, these resource struggles show up in the negative ties in commensalist relationships between populations.

A communication networks perspective on community ecology is more consistent with Hawley's notion of social density, so that the relationships, or network ties, between the populations form the basis of the community density. The density of the community, therefore, is based upon the number of possible ties within the community communication network, which is a function of the number of populations within a community at any given point in time. As populations emerge within the community, or enter from the outside, the maximum number of possible ties changes. Over time, ties between populations can be created, altered, or dissolved. The density of the community viewed as a network, therefore, does not necessarily follow the s-shaped curvilinear relationship outlined in the population ecology literature.

The emergence or entrance of populations into a community, and the subsequent increase in the density of the ties between those populations fosters community legitimacy. Community-level legitimacy, therefore, is not simply based on increasing density with regard to the number of populations and ties within the community, but is also reliant on the substance of the relationships between the populations as well as environmental influences on those relationships. As the density of populations within the community increases, so do the strains on the resources within the open environmental space. In population ecology, these resource constraints would foster competition between the organizations within the population. Under the community ecology framework, populations *may* compete as density increases, but they may also cooperate in order to create more resources within the open environmental space. Therefore, the ties between populations may be either competitive or mutual, and may change over time as the resources within the open environmental space change.

These density dependence arguments are similar to the arguments made by Kauffman regarding network complexity and coevolution (1993; 1995). According to Kauffman, the number of *epistatic* (or constraining) *links* between nodes in a network affects the ability of the network to reach an optimum level of fitness. As the density of epistatic links within the network increases, the complexity of the network increases. Low levels of network density improve the ability of the network to reach optimal fitness levels. But, too much connectivity within the network leads to a *complexity catastrophe*, where "conflicting constraints in complex systems limit the optimization of function possible" (pp. 52-54; see also McKelvey, 1999a, 1999b)

This notion of complexity catastrophe is commensurate with Astley's (1985) argument that the "growth of internal complexity accompanying system closure fosters a stabilization of communities but also sets them up for eventual collapse" (p. 236). According to Astley, as the relationships within the community become more complex, the community begins to close itself off from the environment, and the populations start to "function mainly by exchanging resources with each other rather than directly with the environment" (p. 235). This is not to say that the community will stop interacting with its environment completely. Instead, it will begin to rely more on the resources flowing within the community than it did in the early stages of its formation. Consequently, it will be less dependent on the environment for resources. This self-sufficiency creates a buffer between the populations and the environment. If the density within the network moves beyond this "tipping point" (Kauffman, 1993, 1995), however, the community will begin to collapse.

Open Environmental Space

Open environmental space is the conceptual equivalent of the notion of niche in population ecology. It contains the resources that are available to support the community. In network terms, the open environmental space of the community is equivalent to structural holes in a network, or the *possibility* of network connections between populations within the community (Burt, 1992). New populations either enter or emerge to fill holes within the community network. In a community, structural holes provide populations with available resources or "ecological opportunity" (Stanley, 1981, p. 96), in much the same way that "structural holes provide social entrepreneurs with investment opportunities" in a social network (Monge & Contractor, 2003, p. 145; see Burt, 1980). In the early stages of community formation, network holes (and therefore resources) will be plentiful, and therefore competitive pressures between populations will be weak. Over time, new and existing populations will move into these structural holes and competition will ensue to fill the remaining holes. Competitive ties between the populations are likely, therefore, as the structural holes within the community communication network are filled; cooperative ties, however, may be formed in order to create new resources within the community. In addition, as new populations enter the community, new network holes are created, since the addition of new nodes in a network creates the possibility of new ties with all of the nodes already in the network. New resources, therefore, will also be created. Of course, some existing ties are likely to be broken, as populations may give up existing relations in the process of creating new ones.

In addition, a network perspective on open environmental space helps us understand how organizations and populations "enact their own operating domains" (Astley, 1985, p. 234). As new populations enter the community's communication network, the number of possible network ties increases exponentially. As the number of possible ties increases, so does the likelihood of creating ecological opportunities (structural holes). At some point, as described above, the number of populations and the ties between those populations may increase to a point where the level of network complexity cannot be sustained. This is the point at which the community becomes unstable and either adapts or collapses (Astley, 1985) as described by the punctuate equilibrium model.

Punctuated Equilibrium

Tushman and Romanelli's (1985) conception of punctuated equilibrium envisions a community that undergoes periods of convergence, reorientation, and recreation. Under the communication network rubric, *convergent* periods are those in which the communication networks between populations in a community remain relatively stable. Periods of *reorientation* occur when dramatic changes, such as the inclusion of new populations into the community, rapid environmental changes, or technological innovation, take place. During these reorientation periods, communication networks within the community radically change. When a new population enters the community, for example, it alters the number of possible ties within the community, inherently changing the network density. In addition, the entrance of a population is likely to have a greater impact on community density early in the coevolution of the community since fewer populations exist. *Recreation* occurs when the community fundamentally changes it purpose or function. Because communities are established on these purposes or functions, recreation may mean either the transformation of the community network, or fundamental changes in the relationships between the populations.

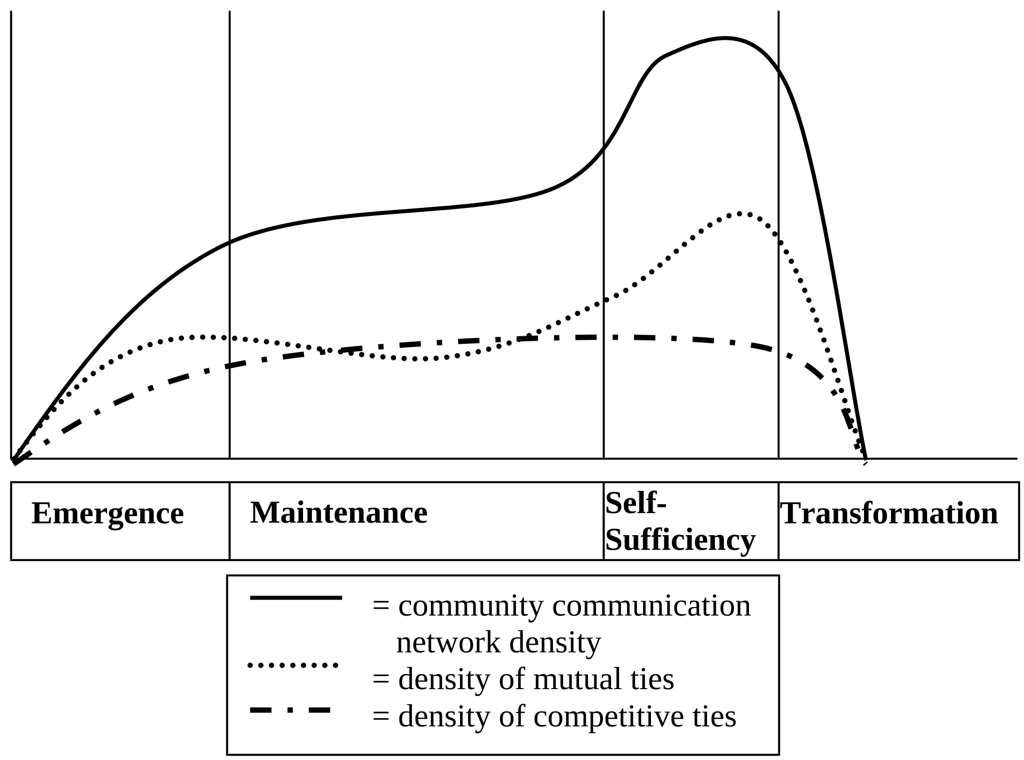
Stages of Community Evolution

A communication network perspective on community evolution is consistent with Astley's argument that "variation is the dynamo" of evolutionary change (Astley, 1985, p. 240). Novel communication networks must accompany open environmental space in order for community evolution to occur. In short, *variation* in the community comes from the introduction and exploration of possible new communication ties, both competitive and mutual, with the entrance and exit of populations being the main factors in the increase or decrease of this possibility. *Selection* entails forging some of those possible communication ties and foregoing others. *Retention* requires that selected communication ties be maintained over some period of time.

Another way of viewing the evolution of the community is to understand how the variation, selection and retention of the community communication networks result in four stages of community evolution: *emergence*, *maintenance*, *self-sufficiency*, and *transformation*. Figure 2 presents a model of these stages. Three curves are shown, one for density of the entire network and one each for mutual and competitive ties. A community can emerge for a variety of reasons. Aldrich (1999) highlights three stimuli for community emergence: "technological innovation, transformation of norms and values, and new regulatory regimes" (p. 310). These stimuli encourage populations to form network ties. During the earliest stage of community evolution, the ties formed between populations are more likely to be mutual than competitive, since competitive ties may inhibit further growth of the community (Aldrich, 1999).

These two evolutionary models, one of population change, the other of community evolution can be mapped onto each other. Tushman and Romanelli's model was conceived for populations that were already in existence and had operated in a more or less stable equilibrium for some time. The stage model presented here adds an initial stage at which the communities comprised of populations begin to emerge. Thus, the emergence and maintenance stages of the community model are roughly equivalent to the convergence stage of the punctuated equilibrium population model. The remaining two community evolution stages, self-sufficiency and transformation, align reasonably closely with the final two punctuated equilibrium population change phases — reorientation and recreation.

Figure 2: Stages of Community Evolution by Network Link Density



The community emerges as populations begin to enter or develop within the community and create open environmental space within the network. During this stage, the populations within the community are still very dependent upon the environment for resources and legitimacy. In addition, this is a particularly precarious period for the community because as new populations enter the community, they dramatically change the link density of the network. If large environmental changes occur, therefore, it is likely that the community will simply dissolve. Applied to the emergence of the CTVC, this suggests the following hypothesis:

> ***Hypothesis 1***: Major environmental-level events (such as technological innovations, transformation of norms and values, and new regulatory regimes) initiated the first ties between populations in the children's television community.

In addition, in order to foster the creation of new resources within and for the community, the initial populations will need to have primarily cooperative, or fully mutual, ties. Individual populations forge ties with other populations because they possess resources that they need, therefore commencing the creation of the community. This is commensurate with Pfeffer and Salancik's (1978) resource dependency theory on interorganizational networks which states that organizations enter into links with other organizations in order to share resources and to buffer themselves from the environment. Since the similar goal of shielding oneself from environmental changes is the impetus for populations to create the initial ties within a community, we can extrapolate that similar resource dependence arguments transcribe to the community level.

> ***Hypothesis 2:*** The first ties between populations in the children's community were primarily mutual.

The early increases in network density create legitimacy for the community as a whole as well as the individual populations (Aldrich, 1999; Baum, 1996). As mentioned above, and shown in Figure 2, these early ties are primarily mutual in nature. As the community garners legitimacy, it enters a stage of maintenance, similar to the convergent period in the punctuated equilibrium model (Tushman & Romanelli, 1985). At this point in its evolution, the network has reached a point of *minimal density*. During maintenance, the number of populations in the community becomes relatively stable, and the network density continues to increase. As more populations enter the community and more ties are formed, competitive ties between the populations increase. As mentioned above, this increased competition between populations within the community is parallel to the density-dependency arguments outlined in population ecology (Hannan & Freeman, 1977). As competition for resources within the open environmental space increases, so does the likelihood that populations within the community will fail or that the community will enter into a stage of reorientation due to its susceptibility to environmental changes (Tushman & Romanelli, 1985). The community has not yet reached the stage of self-sufficiency in which the community is able to buffer itself from the environment. Instead, during maintenance, the populations are still reliant upon resources from the environment. Therefore, looking at the maintenance stage in the evolution of the children's television community from the network perspective therefore suggests:

> ***Hypothesis 3***: As the children's television community entered a period of maintenance, the proportion of competitive to mutual ties increased.

> ***Hypothesis 4*****:** Major environmental events during the emergence or maintenance stages of the children's television community caused the community to reorient, so that the communication network significantly changed from one period to the next.

There are three possibilities for community evolution at this point. First, following Barnett's (1994) discussion of the *liability of collective action*, communities will dissolve if they cannot reach a viable level of network interconnectedness and cohesion. An organizational community, therefore, will *disband* if the density of the network ties cannot be maintained. The community may also dissolve if a disproportionate number of competitive ties develop, so that there are not enough mutual ties to sustain the legitimacy of the community. In addition, if the community goes through a period of reorientation during maintenance, the temporary instability may weaken the ability of the community to buffer against environmental pressures, allowing it to dissolve in the face of environmental pressures. The second possibility for community evolution is that the community remains in a stage of *maintenance*, where the populations within the community do not alter, and the ties between the populations remain relatively stable. This is a precarious position for the community, since major environmental changes will force a period of reorientation and possibly transformation.

The third and final possibility is that the community can reach a point of *self-sufficiency*, the zenith of community evolution. Community level self-sufficiency enables a community is to buffer the constraints of the environment and therefore increase the chances of survival (Barnett, 1994; Hawley, 1950, 1986). Self-sufficiency is a prerequisite for a self-sustaining community, and network cohesion is the key to maintaining the community. If self-sufficiency is achieved, the populations within the community will be shielded from dramatic changes in the environment; if self-sufficiency fails, the community dissolves, and the populations are left without intermediary protection. We employ the term self-sufficiency in this article to describe both the level at which a community can buffer itself from the environment and as a specific stage in community evolution.

The ability of an organizational community to attain self-sufficiency, however, should not suggest that the ties within the community should be entirely mutual. By entering into a community and engaging in network ties with other community members, populations are inherently fostering and constraining their individual actions. Variation during community evolution occurs through both competition and cooperation between the populations and organizations. In order to reach a state of self-sufficiency, however, the ratio of cooperative to competitive ties within the community must increase. At this *critical mass*, or point in which the communication network has reached a self-sustaining level of interaction, the community has reached a point of collective complexity. At this point, it becomes relatively self-sufficient with regard to resources, and environmental level changes are less likely to cause the community to dissolve (Astley, 1985).

Once the community has reached a point of self-sufficiency, it is able to subsist more readily on the resources contained within the open environmental space of the community. This resource self-sufficiency allows it to buffer against changes in the environment and creates a relatively stable, closed system (Astley, 1985). This stability is only "precariously maintained," however (Astley, 1985). If the complexity of the network ties increases too much, the community will collapse (Astley, 1985; Kauffman, 1993). Communities, therefore, are complex, adaptive systems, and sustaining them is a matter of maintaining a tenuous balance between not enough and too much complexity. In addition, if the community becomes unstable due to its internal complexity, it is likely that it will be highly susceptible to marked changes in the environment. Looking at the children's television community through the lens of self-sufficiency, therefore, generates two propositions.

> ***Hypothesis 5***: When the children's television community reached a point of self-sufficiency, there was a significantly greater number of mutual than competitive ties.

> ***Hypothesis 6***: When the children's television community reached a point of self-sufficiency, it was able to buffer its populations against major environmental changes, and therefore the communication network did not significantly alter.

Throughout the previous discussion of emergence, maintenance, and self-sufficiency stages of community evolution, possibilities for community transformation abound. The transformation of the community has two possible results: the dissolution of the community or the recreation of the community into a new community with a fundamentally different set of goals, norms, values, etc. Dissolution can occur due to a community's inability to react effectively to strong environmental pressures or significant or sudden environmental changes, although to a point, the denser the communication network of the community the less likely that the community will dissolve. However, Astley (1985) and Kauffman (1993) point out that dissolution can also occur if the density of the network becomes too high and too complex. Recreation can also occur due to the inability of the community to react to strong environmental pressures. Recreation is particularly probable if the resources fundamental to the basic goals or functions of the community diminish dramatically.

These four stages of community evolution shown in Figure 2 allow us to better understand how changes in the community communication network affect the viability of the community along its life cycle. The birth and death of the community and of the populations within the community can be understood as an outcome of the changes in the network structure. Although the previous explanation of the stages of community evolution passed through the four stages sequentially, it is possible that different communities may take different evolutionary paths. For example, a community may emerge, enter a period of maintenance, and attain self-sufficiency, only to later fall back into a stage of maintenance due to the loss of ties between populations.

Method

The research to test the six hypotheses was undertaken in three steps. The first was the collection of data for the creation of a set of ten networks, each representing a five-year time period in the history of the CTVC. These networks were created based on data collected via in-depth interviews, network data collection, and examination of historical records. The second step was the creation of an event set, representing the key environmental events in the CTVC over the past fifty years. Finally, the UCINET 6 (Borgatti, Everett, & Freeman, 2002b) computer program was used to test the hypotheses.

Participants

The participants in the study were prominent citizens within the CTVC over the past 50 years. The list includes both people who were integral to the founding of the populations, as well as those who have been prominent figures throughout the years. Obviously, some people from the earlier years were not available to participate in the study. In total, 20 key players from all eight of the populations were interviewed. Interviews lasted, on average, about two hours.

Measurement

The interviews focused on two major topics. The first was the relationships between the populations in the CTVC over the past 50 years. The second was the identification of the major events affecting the community during that time.

Network questionnaire

Participants were asked to fill out a questionnaire designed to collect network data on the community over time. The questionnaire was comprised of a set of ten matrices with the eight CTVC populations listed as the rows and columns. Each of the matrices corresponded to a particular five-year time period within the community's 50-year history. For each time period, participants were asked to identify which of four types of relationships each population had with every other population. The four possible relationships were: no relationship, negative relationship, neutral relationship, and positive relationship. The relationships were specified as directional so participants coded two relations for each pair of populations: the first population's relationship to the second, and the second population's relationship to the first. The four types of relationships were defined as follows:

- Two sets of organizations had *no relationship* if they never interacted with one another or never came in contact with one another.
- Two sets of organizations had a *negative relationship* if they interacted and the actions of one set *negatively* affected the other.
- Two sets of organizations had a *neutral relationship* if they interacted but the actions of one set *did not* affect the other.
- Two sets of organizations had a *positive relationship* if they interacted and the actions of one set *positively* affected the other.

For those questionnaires completed during the interview, participants were asked to narrate their responses to the questionnaire with anecdotes that illuminated the relationships they identified between two populations during a particular time period.

Environmental events

During the interviews, participants were asked to identify the major community-level environmental events that affected the CTVC. An environmental event was defined as a major political, economic, social, or technological occurrence (Aldrich, 1999; Baum, 1996). A list of key environmental events was created by extracting those events that were mentioned most often by the participants. Table 1 provides the set of environmental events, the time periods in which the events occurred, as well as the number of participants mentioning each one.

Table 1: Environmental Events in the History of the Children's Television Community

Environmental Event	Time Period	Number of Participants Mentioning Event
Public Broadcasting Act of 1967	1963-1967	5
Penetration of Cable	1983-1987	11
Children's Television Act of 1990	1988-1992	9
Three-Hour Rule (Addendum to CTA in 1996)	1993-1997	4

Historical Records

In addition to in-depth interviews and the network data questionnaire, several important historical texts regarding the history of the CTVC and particular populations within the community were examined for information regarding relationships between the populations. The texts used in the data collection either focused on the history of children's television in general (Calabro, 1992; Melody, 1973; Pecora, 1998; Schneider, 1987; Turow, 1981), or focused on a particular population of organizations within children's television (e.g., Action for Children's Television, 1988; Cross, 1997; Jarvik, 1998; McNeal, 1992; Polsky, 1974). As described in the section below, the information garnered from these texts was particularly important for establishing the earliest time periods of the community.

Data Coding

A combination of all three data collection methods were used to create the networks for each five-year period. By triangulating the three types of data, a richer, more complete picture of the evolution of the children's television community network was created. The creation of the ten five-year networks was completed in two steps: the designation of an emergence period for each population and the identification of each of the 560 network relationships (relations among eight populations for each of ten time periods). Finally, a set of environmental events affecting the children's television community was developed before the data were analyzed.

The emergence of the populations into the community was derived by looking at the opinions participants expressed during the interviews about when each population entered into the community as well as historical accounts of the populations and community. From these data, populations were assigned an "emergence" time period which specified when they entered the community network. Their ties during the previous periods were recorded as "No Relationship." Then the ties for subsequent time periods were coded by triangulating three types of data: a consensus network derived from the network data collected from the participants (Krackhardt, 1987, 1990), descriptions of the population relationships narrated in the interviews, and descriptions of the population relationships found in the historical records.

The final step in coding the network data was to create four binary matrices for each time period. The multigraph procedure in UCINET was employed to convert the valued community network into three separate binary networks representing the competitive, neutral, and positive relationships. Presence of the relationship was coded as one and absence was coded as zero. The fourth network was the full network which contained all the relations. This matrix was dichotomized so that any competitive, neutral, or mutual tie between two populations was coded as one and a "no relationship" tie was coded as zero. These four networks were analyzed factoring their link density.

Additionally, historical information was coded about the major environmental events and their corresponding time frames. Four critical events arose from the in-depth interviews: the Public Broadcasting Act of 1967 (1963-1967), the penetration of cable in the mid-1980s (1983-1987), Children's Television Act of 1990 (1988-1992), and the Three-Hour Rule addendum to CTA in 1996 (1993-1997). Three of the four were regulatory events which altered the resources within the CTVC. For example, the Public Broadcasting Act buttressed the heretofore struggling public broadcasting system, creating a platform for airing educational children's programming and specifically, *Sesame Street*. The CTA of 1990 and the Three-Hour Rule both were hard-fought, often-polarizing pieces of legislation that constricted the resources of some players (advertisers, entertainment content creators, programmers, toy/licensing companies) while buffering or empowering others (educational content creators, governmental bodies). The penetration of cable, aided by Reaganomics policies of the 1980s, was both an economic and technological event. Not only were there more outlets to air kids' programming, but there were also fewer economic constraints for entertainment programs.

The Community Evolution Stage Model

To test the hypotheses, it was necessary to provide an a priori empirical specification for the community evolution stage model shown in Figure 2. The stage model follows a modified s-shaped curve, with critical density values within the network as the defining junctures between the stages. A minimal density lies between the emergence and maintenance stages, and a critical mass lies between the maintenance and self-sufficiency stages.

For the purpose of testing the hypotheses in this article, the point of minimal density within the community was set at 0.50, or one-half of the total possible ties within the community. This minimal density was selected based on the level at which resources are sufficiently shared and the community is able to garner a sense of legitimacy. A fundamental proposition of community ecology is that the creation of a community, and the sharing of resources, shelters the individual populations from the effects of changes in the environment (Barnett, 1994; Hawley, 1950, 1986). For a community to move past the period of emergence and into a period of maintenance in which there are substantial resources flowing between the populations, there must be enough relationships between the populations through which the resources can flow. In addition, Aldrich (1999) argues that in order for a newly-formed community to earn legitimacy, the populations within the community must create common interests and standards through mutual relationships. In order to achieve consensus, at least half of the communication channels between the populations should be active.

Once the community reached this minimal density, it was considered to be in the maintenance stage. At that point, increases in the density of the community communication network move the community toward a point of self-sufficiency. Because the point of self-sufficiency is a precarious state that requires a high-proportion of actual to possible ties within the network, but not too many ties or the community may dissolve due to network complexity, the critical mass for this stage model was set at 0.75. Like the minimal density, this critical mass was selected based on the necessary level of resource flow. The role of the community is to shield populations from the environment, and the exchange of resources is the vehicle for the creation of a resistant community. In addition, once a community has passed from a period of emergence to a period of maintenance, competitive ties between the populations increase. Although some of the mutual ties that existed during the emergence of the community may change to competitive ties, it is unlikely that the only way a competitive tie will be formed is through this transformation from a mutual tie. Therefore, new competitive ties will form between populations that previously did not have a relationship, or with new populations that enter into the community. The number of competitive ties cannot greatly outnumber the mutual ties, or the legitimacy and cohesion of the community could be jeopardized (Aldrich, 1999; Barnett, 1994). As the number of ties between the populations increase, so does the network density.

By setting the minimal density at 0.50 and the critical mass at 0.75, this stage model takes into consideration the need for increased network ties in order for the community to buffer against environmental pressures, as well as the reality that community networks are rarely fully connected. Because the adherence of the community evolution to the stage model is important to the analysis of the hypotheses, the first analysis conducted was in response to the following research question.

> ***Research Question 1***: To what extent does the evolution of the children's television community adhere to the exploratory stage model?

Analysis

The research question was analyzed by computing the densities, represented by the delta symbol, Δ, for the full networks for each of the ten time-periods. After the densities were obtained, they were compared to the critical density levels defined above. The assignment of time periods into stages was then completed, and those stages were used in testing the hypotheses.

Statistical tests of hypotheses were performed on network densities. Differences between densities were computed by using the UCINET "Compare Densities>Paired" routine, which uses bootstrapping techniques to acquire estimates of standard errors and to compute *t*-tests. Alpha was set at the .05 level for all tests.

Results

The Community Evolution Stage Model

Results for the computation of ∆s for four networks at ten points in time are presented in Table 2: the network with three relations combined, the network of mutual and competitive relations minus the neutral relations, the mutual network, and the competitive network. Two preliminary observations are evident from an initial review of Table 2. First, the full community network quickly reached a very high level of density in the 1968-1972 time period (∆ = 0.79) and in the following period reached its peak density (∆ = 0.93), where it remained for the rest of the time periods.

Table 2: *t*-Tests of Network Density Measures by Time Period and Between Time Periods

	1953-1957	*t*	1958-1962	*t*	1963-1967	*t*	1968-1972	*t*	1973-1977	*t*	1978-1982
$\Delta_{M\ N\&C}$	0.21 (12)	0.00	0.21 (12)	1.64	0.39 (22)	2.74*	0.79 (44)	2.18*	0.93 (52)	0.00	0.93 (52)
$\Delta_{M\&C}$	0.21 (12)	0.00	0.21 (12)	0.94	0.29 (16)	2.57*	0.64 (36)	0.58	0.70 (39)	-0.98	0.63 (35)
Δ_{M}	0.21 (12)	0.00	0.21 (12)	0.75	0.25 (14)	2.66*	0.52 (29)	0.31	0.54 (30)	-0.94	0.48 (27)
Δ_{C}	0.00 (0)	0.00	0.00 (0)	1.03	0.04 (2)	1.20	0.13 (7)	0.75	0.16 (9)	-0.80	0.14 (8)
EVENT					X						

***** *t* (5000), $p < 0.05$ [with bootstrap sample]
$\Delta_{M,N\ \&\ C}$: overall network density (mutual, neutral, and competitive ties)
$\Delta_{M\ \&C}$: overall network density (mutual and competitive ties only)
Δ_{M} : density of mutual ties
Δ_{C} : density of competitive ties
EVENT : occurrence of environmental event

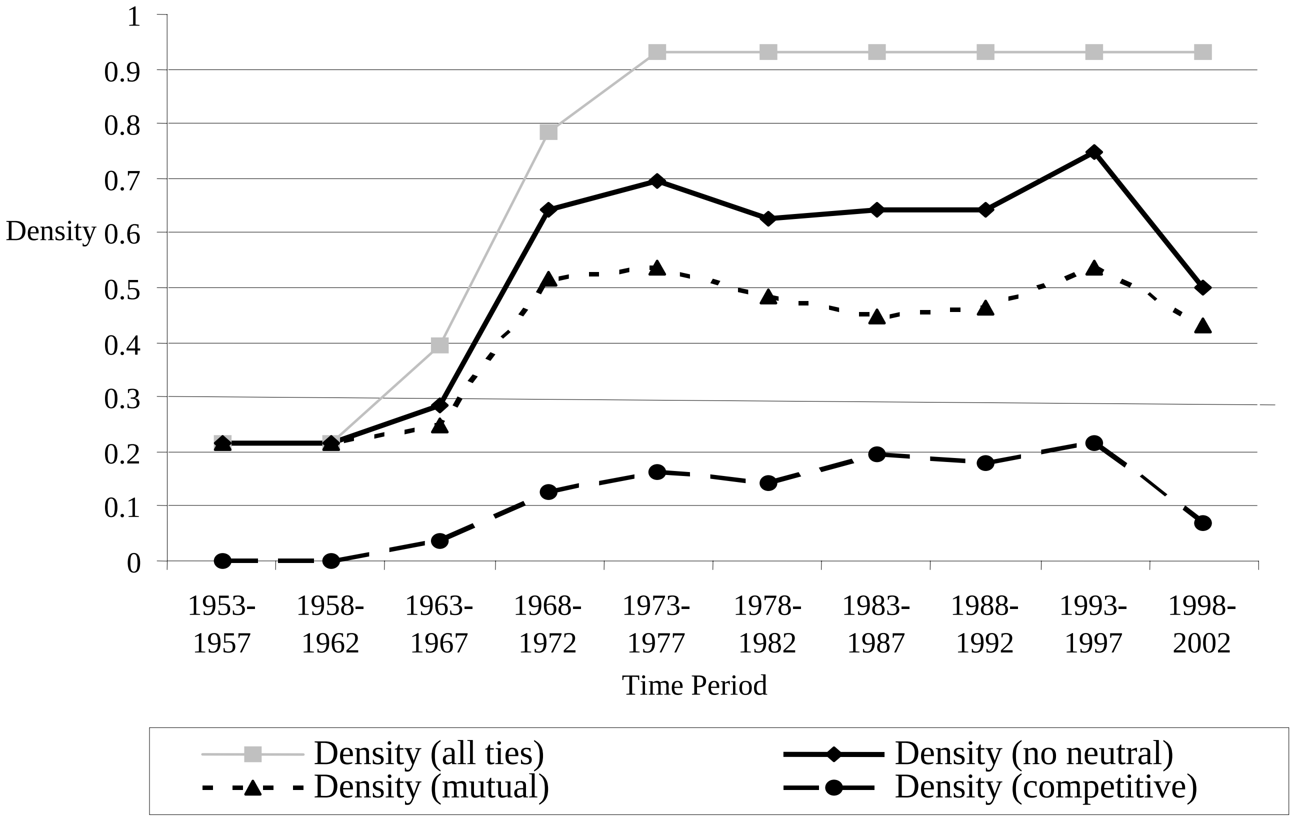
Table 2: *t*-Tests of Network Density Measures by Time Period and Between Time Periods
(continued)

	1978-1982	*t*	1983-1987	*t*	1988-1992	*t*	1993-1997	*t*	1998-2002
$\Delta_{MN\&C}$	*0.93 (52)*	0.00	0.93 (52)	0.00	0.93 (52)	0.00	0.93 (52)	0.00	0.93 (52)
$\Delta_{M\&C}$	*0.63 (35)*	0.19	0.64 (36)	0.00	0.64 (36)	1.06	0.75 (42)	-2.46*	0.50 (28)
Δ_{M}	*0.48 (27)*	-0.52	0.45 (25)	0.30	0.46 (26)	1.16	0.54 (30)	-1.82	0.43 (24)
Δ_{C}	*0.14 (8)*	1.39	0.20 (11)	-0.36	0.18 (10)	0.64	0.21 (12)	-2.35*	0.07 (4)
EVENT			X		X		X		

***** *t* (5000), $p < 0.05$ [with bootstrap sample]
$\Delta_{MN\&C}$: overall network density (mutual, neutral, and competitive ties)
$\Delta_{M\&C}$: overall network density (mutual and competitive ties only)
Δ_{M} : density of mutual ties
Δ_{C} : density of competitive ties
EVENT : occurrence of environmental event

Second, preliminary examination of the data reveals substantial changes in mutual and competitive ties within the community over the 50-year period. Figure 3 compares these empirical results to the theoretical parameters set forth by the community evolution stage model provided in Figure 2. Using the minimal density and critical mass parameters established in the theoretical model (0.50 and 0.75, respectively), the children's television community moved from the emergence stage into the maintenance stage during the 1968-1972 time period and then became self-sufficient during the 1993-1997 period. The period between 1998 and 2002, however, saw a dramatic decrease in the community's network density, so that the community returned to a period of maintenance. Therefore, the following stages were used in testing the hypotheses: Emergence, 1952-1967; Maintenance, 1968-1992; Self-Sufficiency, 1993-1997; and Maintenance, 1998-2002. With the exception of the final time period when the community returned to a period of maintenance, the children's television community evolved over time as specified by the community stage model.

Figure 3: Network Densities by Time Period



The Hypotheses

Hypothesis 1 predicted that major environmental-level events (such as technological innovations, transformation of norms and values, and new regulatory regimes) would have initiated the first ties between populations in the children's television community. The qualitative data gathered through the interviews and historical records only partially supports this hypothesis. Although the introduction of television, a technological event, and the subsequent emergence of the CTVC seem to support this hypothesis, data regarding the relationships between the first populations within the community question this support. Specifically, several populations (entertainment content creators, content programmers, toy/licensing companies, advertisers) had already established relationships during the earlier years of children's radio. As these populations created the CTVC, they retained the same basic relationships they had during the earlier era. On the other hand, the new technology of television provided a visually-oriented platform on which these relationships played out, and very quickly changed the ways in which the populations worked together to reach the viewing population of children. For example, toy or advertiser sponsorship of programs, a hallmark of the radio age (e.g., *Little Orphan Annie* sponsored by Ovaltine) was soon replaced by the program-halting, 30-second advertisement, which worked well in the visual space and allowed multiple advertisers to buy multiple commercial spaces on a single program. So although the initial populations of the CTVC were held over from the radio age, the change in technology altered the resources on which the relationships relied. This hypothesis, therefore, was only partially supported.

Hypothesis 2 predicted that the ties during the emergence stage of the CTVC were primarily mutual. During the 15-year emergence period, 1952-1967, the number of mutual ties was significantly greater than the number of competitive ties (see Table 3). Mutual tie density ranged from 21% at the outset to 25% at the end of the period, while competitive ties did not exist in the early stages and increased to only 4% by the end of the period. Therefore, Hypothesis 2 was supported.

Table 3: Results of *t*-Test Comparison of Mutual and Competitive Ties by Time Period

Time Period	Δ_M	Δ_C	t
1953-1957	0.21 (12)	0.0 (0)	2.40*
1958-1962	0.21 (12)	0.0 (0)	2.40*
1963-1967	0.25 (14)	0.04 (2)	2.33*
1968-1972	0.52 (29)	0.13 (7)	3.59*
1973-1977	0.54 (30)	0.16 (9)	3.11*
1978-1982	0.48 (27)	0.14 (8)	2.82*
1983-1987	0.45 (25)	0.20 (11)	1.93
1988-1992	0.46 (26)	0.18 (10)	2.55*
1993-1997	0.54 (30)	0.21 (12)	2.20*
1998-2002	0.43 (24)	0.07 (4)	2.84*

***** t (5000), $p < 0.05$ [with bootstrap sample]
Δ_M: density of mutual ties
Δ_C : density of competitive ties

Hypothesis 3 predicted that as the CTVC entered a period of maintenance, the proportion of competitive to mutual ties would increase. In order to support this hypothesis, the ratio of competitive to mutual ties should have increased during the maintenance period relative to the emergence period. Table 3 shows that during the 15-year emergence period (1953-1967) the average density ratio of competitive to mutual ties was $\Delta = 0.05$. During the maintenance period (1968-1992), the ratio of competitive to mutual ties increased, with an average ratio over the five time periods of $\Delta = 0.33$. Because there was a significant increase in the average competitive-mutual tie ratio between the two time periods, $t(5000) = 38.202$, $p < 0.05$, Hypothesis 3 was supported.

Hypothesis 4 predicted that environmental events during the emergence or maintenance stages of the children's television community caused the community to reorient, so that the communication network significantly changed. There were four environmental events identified earlier. These events occurred in time periods 1963-1967, 1983-1987, 1988-1992, and 1993-1997. A comparison of the network densities from these time periods with subsequent time periods generated two statistically significant differences and two non-significant differences. From 1963-1967 to 1968-72, the number of ties within the community more than doubled (from 16 to 36), yielding a significant difference in network density ($t(5000) = 2.57$, $p < 0.05$). From 1983-1987 to 1988-1992, there was no change in the number of ties within the network ($t(5000) = 0.00$). From 1988-1992 to 1993-1997, there was not a significant change in the network density ($t(5000) = 1.0555$). From 1993-1997, the number of ties decreased significantly, from 42 to 28 ($t(5000) = -2.46$, $p < 0.05$). Hence, Hypothesis 4 was partially supported.

Hypothesis 5 predicted that when the CTVC reached a point of self-sufficiency, there would be a significantly greater number of mutual than competitive ties. In the 1993-1997 time period, there was a significantly greater proportion of mutual than competitive ties ($t(5000) = 2.20$, $p < 0.05$). Hypothesis 5 was therefore supported.

Hypothesis 6 predicted that when the children's television community reached a point of self-sufficiency, it would be able to buffer its populations against major environmental changes, and therefore the communication network would not significantly alter. During the period of self-sufficiency (1993-1997), there was an environmental event, the Three-Hour Rule Addendum to the Children's Television Act. Since the community had reached a point of self-sufficiency during that period, we would predict that the community ties would not significantly change in the next time period (1998-2002). A χ^2 test of the goodness-of-fit between the two time periods showed that there was change, that the densities were not significantly similar (χ^2 (1) = 2.80). As we can see in Table 2, both the overall density of the network (excluding neutral ties) and the competitive ties reduced dramatically. Therefore, Hypothesis 6 was not supported. Table 4 presents a summary of the results of the data analysis.

Table 4: Summary of Results

Hypothesis	Results
1. Major environmental-level events (such as technological innovations, transformation of norms and values, and new regulatory regimes) initiated the first ties between populations in the children's television community.	PARTIALLY SUPPORTED
2. The first ties between populations in the children's community were primarily mutual.	SUPPORTED
3. As the children's television community entered a period of maintenance, the proportion of competitive to mutual ties increased.	SUPPORTED
4. Major environmental events during the evolution of the children's television community caused the community to reorient, so that the communication network significantly changed.	PARTIALLY SUPPORTED
5. When the children's television community reached a point of self-sufficiency, there was a significantly greater number of mutual than competitive ties.	SUPPORTED
6. When the children's television community reached a point of self-sufficiency, it was able to buffer its populations against major environmental changes, and therefore the communication network did not significantly alter.	NOT SUPPORTED

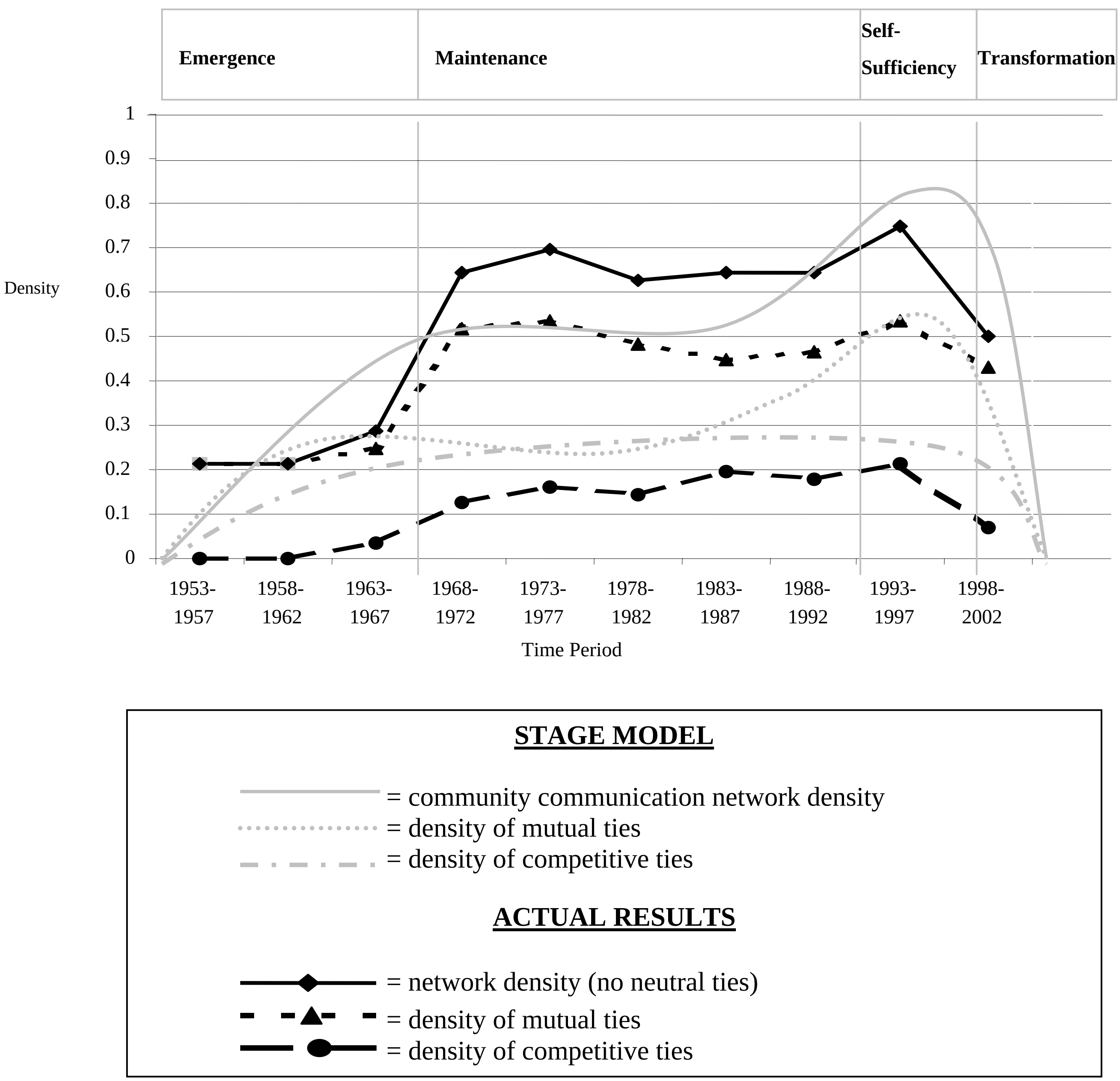
Discussion

The results of this study provide supporting evidence for a community networks approach to community ecology. This section provides a discussion of the results relative to the theoretical stage model developed previously. It also examines the role of the environmental events in the evolution of the community.

Figure 4 compares the theoretical stage model with the results from the data analysis. Separate plots are provided for mutual, competitive, and mutual plus competitive ties across all four stages. The plots of the empirical densities follow quite closely to the theoretical values. All three start with low densities that increase rapidly to the minimal density level. During the emergent stage, mutual links grow more rapidly and reach higher levels than competitive links. During the maintenance stage, density levels for all three networks continue to increase, though at slower rates, as indicated by the flattened curves.

As predicted by the model, the level of density of the mutual network decreases while the density of the competitive network increases, though the lines do not cross each other. Toward the end of this period, the densities of all three networks increase as the community evolves into the self-sufficiency stage, where densities reach their highest point. From that point on, as the community evolves into the transformation stage, densities decrease, though the density level of the mutual network remains at higher levels than the competitive network. Thus, the primacy of mutual ties predicted in the theoretical analysis was supported.

Figure 4: Comparison of Proposed Stage Model with Empirical Results



The relationship between the four environmental events and the levels of network density are interesting. First, it is important to remember that the emergence of the CTVC was, in part, a response to the level of television penetration in American households. This supports Hypothesis 2 and Aldrich's (1999) argument that social, technological, or regulatory events in the environment create the possibility for community emergence.

The Public Broadcasting Act of 1967, which was the first environmental event, had a significant corresponding change in network density ($t_{1963\text{-}1967 \rightarrow 1968\text{-}1972} = 2.57$, $p < 0.05$). This finding is consistent with the theoretical model. However, this act was the culmination of political action by governmental bodies, financial backing by philanthropic organizations, and the general social climate of public advocacy. For that reason, it is difficult to parse out whether the dramatic increase in density is due to the singular event, or the general environment within which the community was situated.

The second event was the penetration of cable in the mid-1980s. As predicted, the level of mutual ties was significantly higher than the level of competitive ties throughout this phase (1968-1992). This change in the nature of the ties is supported by the narrative and historical accounts of this time period, which highlighted the deregulatory nature of the Reagan Administration, the increasing competition in the marketplace due to Nickelodeon and the Disney Channel, and general doldrums of children's television programming in the 1980s. Interestingly, though there was some variation in the levels of density throughout this period, none of the changes were significant. This finding was consistent with the theoretical predictions from the stage model which shows a flattened curve for this stage. However, this finding is somewhat surprising since the penetration of cable was the most cited environmental event in the interviews. One possible explanation for this lack of change is that although the penetration of cable was seen as substantial, approaching 50% in the mid-1980s, the diffusion of cable had been an ongoing process beginning in the mid-1970s and continuing throughout this phase.

The third environmental event was the passage of the Children's Television Act in 1990. The density of the community communication network did not change significantly between the period in which the Act was passed (1988-1992) and the subsequent period (1993-1997; $t = 1.06$, $p > .05$). This finding was not particularly surprising because, although many participants mentioned the CTA as an important event in the history of children's television, very few actually believed that it had any impact on either the children's television content that was created or the relationships between the organizations and populations of organizations. The most striking example of this comes from the head of the advocacy group often touted as being primarily responsible for passage of the Act, Action for Children's Television. According to Peggy Charren, "the law exists, but it's relatively meaningless" (personal communication, April 8, 2003).

The fourth and final major environmental event, which occurred in 1996, was the addendum to the Children's Television Act of 1990. The results of Hypothesis 5 supported the proposition that a community needs a significantly greater portion of mutual to competitive ties to attain self-sufficiency. However, the density reached a peak during this phase and began to fall rapidly thereafter. It is interesting to note that the ratio of mutual to competitive ties over time barely changed between the last period of the maintenance phase and the phase of self-sufficiency ($\Delta_{1988\text{-}1992} = 2.55$, $\Delta_{1993\text{-}1997} = 2.57$). It is possible that in this community Δ = 0.75 was not a sufficiently high density to achieve the critical mass necessary to sustain self-sufficiency. Rather than achieving self-sufficiency, it is possible that the community was still in a period of maintenance when the event occurred and could not buffer itself from the changes in the environment. Another possibility is that the changes brought about by the 1996 addendum fundamentally altered the resources of the children's television community, causing a period of reorientation even though the community had reached a point of self-sufficiency.

Unfortunately, the narrative and historical data gathered do not support either of these possibilities. According to these data, this regulatory event is not the reason for the sudden density shift. Instead, the narrative data suggest that the CTVC was entering a recreation period similar to that of the early 1950s. Just as the increase in television penetration created the opportunity for the emergence of the children's television community and transformed the first populations from the radio community into the children's television community, the increase in adoption of digital media and the Internet during this phase of self-sufficiency was beginning to create a "new" children's *media* community (Corporation for Public Broadcasting, 2003). Economic and political resources that were formerly earmarked for children's television were beginning to be expropriated for new media endeavors (A. Cahn, personal communication, April 3, 2003; P. Miller, personal communication, March 24, 2003; K. Montgomery, personal communication, April 7, 2003; B. Sullivan, personal communication, April 8, 2003; V. Rideout, personal communication, March 21, 2003). If this identification of a fundamental change in the children's television community is accurate, then the sharp decrease in network density may reasonably be interpreted as an instance of community transformation. Thus, the CTVC can be seen as having experienced two fundamental community transformations: children's radio into the children's television community in the 1960s; and children's television into the children's media community at the turn of the 21st century.

If this sharp decrease in the network density of the children's television community is not due to transformation, however, then the results of this study suggest that a model of community evolution must allow for nonlinear movement between stages. In the present research, when density within the community communication network reached the critical mass (1993-1997), it immediately decreased dramatically, stopping at the value used to define a stage of emergence ($\Delta_{1998\text{-}2002}$ = 0.50). Other nonlinear changes are also possible, such as a community that evolves so rapidly that it moves from emergence to self-sufficiency stages without passing through a maintenance phase.

Conclusion

This article presents a communication network based evolutionary model for the study of organizational communities. This framework integrates theoretical premises and empirical evidence from three primary perspectives: evolutionary, community ecology and communication network theory. The 50-year history of the children's television community provides an important and interesting case study in which to explore these ideas about the evolution of organizational communities. The results support the fundamental argument put forth earlier: children's television programming emerged from the macro-level evolution of the communication networks within the children's television community. Populations within the community did not create, distribute, defend, or support children's television as insular entities. The changes in the relationships between the populations in the community over the past 50 years significantly influenced the content of children's programming around the world.

In the future, it would be useful to garner a richer perspective of community evolution by gathering and analyzing valued network data on the relationships between the populations. This would yield a more nuanced picture of community evolution, and would require more sophisticated network analysis tools.

This article addresses only a small part of the theoretical and analytical advances needed to comprehend the evolutionary processes that govern the field of organizational communication and community change. Additionally, this study contributes to our understanding that the phenomena that media scholars call "children's media effects" are multilevel, multifaceted phenomena. They range from micro level psychological development of the child to the meso level of multimedia conglomerates to the macro level of media communities and society. This work has raised many questions about communication and community evolution, provided a few tentative answers, and shown that it is feasible to bridge the boundaries among multiple disciplines.

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