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Ethnomethodological Architectures: Information Systems Driven by Cultural and Community Visions

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As networked digital systems are rapidly created and deployed, social, cultural, and community-focused issues are often neglected. Indeed much research has focused on the "effects" these systems hold, rather than viewing systems as tools to be designed given an understanding of sociocultural context. Acknowledging the cultural practices and belief systems of a set of users may allow systems to be more effectively created and deployed into particular contexts. Emerging research in community information systems and archives has highlighted possible interactions between system design and ethnographic research. These bridges include understanding how communities can begin (1) to create content for their own information systems, (2) to design the database architectures, and (3) to integrate systems within community infrastructures. In this article, I allude to several cultural criticisms that accompany the global proliferation of information technologies. These criticisms can be answered by research that focuses on developing systems based on ethnographic insights. Specifically, I present the research example of Tribal Peace, a cultural information system designed for and by community members of the 19 Native American reservations of San Diego County (California, United States). This case has demonstrated the potential for a community to create an information system that satisfies its own priorities. This precedent points to the need for further research that investigates this convergence.

Introduction

Networked technological systems, because of their global accessibility and cultural impact (Castells, 2001), have raised significant questions of content and classification. These include the question of who produces information for these systems and which standards are being circulated to classify this content. Consequently, scholars have begun to investigate the convergences between media technologies and communities. This process has involved studies of virtual communities that are formed and connected solely on the basis of the networked media environment in which they meet (Preece, 2000; Rheingold, 1993), as well as research focused on creating digital systems to serve perceived ethnic or cultural needs. Because information systems have been criticized as systems of cultural imposition (Sassen, 1997), the question of whether systems that are driven by community needs and discourses can be developed has been raised. Such systems would allow the technology to serve the community's infrastructures and be created from an ethnomethodological framework (Crabtree, 1998; Crabtree et al., 2000; Garfinkel, 1967). It has also been hypothesized that such systems may sustainably be used and adopted within diverse cultural contexts (Srinivasan, 2006b).

Developing information systems from within this framework may provide a response to many of the justified criticisms of blind technological deployment; that theme forms the basis of this article.

Background

Networked information systems allow for (1) preservation via storage of data and content within a series of database architectures and (2) dissemination and communication of information via digital networks and a client-server architecture that can be harnessed and written to by individuals in a spatially distributed audience. Cyberinfrastructures have proliferated (Borgman, 2000), and social network literature has emerged in scholarly material (Wellman, 2001). These developments have significantly impacted notions of community and culture from a traditional idea that geographical locality equates to community (Appadurai, 1998a, 1998b; Ginsburg et al., 2002).

Scholarly research has begun to focus on the cultural implications of global flows of information and capital. These dynamics have created stratifications that point to global unevenness in terms of technology access and authorship. These disjunctures have existed for years (Appadurai, 1998a, 1998b) yet continue to widen as more powerful technologies are introduced. The differences between the "haves" and "have nots" are likely to increase. With these points in mind,

efforts to respond to the "digital divide" are in place. Digital divide initiatives, much as many community-oriented information projects, tend to focus on providing communities with technology access yet often fail to consider the specific goals articulated by communities themselves.

Content and Community

The concept of community has been shifted via the emergence of such information systems. A rich diversity of online communities has emerged, and meaningful research has focused on the elements of sociability and usability fostered in these spaces (Kim, 2000; Preece, 2000). *Online community* is a term that is understood differently across the many disciplines that share an interest in the topic. Whittaker, Isaacs, and O'Day have identified the following core characteristics of online communities (Whittaker, Isaacs, & O'Day, 1997):

- Member maintenanace of shared goals/interests/needs
- Member engagement in repeated, active participation
- Member access to shared resources
- Reciprocity of information, support, and services
- Shared context of social conventions, language, and protocols

An online community is not defined as a community that only meets via an information system, but one in which communication and sharing of resources are connected to a shared technology. Wellman argues (Wellman, 2001) that computer networks are social networks and online communities maintain the potential for creation of strong ties through which ongoing emotional support is provided and weak ties through which distinct and potentially valuable nonredundant information may be accessed (Granovetter, 1973). Online communities have emerged in diverse scenarios with different purposes. Basic categories include the following:

- Virtual communities (of interest and in general): Virtual communities are constituted without explicit acknowledgment of physical geography or copresence. Interest-based communities would be focused on a specific topic, such as cooking or a baseball team, while general communities aim to build emergent connections from heterogeneous members who simply wish to socialize online. Although some have celebrated the power of virtual communities to form and sustain themselves solely in cyberspace (Rheingold, 1993), other researchers fear that the proliferation of such communities may negate the value of the physical world and civic urban communities through a process of cyberbalkanization (Putnam, 2000). These critiques may be overstated in their portrayal of this geographic negation, as the choice remains for community members to maintain their "physical affiliations" while they are online. The inclusion of school information, city of residence, and so on, via such online communities as Friendster and MySpace is reflective of virtual communities that are fundamentally focused on sociability rather than the forced topicality of specific interests.
- Physical communities supported by an online network: These are online communities that are specifically tied to a physical location. Notable examples of such communities include the Seattle Community Network and the Blacksburg Electronic Village. Such geographically tied communities have proliferated throughout the wired world (Carroll & Rosson, 2001).
- Communities of practice: Emerging from Wenger's (1998) descriptions, these are communities for professionals and others dedicated to the sharing of resources. Roles are defined yet fluid; purposes and goals are less fluid and fixed.
- Ethnic/political communities: These are communities that may have no proximity, yet have a common political identity or ethnic background. A variety of Web sites have been designed to allow these groups to join together. Such online communities exist to unite diasporic immigrant groups, allow dialogue among those who are dispersed and disenfranchised, and catalyze processes of preservation and cultural communication. Previous research has pointed to the possibilities of enabling culturally differentiated discourses to empower online communities (Srinivasan, 2004), and the centerpiece example of this article will attempt to extend such research. The study presented in this article is of a community of Native American reservations. Because these groups maintain a common cultural ancestry and similar political priorities, this article focuses on a community that is ethnic/political.
- Activity-based communities: These communities are defined by a shared activity such as shopping, making music, or playing games.

Authorship and Participatory Involvement

The research presented in this article focuses on the ethnic/political community; it attempts to understand how such communities can author, design, and adopt information systems to serve their specific cultural activities.

A number of community information projects have engaged communities beyond the traditional classical ethnographic understandings of "studying" the cultural environment in measurable, quantitative manners (positivist) or describing the culture in its most "normal" state (normativity). A number of such projects have focused on eliciting community stories/oral histories and expression; they are described as cultural storytelling systems, in which different community-created pieces are collected in an online system. An example is the Story Corps project (http://storycorps.net/), whose goal is to exhibit "extraordinary stories from ordinary people." Built around a set of sound recording booths placed at various public spaces, including New York's Grand Central Terminal, the project presents the ability to provide oral narratives that are then presented as part of a system housed at the Library of Congress's Center for American Folklife.

While Story Corps is notable for its emphasis on collection from many voices through oral and visual recording, it focuses on "nation" as a construct, rather than a specific ethnic, local, or linguistic community. Other projects in this vein have centered on using technology to preserve stories and cultural material within specific communities. The Gnawa Stories project (http://www.ibiblio.org/gnawastories/), based on the mystical healers of Morocco, is one interesting effort that has attempted to describe collected content about this community through the categories History, Rituals, Portraits,

and Travels. In soliciting community-created content, these projects are noteworthy; however, even within such projects it remains unclear how deeply different sectors of community are engaged and whether these systems truly allow knowledge to be circulated or preserved within a community.

Although these projects have allowed community voices to emerge online, authorship is but one step in a participatory design process (Bodker, 1996; Bodker & Gronbaek, 1996; Kyng, 1995; Reardon, 1998) in which end users are actively engaged in collaboration with researchers in the design of the technology. The engagement of the user or community as the designer has had demonstrable consequences for aiding systems in serving the specific needs of their users (Bishop, Mehra, Bazzell, & Smith, 2000; Harris, Weiner, Warner, & Levin, 1995; Kyng, 1995). For example, the Afya Project, dedicated to "exploring ways to build community-wide social practices and support systems that foster active participation of marginalized groups in creating digital library collections and services" (Bishop et al., 2000), has attempted to embody a participatory method to recruit and actively involve community members in assessing outcomes and simulating scenarios (Hill et al., 2000) for a system designed to provide information services to a marginalized community of African American women. This article supports such a "community informatics" perspective (Gurstein, 2000) by identifying "effective uses" of technology within the social domain.

The research described in this article is engaged in extending the approaches of such projects to probe into the possibilities for communities to serve as the content creators, interface designers, and, most importantly, information architects and ontology creators of their own systems. However, the focus of this participatory design process is on engaging communities to elicit their everyday real world priorities and activities. In this regard, it is associated with historical studies in ethnomethodology (Garfinkel, 1967).

Ethnomethodology—Engaging a Community to Reflect on Its Practices

Garfinkel developed the concept of ethnomethodology by emphasizing the authenticity of social and situated practices as fundamental to the creation and circulation of information. Decontextualized patterns and standards, described as "coding" by Garfinkel, generate interpretations that are constructed, based on false objectives that belie the ethnographic context of the activity and practice. These codes "furnish a social science" that is removed from the "real world" it aims to study:

> Ethnomethodology is a determinedly "unconstructive" enterprise—it rejects the practices of coding and classifying the ethnographic record through the instructed application of predefined taxonomies and analytic frameworks, and rejects any attempt to achieve a rigorous understanding of social organization through the construction of master narratives or models explaining the real world. (Crabtree et al., 2000, p. 6)

Ethnomethodology argues that knowledge is formed and constructed through interactions and embedded within the context of the everyday. It is these interactions that can generate the real-world character of activities in context and provide an approach to coding and representation of the "fluid ontologies" that serve as the information architecture of a community system.

Classification, Standards, and the Participatory Creation of Community Ontologies

Elsewhere I have argued for the importance of "fluid ontologies" (Srinivasan & Huang, 2005), or the representation of information system content according to fluid, elicited descriptions articulated by community/ies. This approach allows the community to build its own standards structure for its information system, a representation of the information it authors that emerges from the participatory process. I have described the importance of engaging a community by using ethnographic practices (Srinivasan, 2004) to identify different individuals who can lead and sustain projects. Via a participatory process, community members can create their own ethnomethodological representations of real-world activities and priorities, thereby generating information systems that hold cultural relevance.

Without this approach, systems lack an organizational scheme that is reflective of the specific community. Systems that have categorized community knowledge around keywords, for example, have been found to be less engaging to their community of users (Srinivasan, 2004). The fluid ontological approach creates a dynamic evolving representational structure that allows information to be navigated and accessed on the basis of a community's own acknowledgment of its own activities and discourse. It is a structure that is shaped in discrete intervals as community members meet, reflect on the system and its content, and redesign the structure. It is not a type of fluidity that is directly and continuously responsive to browsing patterns, but instead privileges the community's communication and reflections that emerge from in-person meetings (conducted within the reservations at different locations monthly).

The ethnomethodological approach to information system design directly complements the work of Crabtree and colleagues, who argue for exposing the "reflexive social practices of making sense and producing information . . . (social practices) that are embodied" (Crabtree et al., 2000). The focus of this article extends this work by engaging communities to follow the principles of participatory design to create ethnomethodological information architectures.

This method also resonates well with the work of Jacob and Albrechtsen (1997), who advocate a broader view of classification structures that are driven by a mediated dialogue of actors and the reflectivity inspired by this process.

> We argue that both the design and subsequent maintenance of classification systems . . . addresses the inherent social role of the classification system and its situatedness within a

particular social environment. . . . This argument entails a new understanding of a professional role for the creators of classification schemes and an enhanced understanding of their contribution as process-oriented facilitators of knowledge, rather than product-oriented information engineers. (Albrechtsen & Jacob, 1995, p. 30)

Indeed, classifications express value, by articulating "boundary objects," or reference points of inclusion and exclusion (Star, 1989). Scholars have decried the universalized and standardized classification systems, arguing that they have effectively marginalized important domain categories (Olson, 1998) and have become obsolete in describing multidisciplinary knowledge production, at least in the academic domain (Beghtol, Howarth, & Williamson, 2000). The importance of classification has driven global standards research projects such as Dublin Core and the International Committee for Documentation of the International Council of Museums Concept Reference Model (CIDOC CRM). CIDOC states its mission as follows:

> The primary role of the CRM is to enable information exchange and integration between heterogeneous sources of cultural heritage information. It aims at providing the semantic definitions and clarifications needed to transform disparate, localized information sources into a coherent global resource, be it within a larger institution, in intranets or on the Internet. (Crofts, Martin, Tony, Stephen, & Matthew, 2003)

By privileging information interoperability, standards research encounters the danger of neglecting cultural and community context (Boast, Bravo, & Srinivasan, in press). Bowker and Star characterize the process of standardization as maintaining four major characteristics (Bowker & Star, 1999):

1. Ubiquity: Classification Schemes saturating the worlds in which we live
2. Materially textured: Standards are not just numerical but have a material force in the world, and their ubiquity ensures their power
3. Past as indeterminate: The creation of standards is often arbitrary
4. Politics of classifying and standardizing

An approach to information system design that is grounded within the ethnographic process does not negate the powerful achievements in global standards, information retrievals, and top-level ontologies, but it also asks the information scientist to consider community-articulated metadata. Indeed, I believe that a powerful direction for future information systems would follow a hybrid model wherein communities articulate their own information systems yet on a metalevel multiple systems are integrated through global standards.[1]

Given this argument, what is a model by which such systems can be created? And do these systems truly integrate community needs and visions?

Unpacking an Ethnographic Information Studies Model

How can the researcher engage the community in the development of the information system? I have argued that when the researcher can also serve as a community ethnographer, he or she can begin to identify community-specific behaviors and realities (Srinivasan, 2005, 2006a, 2006b; Srinivasan & Huang, 2005). Part of this process has involved identifying leaders of different subcommunities and persuading them to join to lead the project. Ethnographic processes allow knowledge to be described from the perspective of its own actors and is the basis of my strategy in identifying community members to serve as participatory designers of a system's information architecture.

To demonstrate these ideas, I introduce the Tribal Peace research project, focused on the creation of an information system to serve the needs of 19 Native American reservations located in San Diego County, California (United States).

Research Case—Introducing Tribal Peace[2]

The tribal communities of San Diego County, derived from the Kumeyaay, Luiseno, Cupeno, and Cahuilla Nations, face issues of historical and spatial disconnection. The creation of the reservation system has fragmented and disconnected these peoples from one another in a physical sense while also effectively purging "collective memory." Knowledge of native languages, songs, and rituals is largely lost across the reservations.

Figure 1 reveals a significant physical dispersion that can be understood in terms of physical distance and infrastructural disconnection. Not only are the roads and highways disadvantageous for collective meetings across the reservations, but other critical types of collective infrastructure are lacking, including access to water resources, hospitals, schools, and fertile land (Srinivasan, 2005).

Locations on different sides of a mountain range with no direct highway connection make the journey between the reservations of Campo and San Pasqual, for example, disconnected and difficult. Even on the individual reservations, land title is not contiguous. The so-called checkerboard pattern exists on the scale of a single reservation: In order to go from one point of the reservation to another, one must pass through nonreservation land. This lack of contiguity and boundedness generates the fragmentation on the microscale.

I was invited to work and supported in this research by the leaders of these 19 reservations who wished to build on a significant technology grant received by the Southern California Tribal Chairmen's Association (SCTCA) from the Hewlett-Packard Corporation. The grant entailed the

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[1]Publications in this regard are Srinivasan (2006a, 2006b).

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[2]This section is taken directly from Srinivasan (2005), an unpublished doctoral dissertation. Journal articles in *The Information Society* (Srinivasan, 2006b) and *International Journal of Cultural Studies* (Srinivasan, 2006a) complement this research by focusing on the developmental, educational, and cultural impacts, respectively, of the study and methodology described in this article.
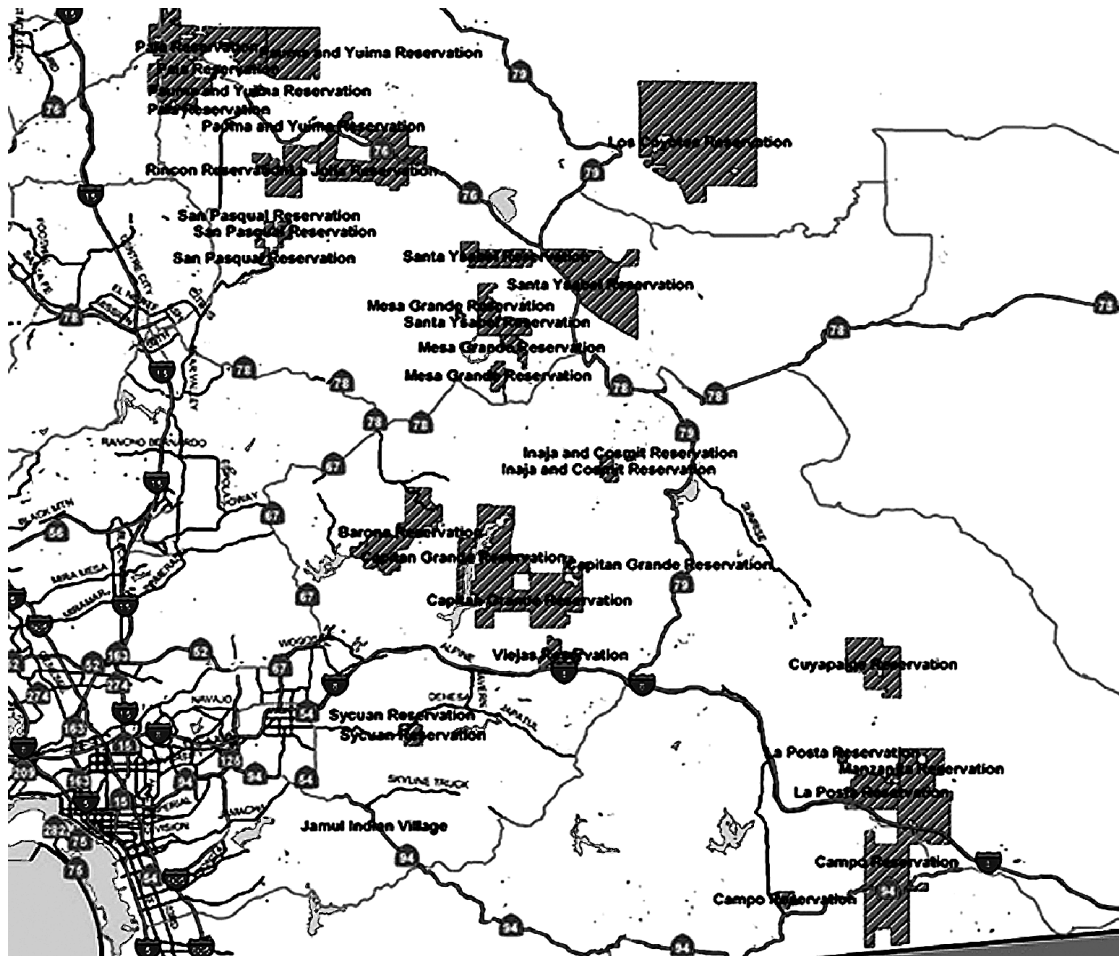
FIG. 1.   The 19 native reservations of San Diego County and interconnecting highways.

provision of a digital network infrastructure, wireless Internet towers, computers, projectors, video cameras, and so on. This infrastructure would be based on the goals of reconnecting the links between the reservations that had been destroyed over time. The grant was described as providing a "Tribal Digital Village" (www.sctdv.net). Of course the provision of this Internet access and technology would not create a "village," but instead introduce the opportunities for connectivity that all communication infrastructures offer. Therefore, I was invited to develop an information system that could serve as a space of exchange and preservation across the 19 reservations. This information system, it was decided, would be called Tribal Peace.

Ethnography and Information System Design

The ethnographic process of engaging the community, presenting my research and personae, and ultimately receiving the embrace that was manifested in an information system is a key element of this research (Srinivasan, 2005, 2006a). This has involved the understanding that the development of the research accompanies and progresses proportionally with the ethnographer's inclusion in or exclusion from the community and, more importantly, the ability to inspire endogenous

leadership and adaptation over the information system from "within" the community. The time spent with medicine people, political leaders (chairmen), educational representatives, and business owners culminated in the development of Tribal Peace. I describe these interactions with different community members in great detail elsewhere (Srinivasan, 2005, 2006a). It is worth noting that for the initial 6 months, the majority of time was spent observing different community activities (schools, meetings, etc.), meeting leaders and elders from the different reservations, building up networks of connection with community members not currently in leadership positions, to involve participation by a variety of different community members, and developing bonds of connection and trust with community members. These steps helped reach an acceptance level wherein I was seen as not simply there to study the reservations but also to work to create a system to be authored, designed, and operated by them. Therefore, the main goal of the ethnography was to develop an understanding of the structures, networks, actors, and attitudes across the reservations. By building of connections with different reservation members over the first 8 months of fieldwork, a diverse group of community members from across the reservations was formed to serve as an initial project committee responsible for reflecting on the real-world activities of their reservations in context

and correspondingly designing an information system from these insights.

With technology provided by the infrastructure grant, community members had already begun utilizing technologies borrowed from the resource centers to digitize and document traditions, language, and songs, before the system was designed. Reflective stories had been created around participatory video principles (Kindon, 2000) and presented at the different reservation "resource centers." A leadership committee emerged to dictate and design the project—its design and expansion. With my assistance, tribal members began to create video and photo-based pieces around different tribal realities on the reservations. There was little overt instruction in this process, other than teaching tribal members the basics of storyboarding and editing. A number of pieces were therefore created in addition to those already waiting to be shared. These pieces spanned a number of topics including traditional health practices, politics and sovereignty, language training, youth education, and history.

As the information system was to be a Web-based project accessible across the reservations, engaging the project committee in the process of visually designing and leading the outreach process was important. With that in mind different concepts were discussed, drawn out, and described by the project committee. It was decided that a symbol of rebirth should be selected, and consensus was reached on the manzanita tree (Figure 2).

As described, video and audio content had begun to be created and resource center leaders had begun to take charge of the system on an administrative and infrastructural level. However, engaging the community to serve as the designer of the system's classifications and categorizations was an important step remaining. In essence, creating a mapping between the cultural priorities and the database representations of content is the system unlocks the question of ontology and of whose ontology drives the system.

In keeping with the lessons of ethnomethodology and fluid ontologies that drive this article, working with the community to generate an initial ontology necessitated my moving to the periphery as much as possible. Over the first 6 months of my work with these communities, I had made contact with close to 100 individuals across the 19 reservations who expressed interest in and excitement about the project. Some were already established in public leadership roles. These included educators, political leaders, business- and casino-related individuals, parents, teenage and high school youth, medicine and health people, and cultural leaders. I had worked closely with one individual in particular, Shonta Chaloux from San Pasqual, who was seen and publicized as the project leader from within the communities. This leader and the committee invited those whom I had met as well as contacts of their own to attend the first ontology design meeting, held on April 2004 at the San Pasqual Reservation resource center. Those who attended this first meeting represented 14 of the 19 reservations and totaled 45. As a shared collaborative activity, the project leadership committee expressed the goals of the session of articulating and describing the elements of collective importance that occurred across the media pieces. Each piece of content was up to 10 minutes in length, and the attendees randomly screened and discussed emergent topics, temporalities, themes, and their interrelationships. During this process, I was only present at these times as an observer. The decision was that the elicited structure and the elements it contained must be determined through attendee consensus, which was easier to obtain because all were assured that the committee would meet every few months to redesign the ontology on the basis of new system content or reflections of how the structure may more appropriately be adjusted. The process was open-ended and nonregulated by any leader or hierarchy. Any committee member could express his or her opinion and a moderator was present only to keep track of time.
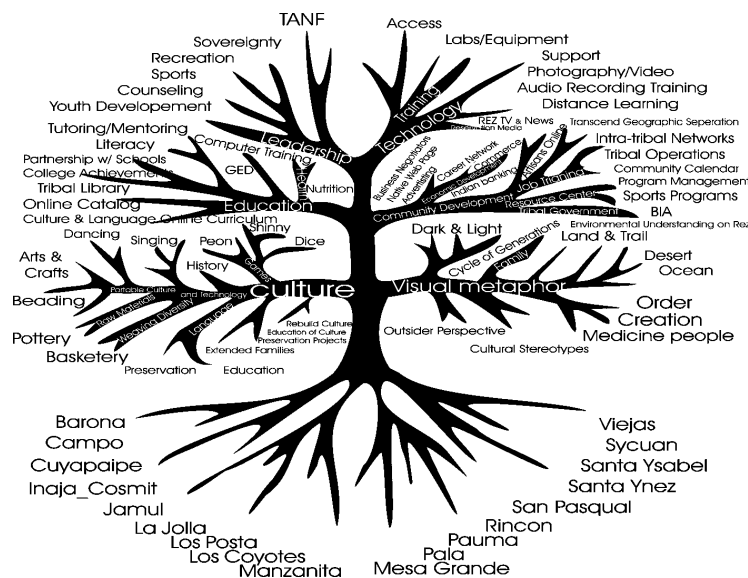

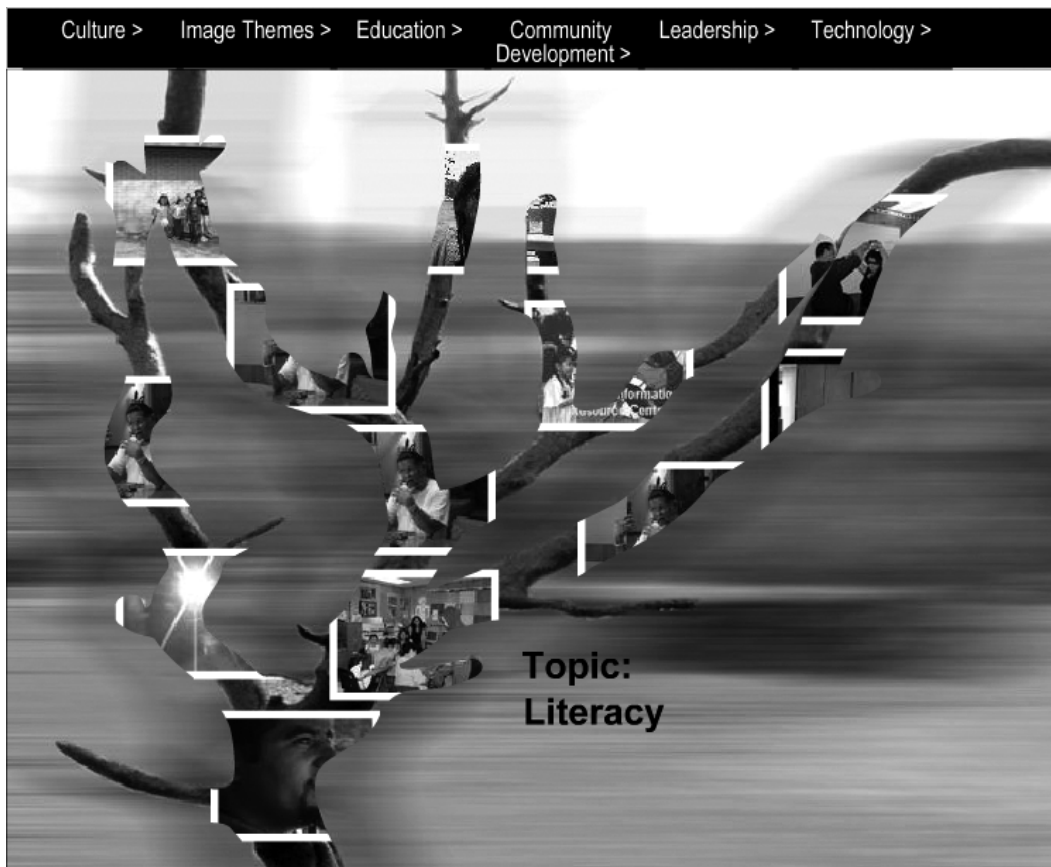FIG. 2. Composite interface metaphor: manzanita tree.

FIG. 3.   Initial tribal peace ontology (topics/concepts with the roots serving as the reservations).

During this meeting, topics would be identified and discussed by the committee. They were listed without any judgment of their relevance on a whiteboard after the committee reached consensus about their relevance. The committee then derived relationships of these different topics, grouping them in clusters of conceptual relevance and identifying labels that described the group of topics. As Figure 3 demonstrates, clusters around topics such as Image Themes have been identified by the committee. Such a label may not have relevance to other communities yet with the community in question was considered relevant in terms of the way history and cosmology are conceptualized. Therefore, as topics such as Ocean, Desert, or Darkness and Light were identified in the free listing process, the committee was able to group them under the topic of imagery, a category of significant cultural relevance for the 19 reservations. It therefore indicates how knowledge and classification practices of these communities follow categories that are culturally specific, locating knowledge in the natural landscape (ocean, desert categories), new technologies (distance learning category), political practices (sovereignty category), and others. The process was therefore ethnomethodologically oriented, in its focus around the viewing of different video/audio pieces to aid a discussion of the everyday, real-world activities.

The identification of topics from this discussion therefore generates the "ethnomethodological architecture" (Figure 3) to anchor the community information system.

The information architecture of Figure 3 was decided upon across a series of project committee meetings. As further content is added to the system and issues change, the committee meets periodically to change the nature of this ontology. What is important is that this ontology has provided a mechanism for community members to associate (and annotate) their submissions with a set of collective topics. It creates a representation that allows information to be navigable and referenceable, yet situated within the practices and discourses of the community. System visitors can browse through content based on different ontology topics. Also notable are the elements that populate this ontology. In that regard, it offers an approach that can potentially collaborate with the top-down ontology standards and interoperability efforts in information science research.

System Evaluations

At the time of this publication, Tribal Peace maintains approximately 400 users and 250 pieces of content to be shared across the 19 Native American reservations. At the

time the evaluation study was made of user logs, 310 users, approximately 6% of the entire reservation population, had created accounts with the system. The following list shows their distribution by reservation:

Los Coyotes: 9

Pala: 32

Barona: 17

Campo: 15

Cuyapaipe: 1

Jamul: 10

La Jolla: 17

Manzanita: 5

Mesa Grande: 8

Pauma: 19

Rincon: 44

San Pasqual: 60

Santa Ynez: 1

Santa Ysabel: 15

Sycuan: 12

Viejas: 15

Nonreservation members: 35

All of the nonreservation members have taken an interest in the system and have signed the nondisclosure agreement present on the site and required for creation of an account.

The growth of usage increased significantly over the 18 months that the system was live on the reservations. I present a few notable results taken from the evaluation period or the first 9 months of system usage. Table 1 presents usage data in terms of time online.

Similarly, data related to the number of user sessions, ontology, and story hits, and so on, for the month sampled have been collected. When the data are compared to a plot of the time I spent on the reservations, a 100% analysis of variance (ANOVA) confidence level that establishes a linkage of correlation is revealed. Therefore, usage is tied to the presence of the ethnographer, at least in an initial period in which the information system has been incubated.

Table 2 presents relevant data focused on the engagement with the different nodes of ontology over the different months. This ontology did not adapt dynamically to particular usage

TABLE 2. System users—percent of ontology nodes queried.

April, 2004	.590
May, 2004	.795
June, 2004	.795
July, 2004	.614
August, 2004	.975
September, 2004	.951
October, 2004	.941
November, 2004	.951
December, 2004	.941

patterns, but instead would be modified during the project committee meetings. The development of dynamic ontologies that are community-based and weighted is an important task for future research. Table 2 therefore indicates the percentages of the 83 total ontology nodes available that were accessed by users each month the data were sampled.

These data show relatively comprehensive engagement with the full range of ontology topics, particularly over time. They indicate that the ontology is fully utilized and represents at least a full subset of community topics and interests. In that regard, it seems to be an effective architecture of information for future usage.

A third interesting finding, described in Table 3, is that reservation members seek information within this system without a bias toward content created on their own reservations. Indeed, the percentage of in-reservation information accessed fluctuates wildly and reveals no significant ANOVA correlation over the 9 sampled months when compared for each reservation of the 19. As an example, Table 3 presents the data from Pauma, a reservation with an approximately average number of users among the 19.

Pauma, as does every other reservation, has fluctuating values that do not directly correlate with month. These data are confirmed in the case of every reservation sampled and tested with ANOVA. There is no significant temporal skew toward seeking information that is "in-reservation." This finding may be caused by the fact that the Tribal Peace system does not emphasize these elements within its interface design and instead connects information visibly through its collective ontology-focused interface. Stories can be also be accessed by specific reservation but only through a secondary feature that filters results from an initial query.

TABLE 1. Average time/session/month (across all users, expressed in seconds).

April, 2004	3218.5
May, 2004	12841.938
June, 2004	3999.83
July, 2004	7489.5
August, 2004	4625.95
September, 2004	2196.55
October, 2004	943.8
November, 2004	853
December, 2004	1589

TABLE 3. Pauma Reservation—percent of "In-reservation" content accessed/month.

April, 2004	.42
May, 2004	.11
June, 2004	.12
July, 2004	.15
August, 2004	.17
September, 2004	.03
October, 2004	.11
November, 2004	.30
December, 2004	.22

TABLE 4. Number of distinct stories viewed/month.

April, 2004	69
May, 2004	107
June, 2004	128
July, 2004	147
August, 2004	246
September, 2004	210
October, 2004	80
November, 2004	233
December, 2004	88

Finally, Table 4 presents diversity data, which attempts to map the number of distinct stories accessed, per month and per reservation.

These data reveal a diversity of usage that is independent of the months in which more time was spent by the researcher. It reveals moderately high values for May and June, yet usage skewed toward August (as with the data in Table 1), September, and November. It appears that during these visits, when Tribal Peace had been most integrated within the schools as a tool of learning, greater diversity of usage had resulted. Therefore, while total amount of system usage ties to the researcher's presence in the early stages of this project, diversity of usage relates to activities within the reservations that were independent of the researcher's visits and timetable.

The study did not involve a formal collection of interview data but included ethnographic observations based on periodic visits to the field site over the period of the study. These observations have revealed that the impact of the system cannot be considered solely in terms of quantitative data. Given that data were collected within an incubatory period, many of Tribal Peace's benefits lie in its potential to engage community infrastructures (such as schools and political and cultural institutions) in the long term. I have observed periodic use of the system in the on-reservation secondary schools, particularly during Native Culture, History, and Politics sections. Additionally, the system has been used in occasional meetings to allow political leaders to access the variety of voices of their peoples. Finally, the system has been advocated by other outside institutions and individuals who maintain strong relationships with the tribes. They include faculty from University of California at San Diego's Department of Ethnic Studies and directors of San Diego's Museum of Man and the Smithsonian's National Museum of the American Indian.[3]

Concluding Thoughts and Reflections

The data presented beg the important question of self-sustainability, on which note I shall close this article. Can such systems exist and persist independently of the presence of the ethnographer? On this topic, I have several reflections:

1. An information system exists within a social and cultural context, and the connections between the social, cultural, and political geography and quantitative system usage are indisputable. The data reveal that diversity of usage is independent of this factor. One cannot analyze or evaluate such systems in a quantitative vacuum but must carefully integrate a social and cultural context to interpret the trends in the data. The time and effort spent by the researcher are manifested in the level of system usage.

2. The 8 months of sampled data show a tight coupling between the time spent in the field, reservations visited, and so on. This finding implies two possibilities: (1) that the 8 months is but a period of incubation, and information seeking behavior may be manifested more independently over time, warranting a longitudinal study with greater time range,[4] and (2) such projects will sustain as social and cultural leaders from within the community continue to steer the project, publicize it, and allow the community's voice and practices to inform the system.

3. Relatedly, institutionalization of the information system within community practices is critical. I have observed long-term sustainability potential in connecting the information system to educational, political, and cultural institutions and events (Srinivasan, 2006a).

Therefore, the jury remains out regarding the sustainability of such initiatives. The clear engagement that is tied to active community outreach work reveals positive potential for the information system to engage, shape, and serve important roles within the community. It raises the possibility that technologies may not thrive within marginalized communities independently of the needed social leadership from within the community. This hypothesis is consistent with the findings of notable digital divide studies that argue that the divide is more effectively resolved when a social and human connection is established to lead the technology initiative within the community continuously (Warschauer, 2003). Further research can begin to uncover the "incubation period" issues and suggest strategies toward community infrastructural adoption.

This article has attempted to present an approach to creating information systems that are created, designed, and integrated within the ethnomethodological framework of recognizing embodied social practices. Enabling communities to serve as the content creators and ontology designers appears to hold sustainable resonance. This research points to the need for further exploration and inquiry into such important questions as the following:

• How can communities continue to explore their goals of memory and preservation and create information systems that represent endogenous priorities?

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[3]Please note that the observations in this paragraph are expounded on further in Srinivasan (2006a).

[4]At the time of publication (April 2006) the Tribal Peace system is still being utilized relatively consistently at a level at least equal to the mean value from Table 1 during the study period. More reflections on this finding warrant presentation in a future publication.

- How can information systems allow the emergence of larger developmental processes? Answering this question may include the study of how the information system engages economic, political, and social visions and allows them to be realized.
- How can community-driven information systems negotiate new relationships between the disenfranchised and governmental/transnational/corporate institutions (Srinivasan, 2006b)? Can these systems serve as mechanisms of cultural communication with these organizational entities?

As international standards continue to emerge and accompany global technology transfers, the pertinence of these questions is magnified. I believe they represent an important research trajectory, one that extends important ongoing research exploring the connections between cultural groups and information systems.

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