USING INFORMATION AND COMMUNICATIONS TECHNOLOGIES TO ADVANCE A PARTICIPATORY CULTURE: A STUDY FROM A HIGHER EDUCATION CONTEXT

by

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Dissertation Committee:
Professor Charles Kinzer, Sponsor
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Approved by the Committee on the Degree of Doctor of Education
Date MAY 18 2009

Submitted in partial fulfillment of the requirements for the Degree of Doctor of Education in Teachers College, Columbia University 2009
ABSTRACT

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Anthony Patton Cocciolo

Advances in information and communications technologies (ICTs) have empowered individuals to share their intellectual, cultural, and creative expressions with wider and more diverse audiences than ever before. This has been made possible by a variety of factors, but most saliently by what has been termed Web 2.0, which is a set of design patterns for structuring websites so that they can be actively shaped and influenced by the interactions and contributions of users (e.g., YouTube, Facebook, and MySpace). These changes have been described as creating the conditions necessary for shifting society from a consumer culture to a participatory culture. This emerging cultural formation has been hypothesized to have a great deal of potential for advancing education and learning by moving the locus of activity from existing power relationships (consumer/producer, expert/novice, and teacher/student) to one that focuses on the individual’s empowerment and willingness to construct and contribute to one’s cultural and physical reality. Despite this potential, there is little research that looks to understand how such ICTs deployed into specific communities do (or do not) make possible these goals.
This study aims to understand the relationship between ICTs and their potential for creating and sustaining a participatory culture, particularly by pointing to a set of factors that highlight the existence of and mediate involvement in a participatory culture. To understand this relationship, this study analyzes an Web 2.0 technology that was used electively by a graduate school community for a two-year period of time (September 6, 2006 to September 6, 2008) by $N=2,580$ students, faculty and staff. The factors that mediate involvement include: communication across organizational structures, spaces for alternative discourses to develop and integrating interpersonal networks. The study concludes that Web 2.0 technologies promote the formation of participatory cultures by making the cultural, intellectual, and creative work of a community visible, and that visibility in turn encourages individuals to participate.
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I arrived in New York City seven years ago with the top down on my red Miata and my dog at my side, exhausted from having made the four day journey from Southern California. Navigating the pot holes of the BQE (that’s the Brooklyn Queens Expressway for you out-of-towners), I was unsure what the future would hold. In this journey, I found myself and I’m incredibly grateful to have had this opportunity to give something back. I would first like to thank my dissertation committee. First, to Charles Kinzer, for making the Communication, Computing and Technology in Education (CCTE) program a place where ideas could be explored and thoughtfully examined, and for guiding me through this project. Second, to Gary Natriello, who hired me to work at the EdLab, pushed me to think about ideas in more expansive ways, and never saying “no” to any of the crazy things I wanted to do. To Lalitha Vasudevan, for adding much needed balance and reminding me to listen to the voices. And to Jeanne Bitterman, whose thoughtful questions as an examiner have indeed strengthened this project. I would also like to thank the faculty of Teachers College, particularly Robbie McClintock, Frank Moretti, Ellen Meier, Robert Taylor, Howard Budin, John Broughton and Shawna Bu Shell, for creating a learning environment that expanded my thinking in ways I could not have imagined.

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CHAPTER I

INTRODUCTION

Background

The introduction of the Internet in the late twentieth-century, and its rapid growth and development in the early twenty-first century, has raised a series of cultural and social questions that need exploration and elicitation. Of these, one of the most interesting is raised by the media scholar Henry Jenkins, who sees an emerging, large-scale transformation in how people interact with media. His viewpoint is best contrasted against what could be considered an earlier media arrangement. Under this earlier arrangement, media users were typically considered consumers, who read, watched, or listened to media produced by large corporate entities or organizations via television, radio, film, or print. These large organizations were at times deemed to have excessive control in shaping public discussions because of their extensive reach, power, and resources. At worst, it has been argued that media eliminates public discourse and rather replaces it with entertainment, which is only one among dozens of criticisms made by scholars and commentators (Postman, 1986). Given this backdrop, Jenkins sees the affordances offered by the Internet as opening up a new media era with implications for society, culture, and education. Under this scenario, media users move away from simply being consumers into also becoming more active producers. He describes this move
away from a consumer culture to one he calls a participatory culture. In a report for the MacArthur Foundation, Jenkins describes a participatory culture as:

… a culture with relatively low barriers to artistic expression and civic engagement, strong support for creating and sharing one’s creations, and some type of informal mentorship whereby what is known by the most experienced is passed along to novices. A participatory culture is also one in which members believe their contributions matter, and feel some degree of social connection with one another (at the least they care what other people think about what they have created. (p. 3)

This revised culture is hypothesized to promote skills, such as distributed cognition, collective intelligence, multitasking, simulation, networking, performance, and play, in ways that earlier media cultures could not. Jenkins notes that the emergence of a participatory culture is made possible by innovations in information and communication technologies (ICTs), in particular by what is often called Web 2.0, which is a type of web technology that is actively shaped and influenced by the interactions and contributions of its users. Jenkins says Web 2.0 refers to:

how the value of these new networks depends not on the hardware or the content, but on how they tap the participation of large-scale social communities, who become invested in collecting and annotating data for other users. Some of these platforms require the active participation of consumers, relying on a social ethos based on knowledge-sharing. Others depend on automated analysis of collective behavior. In both cases, though, the value of the information depends on one’s understanding of how it is generated and one’s analysis of the social and psychological factors that shape collective behavior. (p. 50)

The most salient example of this type of web technology is Wikipedia, which relies on user contributions to create its corpus of encyclopedia articles. The emergence of a participatory culture, made possible in part through Web 2.0 technologies, has immense implications for those concerned with education and learning for both youth and adults. Jenkins finds that:
In such a world, students can no longer rely on expert gatekeepers to tell them what is worth knowing. Instead, they must become more reflective of how individuals know what they know and how they assess the motives and knowledge of different communities. Students must be able to identify which group is most aware of relevant resources and choose a search system matched to the appropriate criteria: people with similar tastes; similar viewpoints; divergent viewpoints; similar goals; general popularity; trusted, unbiased, third-party assessment, and so forth. (p. 50)

Hence, the argument is that the greater diffusion of the Internet across broader segments of the world population, coupled with increased speed and storage capacity on and across the Internet, further buttressed by changes in web design patterns, are creating sites and possibilities for educational and cultural change.

Flashback to the year 2005. The term Web 2.0 was starting to gain widespread attention after it was coined by O'Reilly Media (2005) to describe a new way of approaching the development of Web applications that focused on participation of users in connection with one another rather than on the consumption of content compiled by experts or professional cultural producers. During this time and in concert with this movement, I became interested in the relationship between the design of online environments and their potential to impact the culture that gets expressed within an environment. Up to this point, many online environments designed for use in education were engineered to further reinforce traditional social arrangements, such as the teacher and student relationship. For example, the learning management system (such as Blackboard, Web CT, among others) created a hierarchy of roles, beginning at the top administrative level and bestowing greater privilege on the instructor, and less privilege on the student, and little or none to the unaffiliated with the institution. Hence, these were top-down systems, meant to mirror the bureaucracy of the institutions that
purchased them. I wondered, if one designed a system that ignored all these institutional roles, giving everyone equal play within the environment, what kind of culture would arise around the use of the tool? Would the culture around the use of the tool simply mirror existing social arrangements, such as the teacher/student relationship, as if the technological restraints were still in place, i.e. the learning management system? Or would a different kind of culture arise, much like the one developing on the Internet and what has more recently been described by Jenkins as a participatory culture? Is there a relationship between the design of an ICT and the culture that gets created within?

Research Questions and Hypothesis

The research at hand is therefore driven by this central question: How can ICTs be used to promote participatory cultures? Further, how does the introduction of a Web 2.0 technology into a higher education community impact the culture of learning? Does the introduction of a technology that is open and unrestrictive (the hallmarks of Web 2.0 technologies) into a community result in a culture reflected in the ICT that is equally participatory? Or stated differently, what kind of culture does a community choose to create within an online environment when no one given culture is given preference? Does it choose to create a consumer culture, characterized by consumptive interactions and hierarchical social arrangements, such as producer/consumer, teacher/student, and expert/novice? Or does it choose a participatory culture, where individuals actively contribute to their cultural and material reality? If the technological restraints are
removed, do individuals continue to impose restraints on themselves? And importantly, how does the culture that gets developed in the Web 2.0 environment impact the overall organizational culture? To address the above-noted central and sub questions, a Web 2.0 technology with little restraints on role and type of contribution was designed and developed and rolled out to a graduate school community of 5,000 members and studied over a two-year period of time. The aim of this thesis is to understand the relationship between ICTs and their potential for creating and sustaining a participatory culture. In particular, a set of factors will be introduced that highlight the existence of and mediate involvement in a participatory culture.

If a higher education community chooses to express one culture over another, does this really matter? I will argue that it matters on a number of fronts. First, it matters for the design of online learning environments. It is important to know if online design can have an impact on the culture expressed in the online environment, or if the culture is pre-determined by the face-to-face culture. This is important because it implies that desirable social and cultural outcomes can be promoted through the use of an ICT on the institutional level. For the purposes of this study, the desirable social and cultural outcomes are greater collaboration and sharing among members of the community (or in effect, a more participatory culture). Second and more importantly, it points to the possibilities for ICTs to provoke (or to have no affect on) the culture of learning within an organization. Do ICTs that ignore organizational structures create cultures around their use that are more participatory, where all users have a chance to contribute and feel like their contributions matter, or are the pre-existing organizational structures mapped onto the ICT and more hierarchical (e.g., student consuming the work of experts) cultures
form around the use of the tool? Like the first point made, this is important because it implies that ICTs can be used on an institutional level to promote desirable types of behavior. By desirable types of behavior, I am interested in having students feel emboldened to create and share their research, teaching, and learning, and avoid becoming passive consumers of their educational experience.

And lastly, this project matters with respect to education policy, particularly with respect to national educational objectives. In 2008, the National Science Foundation published a report titled *Fostering Learning in the Networked Word: The Cyberlearning Opportunity and Challenge*. This report called for research into investigating cyberlearning, or “the use of networked computing and communications technologies to support learning,” especially with regard to a “platform” and “infrastructure” perspective (p. 5). This project will offer insight into using ICTs as a platform for knowledge sharing across an institution, and will offer several implications for using ICTs to address cyberlearning goals. The importance of understanding how Web 2.0 technologies can be used to address cyberlearning goals is important because of the national interest in understanding how networked technologies can be used to aid institutions in providing education to larger and more diverse groups. This national interest is expressed in the NSF Cyberlearning report, that finds that “learners everywhere need to increase their knowledge and capacities to keep pace with the scientific advances and succeed in the global workplace. Traditional forms of education cannot meet this demand—simply to meet the worldwide needs for higher education, a major university would have to be open every week” (Atkins, Brown & Hammond, 2007, p. 9). The hope with this project is that it will provide insight into how networked technologies can be used to provide greater
access to knowledge resources and integrate learners into meaningful learning communities. Although this study will not address most of the NSF cyberlearning goals (e.g., how ICTs can be used in higher education to enhance capacity for providing education), this study will point to ways that ICTs can be used to support knowledge sharing within an institution using a platform perspective.

Given the significance of this study, what specific activity must take place by whom within a Web 2.0 environment to qualify it as promoting a participatory culture? Returning to Jenkins' definition of participatory culture, the objective of participatory culture is to move the locus of activity from traditional power relationships (consumer/producer, expert/novice, and teacher/student) to one that focuses on the individual’s empowerment and willingness to construct and contribute to one’s cultural and physical reality. The advantage that the Web 2.0 technology brings in achieving this objective is the low cost of contributing, including the ease of contributing and limited time investment to make the contribution. Additionally, there is the social expectation by members of the user community that one should do something unique and creative with one’s contribution. Lost-cost of contribution has also been described as “the lowering of the transaction cost.”

This notion has been widely picked up from several scholars, including Shirky (2008) who describes how the “collapse of transaction costs makes it easier for people to get together—so much easier, in fact, that it is changing the world” (p. 48). The expectation of being creative, combined with the lowered social barriers to entry, should prompt the user to more freely contribute whatever they feel like and not feel heavily
burdened by what is acceptable or appropriate (although there are certain levels of acceptability and appropriateness that most individuals will bring to any situation, regardless of the environment). For example, these criteria (low cost of contribution, expectation of creativity, and low social barriers to entry) are the hallmarks of a successful YouTube contribution, where success is indicated by the popularity of the video (which is often termed as "going viral") and by overwhelmingly positive comments by the members of the community.

Hence, for the purposes of this study, a Web 2.0 technology supports a participatory culture when the technology allows users to share their unique contributions and have those contributions be received by members of the community who are interested in them. What must be known in order to conclude that this has occurred? The three aspects needed to understand this is: "who is communicating with whom?", "what is being communicated?", and "why is it being communicated?" Why are these important questions worth asking? First, knowing who is communicating with whom can establish whether users are acting more like consumers, or simply downloading materials from expert sources, or if they are establishing their own communication and contribution networks. In particular, understanding "who is communicating with whom" can be ascertained by looking at the knowledge-sharing networks that form around the use of the tool.

This study will look at the extent to which the Web 2.0 technology allows users to share their intellectual, cultural, and creative works with others in ways that they would not otherwise (or not easily) be able to do without the use of the Web 2.0 technology. To
measure this, this study will be looking specifically at the extent to which networks form that fall outside of the normal institutional structures, such as academic programs. For example, to what extent does the technology allow for knowledge sharing that is based on interest and not formally associated with formal institutional structures? Or rather, does the Web 2.0 technology simply provide an electronic venue for sharing that mirrors existing and expected social arrangements (e.g., a student reading the materials an instructor assigns him). I will advance a series of hypotheses that if provided true would indicate that the Web 2.0 technology is promoting a participatory culture. The first is the following:

**Hypothesis 1: Communication Across Structures:** The Web 2.0 environment will prompt the sharing of materials amongst members of the community that were not formally grouped together by institutional structures, such as programs, to a higher degree than individuals within the same program.

In addition to “who is sharing with whom,” “what is being shared” is equally important. Returning to the notion of participatory culture, the contributions should be unique contributions with an expectation of some creativity. The objective is to uncover whether the Web 2.0 environment provided a space where people felt comfortable enough to contribute something out of the ordinary, or whether they constrained themselves to strictly academic discourse. To understand if this has occurred, a latent semantic analysis is used to understand the extent to which the Web 2.0 technology allows for users to share novel ideas that are not part of typical academic discourse. This
analysis will look to the extent to which the content shared diverges from academic discourse within a graduate school of education. Our second hypothesis is:

**Hypothesis 2: Alternative Discursive Spaces:** The Web 2.0 technology will promote the sharing of knowledge that diverged from typical academic discourse within a graduate school of education.

And lastly, it is essential to understand why users are deciding to participate. What influenced them to join the Web 2.0 community? If the intent of a Web 2.0 system is to promote inter-individual connections, users should join because they were promoted by someone. To understand this, all users of the Web 2.0 system were surveyed to understand why they joined the system. Returning to the notion of participatory culture, the Web 2.0 system should be prompting the connections between individuals, rather than the consumption of content from an expert source. This leads to the following hypothesis:

**Hypothesis 3: Interpersonal Networks:** Users will be prompted to join the Web 2.0 system because of interpersonal connections (e.g., professor, friend, colleague, or library staff member) at a higher degree than non-interpersonal sources (e.g., advertisement or website).

In addition to this hypothesis, I will also predict that people are influenced to contribute because they saw other people contribute:

**Hypothesis 4: Social Influence:** On average, users will view the works of others before deciding to contribute themselves.
If all four of these hypotheses prove true, I will conclude that the Web 2.0 system is indeed providing a space for a participatory culture to develop.

In order to test these four hypotheses, a Web 2.0 technology was iteratively designed and developed and deployed within a particular learning community to see how the technology mediates involvement and participation in that community. The Web 2.0 environment was created by my colleagues and I at the EdLab at Teachers College, Columbia University, called PocketKnowledge (PK), and was deployed to the Teachers College community. PocketKnowledge is much like Wikipedia in that it started as an empty container, or simply a Web 2.0 technology waiting to be written to. This empty container required that community members contribute to it. However, where Wikipedia aims to be a comprehensive encyclopedia of the world's knowledge, the purpose of PocketKnowledge is to store the creative, cultural, and intellectual products of the students, faculty, and staff of the Teachers College, Columbia University community. The Teachers College community is a graduate and professional school of education located in New York City and is composed of roughly 5,000 faculty, students, and staff, who teach and study in a variety of fields, most notably education and spanning into psychology and health. This population of people will be considered the subjects of this study, whether they chose to use PocketKnowledge or not. This study will analyze the collected data within PocketKnowledge from a two-year period (September 6, 2006 to September 6, 2008) to understand the dynamics of the knowledge-sharing networks, the content semantics of these networks, and what influenced people to join these networks.
The study of the rise of what Jenkins describes as a participatory culture, and the ways in which this is made possible by the innovations in digital communications technology, would on first glance need to be studied at a larger level than what could be provided by a single academic learning community and a single Web 2.0 learning environment. For example, the Web 2.0 tools available to people today are numerable, such as Flickr for sharing photos, Facebook and MySpace for interacting with friends (among many others), and the communities that use them range from youth to adults across the world. However, since this is such a wide and diverse group, and the tools equally as wide and diverse, trying to investigate all of this activity in any systematic way would appear difficult at best. Rather, choosing a relatively small community and a relatively modest tool is appropriate because it focuses attention on the mediation between user, tool, and community. It allows for particular design decisions in the tool to be analyzed, as well as opportunities for capturing the online and face-to-face utterances of people living in the community as well as communicative exchanges made within the tool.

My hope is that by focusing on a small community and a single tool, conclusions that can be drawn relating the emergence of a participatory culture and how it is made possible by Web 2.0 technologies. Of course, it could be argued that several problems persist with this prospect. One might be that the Teachers College, Columbia University community is not representative of the culture at-large but rather most representative of a graduate school or university community. It could also be argued that university communities are inherently and historically participatory cultures, and any such similar activity is simply a byproduct of the pre-existing culture rather than any affordances.
offered through an ICT. Despite these problems, I will argue that this research should have relevance for understanding the formation of participatory culture more broadly than simply a university community. Although universities do have a history of being more participatory than some institutions, and the individuals who make up universities may be more formally educated in comparison to the average U.S. population, the hope is that this study will shed light on how the new affordances offered through Web 2.0 technologies make this new cultural emergence possible. However, for those more conservative in their views with respect to sample and representativeness, it is acceptable to limit your reading of this document to the effects of introducing Web 2.0 into a graduate-level learning community and judge for yourself the relevance to the culture at-large.

Rationale

The need to study the effects of introducing Web 2.0 technologies (also referred to as social software) into higher education contexts is needed for a variety of reasons. The first reason is that if a cultural shift is indeed in progress, as Jenkins (2006) suggests, understanding how and why such a shift is occurring is essential. Second, since the use of social software by young people is quickly growing, understanding its impact potential is necessary. Although this study looks at a university community, the use of social software by young people is relevant because they will soon be the students enrolled in higher education institutions. To illustrate the growth of social software use by young people, a 2007 study by the Pew Internet and American Life project found that 39% of
teens (young people ages 12-17) have increased the sharing of their artistic creations online, such as artwork, photos, stories, or videos, from 33% in 2004 (Lenhart et al., 2007). Similarly, 28% have their own blog or online journal (up from 19% in 2004), and 26% remix content they find online to form their own creations (up from 19% in 2004). Dede (2005) expects that this active involvement with new ICTs will lead to a shift in learning styles. In addition to addressing the participatory cultural question and the growing use of social software by young people, research is also needed to address the widespread speculation as to what impact the introductions of such technologies could have in education and business sectors. For example, a 2006 article in EDUCAUSE quarterly (a publication dedicated to information technology in higher education) declared “still new on campus, social software tools [a synonym for Web 2.0 technologies] can support students and staff beyond the classroom, reaching around the world for learning and communication.” The stated potential of Web 2.0 technologies extend beyond higher education and into K-12 education where there is a focus on integrating such tools into teacher training and professional development.

In addition to educational domains, there is a perception that social software has the potential to rectify issues involving the distribution of knowledge and the orchestration of work activity. This perspective is most saliently expressed in the business literature. For example, a June 2007 Gartner research report finds that the “expansion of Web 2.0 technology [or social software] use within the enterprise is inevitable and unavoidable,” because:

Web 2.0 can deliver value to the enterprise in many different areas. Social software can deliver better business agility by enabling people to find expertise and information faster than they do now. The community and
The potential of social software for business is expressed elsewhere and in different ways. For example, a number of books have been recently published that discuss the business potential of social software, such as the volumes assembled by Tapscott and Williams (2006), Benkler (2006) and Shirky (2008). From published books to research reports, each takes a slightly different perspective; however, all reiterate the potential for social software to transform industrial-era businesses to more innovative, productive, and profitable organizations. However, despite the widespread enthusiasm, little empirical research has been conducted that investigates the structural effects of introducing such social media into pre-existing organizations. Although the focus here will not be on the business context but rather on an educational context, it is important to highlight the widespread interest in Web 2.0 across different domains of society.
CHAPTER II

LITERATURE REVIEW

Overview

This study will have to contend with a number of issues related to the messiness of designing, developing, and rolling-out a technology into a real-world context. Although parsing out all the variables involved in such a context is a difficult challenge, it is believed that studying such an environment in a real-world context (rather than a controlled laboratory context) will provide new insights that better represent actual practice. To mitigate this task, the literature review is designed to highlight the theoretical and practical issues involved in such an endeavor. In the first part, an expanded notion of participatory culture will be discussed as well as some critical notions of this idea. The second part of the literature review will highlight some theoretical issues with respect to the issue of learning within a collaborative networked environment. The approach taken is the networked learning perspective, which will use the concept of a network as a tool for shedding light on how individuals learn in a networked environment. This perspective is important because it opens up the theories and methods related to social networks and network theory. The use of social network analysis methods will be critical for uncovering the interactions of learners in the Web 2.0 environment. Additionally, it will highlight our focus on socially situated learning rather than other models of learning. Third, literature that concretizes an understanding of Web
2.0 will be introduced. Fourth, the design-based research literature will be introduced which highlights how creating a design and introducing it into a real-world context can create different kinds of useable knowledge. Following this discussion, an introduction to the literature related innovation, change, and diffusion will be provided. This literature is particularly important because it provides background on how individual learners find out about new innovations, how they incorporate those innovations into their lives, and the obstacles for the success of an innovation. One aim of this literature is to highlight not only that it is important that people become aware of and use the innovation (in this case the ICT), but also why (or why not) it is used in an innovative fashion (e.g., to promote a more creative and participatory culture). And lastly, some historical examples related to the impact of new ICTs on cultural change will be reviewed.

**Participatory Culture**

Central to my work is the notion that there is a relationship between technology, design, and inter-user communication, and the interaction of these forces can have an impact on culture. The particular type of cultural formation I am interested in promoting and understanding is what has been described by Henry Jenkins as participatory culture (Shäfer, 2008). According to Shäfer (2008), Jenkins used this term to “distinguish active user participation in online cultural production from an understanding of consumer culture, where audiences consume corporate made media texts without actively shaping, altering and distributing them” (p. 14). Shäfer provides a thorough investigation of the historical, conceptual and critical components related to participatory culture in his 2008
dissertation. Some of his notions will be discussed because they expand and enrich the notion of participatory culture.

Shäfer first discusses what “participation” in “participatory culture” means:

Participation is first of all part of a rhetoric that advocates social progress through technological development, and which aims to create expectations and understandings for technology. It can be seen as an appendix in the struggle against exclusion from political decision-making processes, as well as exclusion from ownership of the means of production, and the creation of media content. The promise of social progress and a reconfiguration of power through participation is embedded in technological development and postulated anew with each 'media revolution' (Daniels 2002; Flichy 2007; Turner 2006, p. 21).

Hence, Shäfer makes the case that when “participatory culture” is refereed to with respect to ICTs and the “media revolution,” there is an implicit reference to established notions of what it means to participate in a civic democracy. Shäfer points to Habermas’ (1991/1962) scholarship on how participation has been viewed as a key to democratic development and ameliorating social inequalities. However, the work of John Dewey could be an equally relevant footnote with respect to what democratic “participation” means in a democratic society. For example, in A Public and It’s Problems (1927/1954), Dewey describes how liberty is not the freedom from having to participate, but rather “the power to be an individualized self making a distinctive contribution and enjoying in its own way the fruits of association” (p. 150). The notion of individuals engaging in participatory cultures is a much closer approximation to both Dewey’s and Habermas’ ideal types for civil society, especially compared to what has arguably become a diluted democratic reality where individuals are reduced to voters who must make one of two choices. Although a discussion of the social and political connotations of participation are beyond the scope of this thesis, the point is that when one speaks of participatory
culture, it should not be viewed simply as people making or doing things online, but ideally also viewed with respect to the social and political connotations that are bestowed on the notion of participation.

Given the depth of the concept of participation, Shäfer argues that "the emerging media practice and the discourse on information technologies harbor a promise of social progress," yet there is an "intellectual short cut which perceives increased user activity far too readily as a fundamental shift in power structures within the cultural industries" (pp. 21-22). Rather, more sophisticated mechanisms are needed to understand participatory culture. He argues that an understanding of participatory culture can be achieved through using an analytic framework that is comprised of three elements. The first looks at participatory culture in the macro-sense or as a dispositif, which is a French term meaning "to describe a variety of formations of different relations between three domains, namely the domain of discourses (popular, scholarly, bureaucratic, legal...), technology (basic features and design) and people and social use (what users actually do with the new technologies). An illustration of his notion of the dispositif of participatory culture is included in Figure 1. The notion of a dispositif was heavily used by Foucault to understand how power was maintained through discourses within the legal and medical field (p. 26).
In addition to an understanding of participatory culture in the macro-sense or as a dispositif, one must also understand it within the micro-sense, or on the actor-network level, which is “employed to map the different actors engaging in design and appropriation…” (p. 27-28) (see Figure 2). Understanding this strand relies on the use of Actor-Network Theory (ANT), which was developed by Bruno Latour (among others), and includes a set of methods, terminology, and theoretical orientations to understanding the relationship between technology, its users, and society.

Figure 1: Dispositif of participatory culture, from Shäfer (2008, p. 27)
Shäfer’s third level used to understand participatory culture is the socio-technical ecosystem perspective, which deals with “the large number of users and artifacts that constitute an emerging complexity” (p. 29). This level looks to capture those elements that don’t nicely fit within the macro- or micro-levels but tries to capture the complexity that results from the large number of interactions between users and information systems. The notion of an emerging complexity draws on the work of complexity science, which has been used to understand a variety of phenomenon, from power outages to flocks of geese (e.g., Watts, 2003). Shäfer uses this analytic framework to understand a number of sites of participatory culture, including the Xbox Linux Project among several others. This multi-tiered approach to understanding participatory culture is essential. Although Shäfer’s (2008) approach will not be directly applied, a relatively similar analytic
framework for understanding the relationship between ICTs and participatory culture will be discussed in the research methodology chapter.

Given what is meant by participatory culture, why do individuals choose to engage in them? Do they do it to increase their status? Or receive attention from others? Do they do it for altruistic reasons? Or does it coincide with one's personal philosophy, akin to Dewey's (1927/1954) notion that participation is essential to freedom? There seems to be a variety of viewpoints in studies of why people choose to do things online where the direct benefit to the individual is less than clearly decipherable. Huberman, Romero and Wu (2008) found there to be a correlation between a user's productivity on YouTube (or the quantity of videos contributed) and the amount of attention they receive from others. Specifically, people decrease their contributions if they don't feel like they are getting attention from others “to the point of making contributors stop uploading videos” (p. 8). Hence, this study illustrates a tight correlation between interest in contributing and attention received. Other studies have pointed to altruism and reciprocity as the most important factor influencing involvement in an online community, particularly as they are mediated through gift-giving systems (e.g., Giesler, 2006). And others have argued that reputation and social status are the largest factors influencing why people are motivated to participate in virtual environments (e.g., Lambel and Bhalla, 2007). Shirky (2008) points to structural factors rather than psychological factors in explaining individual interest and involvement in participatory cultures. He finds that by “lowering transactions costs, social tools provide a platform for communities of practice” (p. 100). This explanation would indicate that people do things in these environments because they can be done so much more quickly than ever before (e.g., form a like-
minded group). And finally others have posited that involvement in a participatory culture, such as in peer production or open source software, cannot be easily boiled down to a few variables, such as attention or social status. For example, Benkler (2006) makes the point that tracing the motivational aspects is a difficult challenge:

> Human beings are and always have been diversely motivated beings. We act instrumentally, but also noninstrumentally. We act for material gain, but also for psychological well-being and gratification and social connectedness. This seemingly simple statement furthermore complicates the idea of a networked society and hinders attempts to predict the way communities of users will act. On the other hand, this more nuanced vision allows us to have a deeper understanding of the diverse online behaviors. For instance, there are countless explanations for why people might join a particular social network or make the decisions they do when they come there. (p. 6)

The position taken in this paper aligns itself with Benkler in that the reasons for individual involvement in a participatory culture are complex and vary from person to person. Hence, the aim here is not to try to measure the extent to which status, altruism, attention or other factors are the most salient motivator. Instead, I will be focusing here on factors that are necessary for identifying the existence of a participatory culture and aspects that mediate involvement in a participatory culture (such as ability to communicate across organizational boundaries and participate in alternative discourses).

**CSCL, Situated Learning and Networked Learning**

The interaction of learners within networked collaborative spaces necessarily raises a number of theoretical issues. To begin to address these issues, it is necessary to adopt a theoretical perspective to describe the relationship between the users, design and their resultant interactions. Given this need, the perspectives offered through networked
learning (NL), computer-supported collaborative learning (CSCL), and situated learning each offer to varying degrees much needed theoretical perspective for understanding the inter-workings of such complex systems. Hence, the aim of this discussion is to highlight those theoretical aspects that most saliently elucidate the particular circumstances captured in this study.

The field of computer-supported collaborative learning (CSCL) is described by Koschman (2002): “CSCL is a field of study centrally concerned with meaning and the practices of meaning-making in the context of joint activity, and the ways in which these practices are mediated through designed artifacts” (p. 18). According to Stahl, Koschman & Suthers (2006), the arrival at this shared understanding of what CSCL is was developed over several decades and relied on varying theoretical commitments. This understanding grew out of attempts to use computers to improve learning and was hence influenced by the technologies and theories available at the time. For example, Stahl et al. discuss how early uses of computer-assisted instruction relied on a behaviorist approach and it “conceived of learning as the memorization of facts” (p. 5). Other researchers used different approaches, such as the Intelligent Tutoring approach, which relied on a cognitive psychology model and “analyzed student learning in terms of mental models and potentially faulty mental representations” (p. 6). Other uses of computers to improve learning were attempts to teach the LOGO programming language using a constructivist approach, believing that “students must build their knowledge themselves” (p. 6). Additionally, Stahl et al. note that during this time there was much emphasis on the potential efficacy of Artificial Intelligence (AI) as a way of aiding student learning. By AI, Stahl et al. refer to “computer software that closely mimics behaviors that might
be considered intelligent if done by a human” (p. 6). Despite the early enthusiasm for AI, the problem was that much of human understanding and learning could not be easily represented on the computer. Hence, Sahl et al. conclude that AI and education “is still an active research area within the learning sciences, but is limited to domains of knowledge where mental models can be algorithmically defined” (p. 6). Hence, the “software is designed to support, not replace, these human, group processes” (p. 7).

From this range of technologies and theoretical perspectives, CSCL developed alongside the theoretical framework most often employed by CSCL researchers, the situated learning model. This viewpoint can trace its roots back to Vygotsky (1978), who focused on individuals interacting within a society and culture as the largest factor in individual development. This perspective is further developed by Jean Lave (1988), who articulated the notion that cognition is situated: "'cognition' is constituted in dialectical relations among people acting, the contexts of their activity, and the activity itself” (p. 148). Lave later worked with Wegner to develop the notion of legitimate peripheral participation, which describes a process of how a newcomer becomes a member of a community by gradually taking on the role of the expert (Lave & Wegner, 1991). Brown, Collins and Duguid (1991) built on Lave and Wegner’s work to argue for greater attention to collaborative learning, cognitive apprenticeship, group dynamics and providing opportunities for novices. With respect to CSCL, Stahl et al. (2006) point to the importance of this perspective:

According to Vygotsky, individual learners have different developmental capabilities in collaborative situations than when they are working alone. His concept of the “zone of proximal development” is defined as a measure of the difference between these two capabilities. This means that one cannot measure the learning—even the individual learning—that takes place in collaborative
situations with the use of pre- and post-tests that measure capabilities of the individuals when they are working alone. To get at what takes place during collaborative learning, it does not help to theorize about mental models in the heads of individuals, because that does not capture the shared meaning making that is going on during collaborative interactions.

Given this approach to using computers to support collaborative learning, it is quite logical that the CSCL community aligns itself with the situated learning perspective. However, as Stahl (2005) notes, there are a range of views that can be used to shed light on group learning in computer-aided environments, including collaborative knowledge building, social psychology, distributed cognition, activity theory, and ethnomethodology.

Despite the natural fit between CSCL and the situated learning perspective, some researchers highlight other perspectives on how networked computing could be utilized to improve learning. Jones, Ferreday and Hodgson (2008) find that one possible limitation of the CSCL approach is that:

Both CSCL and CoPs [Communities of Practice] place an emphasis on the strong relationships found in communities and collaboration, relationships that imply a certain closeness and unity of purpose. These approaches also tend to emphasize human–human relations even when these are mediated through an electronic network and are separated by time and distance. (p. 90)

Jones et al. point to the observation that most studies that employ a CSCL or CoP perspective look at small groups and the shared meaning established amongst the group members. Although this is perhaps one of the most important ways that learning within a computer-assisted environment could be understood, there are indeed other types of arrangements and relationships worthy of attention. Jones, Dircknick-Holmfeld and Lindström (2006) argue for a meso level of analysis of collaborative learning, beyond the micro level often analyzed in CSCL studies. Under this scenario, other areas of study
could include “how to design for collaborative learning at the institutional level, in organizations, school settings, and in networked learning environments” as well as “how the technology and infrastructure affords, and mediates the learning taking place” (2006, p. 37). Hence, the meso level approach could expand the domain of analysis from small groups to larger organizations such as institutions. Another aspect of the meso level approach is that it highlights how “the strong notions of community contained in CoPs might ignore the importance of the ‘strength of weak ties’” (Jones, Ferreday, Hodgson, 2008, p. 91). The term “weak tie” refers to the strength of a relationship, which can measure the “(probably linear) combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services which characterize the tie” (Granovetter, 1973, p. 1361). The reason these researchers draw attention to weak ties among learners is the perception that ‘weak ties’, in addition to ‘strong ties’ that characterize a community of practice, may be an increasingly important aspect of living, learning, and working in the emerging social order. To highlight this trend, Jones et al. point to the sociology of Castells (2000), who describes how “the new economy is organized around global networks that imply an increasing interdependence and cooperation, and yet on the other hand, the work process is increasingly individualized” (p. 91). In Castell’s sociology, the Internet and networked computing act “as material support for this sociological trend of individualization” (Ryberg & Larsen, 2008):

But the most important role of the Internet in structuring social relationships is its contribution to the new pattern of sociability based on individualism [...] Increasingly, people are organized not just in social networks, but in computer-communicated social networks. So, it is not the Internet that creates a pattern of networked individualism, but the development of the Internet provides an appropriate material support for the diffusion of networked individualism as the dominant form of sociability” (Castells, 2001, p. 130-131).
Jones et al. find that this new social arrangement leads to “fundamental questions about the relationships between the networked society and the organization of learning” (p. 91). The question is, should educators and researchers embrace Castell’s notion of “networked individualism,” or should the locus of attention remain on the tightly knit and coherent communities often characterized in the CSCL literature? The answer provided by the networked learning community and the position taken in this paper is that the small group collaboration as well as the larger meso level context should be incorporated into the domain of analysis. The networked learning (NL) position, which has gained more ground in Europe than in the United States, and is defined as “learning in which information and communication technology (C&IT) is used to promote connections: between one learner and other learners, between learners and tutors; between a learning community and its learning resources” (Jones & Steeples, 2002, p. 2). The networked learning perspective is beginning to be more widely accepted in the United States; however, by a different name. A 2008 report commissioned by the National Science Foundation advocates for the cyberlearning perspective, which is defined as “learning that is mediated by networked computing and communications technologies” (Borgman et al., p. 10). For the purposes of this paper, I will use the term “Networked Learning”; however, the term “Cyberlearning” is equally useful in referring to the range of phenomenon associated with the emerging domain of learning and ICTs. With regard to networked learning, Jones describes it as being “concerned both with material artefacts, the physical infrastructure of computer networks and the material they both store and distribute and the social processes of education and learning” (Jones, p. 87). The move
towards a networked view of learning is appropriate because networks are increasingly being used as a way of understanding a range of phenomenon, from social change, to economic activity, to the outbreak of viruses. Castells observes that the “new society is made up of networks”, where sociology will “require reconceptualizing many social processes and institutions as expressions of networks, moving away from conceptual frameworks organized around the notion of centers and hierarchies” (2000, p. 695-696).

Given this theoretical perspective, how can it be used to shed light on learning within digital environments?

Several studies have used the Networked Learning perspective in attempting to elucidate how youth engage in online social environments. A particularly salient example is provided by Ryberg and Larsen (2007), who studied youth usages of Arkut.dk, a social networking site used mainly by young Danes ages 13-17. The researchers conducted a virtual ethnography where they acted as participant observers for a seven-month period. During the investigation, the researchers witnessed how the youth navigated between both strong ties and weak ties:

The website in itself is a very good example of how people in practice move through different types of relations in a profoundly networked structure. This is due to the interweaving between strong and weak ties that the technology affords. This for instance plays out in the practice [...] in which the youngsters draw on strong ties (their trusted network of friends) when they are portraying themselves; while simultaneously inviting weak ties (foreign Arto-users) to comment on their pictures. (p. 110)

The researchers found that CoPs and networked learning need not be exclusive, but rather that CoPs can be considered one type of social arrangement, characterized by strong ties, among a learner’s larger network of relationships. However, determining what tie is strong or weak is involved, since the youngsters using Arto use it for different reasons:
some to maintain relationships with strong ties, others to form newer or weaker relationships. Hence, because someone is on one’s “friend” list does not imply the strength of the tie. The findings of the study conclude that Castell’s notion of “network individualism” fits very well with the types of interactions exhibited in Arto because “there seems to be a simultaneous utilization of weak and strong ties, as well as a profound mixture of online and off-line contexts” (p. 112). Further, the researchers found that the “tensions between becoming increasingly individualized and increasing reliant on others seem to be the very social fabric of this social networking site; their individual identities basically exist and become real through their networks, which points out that this double nature of ‘networked individualism’ can be an analytic entry point to understanding network identities and networks” (p. 112).

Other studies point to the need to look to other types of online organizations other than those characterized by strong ties or communities of practice. One such study is provided by Jones, Ferreday, and Hodgson (2008), who investigated an online discussion forum for school leaders. Jones et al. note that since the school leaders in their study were senior professionals, their ability to commit to a professional learning community was limited because of their extensive prior commitments. However, although the connections established amongst participants were weak, the authors of the study indicate that they should not be overlooked because they hypothesize that "weak connections [are what]… make networks so powerful" (p. 92). In the study, the researchers analyzed the dialogue of the school leaders’ online discussion and coded for the characteristics for tie strength, which include: amount of time, emotion intensity, intimacy, and reciprocal services (Granovetter, 1973). In analyzing the strength of the ties, the researchers note
that the amount of time, emotional intensity, and intimacy generated among the participants were low. However, the amount of reciprocal services was high, as was the level of information exchange, leading to exchanges that were quite productive for the participants. The study concludes that the formation of such loose-knit communities should not be over-looked, especially since weak ties are a factor in building social capital (Kavanagh et al., 2003).

One possible criticism of the networked learning lens is whether it is compatible with the situated learning perspective. Since situated learning focuses on communities of practice, and networked learning looks to go explicitly beyond communities of practice (yet not to discount them), is there an incompatibility? Ryberg and Larsen (2008) investigated this issue and find that the movement between strong associations and weaker associations has “always been central to the theory of CoP”; however, these movements in a networked fashion have not been “widely adopted by the broader educational research community” (p. 105). Despite the lack of adoption by the education research community, Ryberg and Larsen note how Etienne Wenger, one of the founders of the situated learning perspective, has begun to shift his analytic frame to a more networked position:

The analytic focus has moved slightly away from CoP’s and onto people’s movement between different CoP’s and larger-scale learning systems. Thus, he focuses on how identity is developed through participation, immersion or withdrawal from CoP’s and through people’s multi-membership and boundary participation in different communities over time (Wenger 2005). In our interpretation this closely resembles the notion of networked individualism (Castells 2001), and it also seems to take a more networked view, as the focus is moved away from the particular community towards individual trajectories or relations.
Hence, as the world becomes more complex and interconnected, and people move between multiple affiliations and networks, it is only logical that an analytic frame that looks at both the tight-knit communities as well as the ways in which people move among the network be adopted.

Given the preceding discussion, what are the implications for this study? The implications include the following:

- A situated learning perspective will be the lens used for understanding human learning. This perspective highlights our focus on the knowledge context and the importance of social interaction and collaboration on learning.

- Unlike the micro-level analysis often uses in CSCL research, which focuses on shared meaning-making within small groups, this study will use the expanded view offered by the networked learning perspective. This perspective allows for micro-, meso-, and macro-level analysis of the ways in which ICTs afford, constrain, and mediate collaborative learning.

Web 2.0 and ICTs

This study concerns itself with the introduction of a Web 2.0 environment into a pre-existing learning environment. Central to addressing this question is what is a Web 2.0 technology, and is there really such a thing as a Web 2.0 technology? Although there is debate on whether there is such a thing as Web 2.0, the position that this study will take
is that the term Web 2.0 is indeed a worthwhile concept for capturing some important design patterns and is a useful delineation from Web 1.0 or just the Web.

The reason that there are questions as to whether Web 2.0 is a “real thing” is a result of the complicated notion about the concept, a great deal of marketing hype which may confuse matters, and questions related to the development and trajectory of the Web. Several researchers have noted the difficulty of defining Web 2.0. For example, Cormode and Balachander (2008) note that a “precise definition is elusive and many sites are hard to categorize with the binary label ‘Web 1.0’ or ‘Web 2.0’” and Anderson (2007) notes that “Web 2.0 is a slippery character to pin down.” Anderson asks:

Is it a revolution in the way we use the Web? Is it another technology ‘bubble’? It rather depends on who you ask. A Web technologist will give quite a different answer to a marketing student or an economics professor. (p. 5)

This is further complicated by the great deal of marketing and publicity given to the concept and the companies that most represent it, such as Facebook and Myspace, best illustrated by the 2006 TIME Magazine cover, which named the person of the year as being “You” (see Figure 3). In addition to the hype, there are questions as to whether the term “Web 2.0” is really anything different from a more fully-developed “Web.” Anderson (2007) notes that the creator of the Web, Sir Tim Berners-Lee, disagrees that “Web 2.0” is anything different from the “Web” because connecting people was “what the Web was supposed to be all along” and Web 2.0 “is a piece of jargon” (p. 5). Taking this perspective, Web 2.0 can be seen as “a consequence of a more fully implemented Web” (p. 6). However, Millard and Ross (2006) note that “Web 2.0 (meaning the set of applications, web sites and companies that define it) is not totally analogous to the vision
of the early hypertext pioneers, mainly because the attributes that they were seeking are not available ubiquitously across all the systems of the Web” (p. 30). They also find that “Web 2.0 has purposely rejected some of those old aspirations, and the assumptions that went with them, in favour of a more flexible, lightweight and responsive approach” (p. 30). However, without question, Web 2.0 utilizes all of the same technology as Web 1.0, although it includes some new, additional technology that was not available in Web 1.0 (Cormode & Krishnamurthy, 2008). Hence, it is not sufficient to say that Web 2.0 is simply the end-product of an early vision of the Web because there is not complete overlap nor is all aspects of the initial vision incorporated.

Figure 3: Cover of TIME Magazine - "The Person of the Year is You"
Although the development of Web 2.0 is difficult to pin down, the creation of the term is traced back by Anderson to the team at O’Reilly Media, Inc., who were interested in making “explicit certain features that could be used to identify a particular set of innovative companies, including business characteristics,” which was later captured in the influential paper, “What Is Web 2.0: Design Patterns and Business Models for the Next Generation of Software” (O’Reily, 2005). This paper included the equally influential Web 2.0 meme map, which outlined the characteristics of a Web 2.0 environment (see Figure 4). Some of these memes (or characteristics) include “radical trust” of the user, “participation” (“not publishing”), “tagging” (“not taxonomy”), and “software that gets better the more people use it”. Anderson notes that the term “was not coined in an attempt to capture the essence of an identified group of technologies, but an attempt to capture something far more amorphous,” such as which companies had the most investment potential (p. 5). Despite the term being coined for a purpose seemingly unrelated to education, Anderson, in a report commissioned by the UK Joint Information Systems Committee, finds that the term captures an important set of ideas and that it is “more than a set of ‘cool’ and new technologies and services” (p. 53). These ideas that are deemed important to education and derived from the O’Reiley report include: 1) individual production and user generated content, 2) harnessing the power of the crowd, 3) data on an epic scale, 4) architecture of participation, 5) network effects, and 6) openness. Anderson, Cormode and Krishnamurthy (2008) also agree, despite the difficulty of pinning down Web 2.0, that there are salient concepts that distinguish Web 2.0 from Web 1.0 or just the Web. These ideas are manifested in concrete site features, which include:
- Users as first class entities in the system, with prominent profile pages, including such features as: age, sex, location, testimonials, or comments about the user by other users.
- The ability to form connections between users, via links to other users who are "friends," membership in "groups" of various kinds, and subscriptions or RSS feeds of "updates" from other users.
- The ability to post content in many forms: photos, videos, blogs, comments and ratings on other users' content, tagging of own or others' content, and some ability to control privacy and sharing.
- Other more technical features, including a public API to allow third-party enhancements and "mash-ups," and embedding of various rich content types (e.g., Flash videos), and communication with other users through internal e-mail or IM systems.

Figure 4: Web 2.0 Meme map, retrieved from http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html
Given the high degree of coherence of what Web 2.0 is amongst business thinkers (e.g., O'Reiley) and researchers (e.g., Anderson), why is Web 2.0 so difficult to pin down? The difficulty stems from the contingent, social nature of Web 2.0. Anderson notes that it is “important to acknowledge that these ideas are not necessarily the preserve of ‘Web 2.0’ but are, in fact, direct or indirect reflections of the power of the network: the strange effects and topologies at the micro and macro level that a billion Internet users produce” (p. 53). Hence, Web 2.0 cannot be distilled to a technology or set of affordances, but must be looked at in micro-level perspective (individual psyches interacting with ICTs) and a macro-level perspective (the social, cultural, and network byproduct of massive micro-level interactions).

The most important aspect from a micro-level or psychological perspective is the notion of perceived affordances, made salient by Don Norman (1988). The idea of perceived affordances is that an object (be it a simple object in the real world to a complex virtual world) exhibits certain functions and features that people believe can accomplish some task. The use of the word “perceived” highlights the notion that functions that are not perceived by humans are not important. Of course, the ability to perceive what an object can do is not strictly a psychological process but rather buttressed by education and interactions with the socio-technical world. The natural corollary to this perspective is that things that are easy to do will tend to be done, while those things that are difficult to do will happen less frequently. For example, the affordances of social networking sites such as Facebook, which allow individuals to signal and keep tabs on their friends (among many other features), make widespread communication happen in
ways that were not easily afforded by earlier communication forms. This does not mean that simply because things can be easy done that they will be; however, it highlights how once symbolic actions become possible (or afforded by some technology), then the potential for that action to occur increases. This notion has immense implications for society and culture because it indicates that new technological affordances can eventually lead to network byproducts, which may have social and cultural significance. This can be seen at a micro-level, where low-cost communication allow for someone living in the diaspora to stay connected to his or her home and culture in a way that was prohibitively expensive or impossible before. It can also been seen at a macro-level, where such changes in communications can impact markets, economies and the division of labor (Benkler, 2006). Hence, pinning down Web 2.0 can be difficult because although the individual psyches interacting with the environment is rather straightforward, the large-scale outcomes cannot be easily described as the sum of all interactions. Despite this difficulty, this paper maintains (as does Anderson and Cormode & Krishnamurthy, 2008) that it is a useful concept for describing a set of important ideas which manifest themselves in design patterns and ultimately in features available to the user.

Design and Design-based Research

Another critical part of this project is the notion that creating a design and having individuals interact with it can generate knowledge on the mediation between technology, user, and communities. The importance of design with respect to learning is captured in
the design-based research (DBR) work currently being conducted by several scholars in the Learning Sciences. DBR or design experiments look to create new, innovative, and experimental learning contexts, which can then be studied to better understand the mediation between context, groups, and individual learners (Brown, 1992; Barab & Squire, 2004). This stance on using technology to enhance learning is compelling because the role of the researcher is not simply someone who studies what is “already there,” but rather performs actions in the world and contributes to our understanding of how learning occurs. Also, engaging in design experiments allows one to fully engage the potential affordances of ICTs. Design experiments provide the opportunity to study a variety of instructional techniques, such as scaffolding, anchored instruction, case-based reasoning, problem-based learning, instruction that encourages reflection, instruction that promotes metacognitive activity, among others (Cobb et al., 2003; Pea, 2004; CTGV, 1990; Schrader et al., 2003; Jonassen, 2000; Lin et al., 1999; Lin, 2001). This review will include a discussion of why to use DBR and examples of projects that have used DBR. Although this project does not use design-based research in the strictest sense (as described by Barab and Squire, 2004), many of the notions it advances have a great deal of relevance to this project, such as the idea of having individuals engage in a design as a way of generating social science research data.

The reasons for using DBR in educational research are varied. On a more systemic or political level, there is a perceived need to reconnect educational research with the problems and issues of everyday practice and thus be able to create “usable knowledge” (National Research Council [NRC], 2002 and Lagemann, 2002 in Kelly, 2003). Since DBR uses an interventionist approach that looks to address practice-based
problems, DBR is well-suited to better connect educational research with practice. In addition to this political aspect, the rationale for DBR is derived from perceived limitations in prevailing forms of research. One such problem identified by Collins (1999) is narrow measures (p. 18). By this, he is referring to the emphasis on "bottom-line" measurement, such as tests, which measure ultimate outcomes rather than those aspects which could be potentially more important, such as motivations or dispositions. In addition to adherence to outcome-based measurements, many forms of empirical research do not attempt to understand the "messiness of real-world practice" (Barab & Squire, 2004, p. 3). For example, many experimental techniques only attempt to observe the changes within one or two variables where DBR attempts to capture and comprehend a wider range of phenomenon.

In addition to the problem of narrow measures, the literature on DBR presents empirical research as not adequately describing naturalistic contexts, such as classrooms or larger contexts such as institutions. By this, those who advance DBR argue that laboratory contexts are not sufficient or accurate ways to depict the messiness of real world practice. The importance of context is essential to many of the theoretical frameworks that guide DBR practices, such as situated cognition, which is guided by the notion that "...learning, cognition, knowing, and context are irreducibly co-constituted and cannot be treated as isolated entities or processes" (Barab & Squire, 2004, p. 1). O’Donnell (2004) notes that the importance of real-world practice has persisted in importance, although it has at times been neglected. For example, she notes that during the 1970s, simpler, more measurable phenomena were studied in laboratory contexts within educational psychology (p. 256). However, even Thorndike (1910) recognized the
importance of observing real-world contexts in addition to the more controlled laboratory contexts. O'Donnell hence notes that DBR has the potential to cause a "return to the kind of considerations envisioned by Thorndike" (p. 256).

Related to the importance of context, a particular motivation for DBR is the interest in the multiple ways of studying a design. Collins (1999) articulates some of these multiple ways, including (p. 35):

- Cognitive level: What do learners learn within a particular learning environment?
- Interpersonal: How do students act amongst each other and with their teacher?
- Group or classroom level: How is the group characterized as a whole?
- Resource level: What resources are available to learners?
- Institution or school level: Is the school supportive of the design?

The multiple ways of looking at a design call for different research methods and employment of a variety of perspectives. For example, Collins finds that ethnographic research could be a particularly efficacious research method for observing both the interpersonal or the group or classroom level interactions.

Equally important to being able to look at a design in multiple ways is the primacy of theory development in DBR. This is perhaps the most stated point amongst those arguing for DBR in educational research. For example, Edelson (2002) notes that what separates DBR from ordinary design is that ordinary design only concerns itself with using "the lessons embodied in a design procedure, problem analysis, and design
solution to create a successful design product", where DBR "retains that goal but adds an additional one, the goal of developing useful, generalizable theories" (p. 112). This notion is echoed by Barab and Squire (2004), who note that design-based research "requires more than simply showing a particular design works but demands that the researcher (move beyond a particular design exemplar to) generate evidence-base claims about learning that address contemporary theoretical issues and further the theoretical knowledge of the field” (p. 6).

To answer questions as to what kinds of theory development are possible with DBR, Edelson (2002) articulates three types. These include:

- **Domain Theories**: "A domain theory is the generalization of some portion of a problem analysis. Thus, a domain theory might be about learners and how they learn, teachers and how they teach, or learning environments and how they influence teaching and learning” (p. 113).

- **Design Frameworks**: "A design framework is a generalized design solution. Although design theories are descriptive, design frameworks are prescriptive. They describe the characteristics that a designed artifact must have to achieve a particular set of goals in a particular context” (p. 114)

- **Design Methodologies**: "A design methodology is a general design procedure. Like a design framework, it is prescriptive. However, a design methodology provides guidelines for the process rather than the product” (p. s115).
What is interesting about Edelson's discussion of the types of theory generation possible with DBR is his rather liberal use of the term “theory.” He therefore allows design frameworks and design methodologies to fall into this category. Kelly (2004) reacts against the liberal use of this term, quoting the National Academy of Sciences definition of theory, which states that a theory is “a well-substantiated explanation of some aspect of the natural world that can incorporate facts, laws, inferences, and tested hypothesis” (p. 123). Articulating that the use of theory requires hard-fought consensus among scientists, he argues for the use of “working words” which are less strong, such as “framework” or “hypothesis”.

Barab & Squire (2003) provide a synopsis of the major projects that have used DBR. Adapted from their listing, some of these projects include:

- Inquiry learning forum project: Create a more nuanced understanding of the challenges in creating online communities
- Virtual solar system project: Exploration of relationship between project-based learning and situated cognition
- Student apprenticeship camp: Exploration of the efficacy of apprenticeship-type learning environments
- Hartford Middle School project: Using interdisciplinary anchors as a way of teachers to conceive of interdisciplinary units

One particularly interesting application of DBR is The Quest Atlantis (QA) project by Barab et al. (2005). This project combines the new affordances made available with
ICTs, with insights from game design and educational research, to address both educational and social commitments. To study the effects of the environment on learners, the researchers use a design ethnography. The design ethnography is a process that "involves design work coupled with the continual production of naturalistic interpretations based on both qualitative and quantitative data over extended time frames and at multiple sites" (p. 92). Qualitative data is gathered when participants observe and interact with the evolving technical structures as well as "the social relationships, interactions, member-produced work, and conversations (online and face-to-face) through which these structures are informed and take on meaning" (p. 92). Hence, the design of the project is the outcome of the interpreted qualitative data. This forms "the tapestry that is QA" (p. 92).

The design ethnography is an important aspect of researched-based design. It shares many aspects with critical ethnography, which "goes a step further [from the basic ethnography] to leverage this understanding to develop a critique with the goal of transforming the context that is being researched." (p. 102). However, the design ethnography goes further than the critical ethnography by "reifying this critique into a design" (p. 102). The qualitative data which comes to form the design ethnography is collected from field notes, submitted articles, email exchanges, student work, student interviews, and reflection of first-hand experiences. These observations lead to the four braids of QA's design. These braids include 1) vision, 2) participatory design process, 3) meta-context, and 4) support for project implementation. With regard to the vision for the project, the authors claim that participation from local sites changed over time:
... in the beginning we believed that we had a fairly solid vision of what needed to be designed and so treated these sites more as usability sites than as participants of a fundamentally altered vision. Over time, however, these sites become less of a repository for our predesigned vision and more of a collaborative group with whom to co-construct a vision of QA. Toward this end, we spent more and more time listening, eventually choosing to build an ethnographic account of one after-school site... (p. 96)

Given this discussion of design-based research, what are the implications for this study? DBR and the experiences of design-based researchers are relevant because they capture the notion that creating a design and deploying it into a real-world context can create useable knowledge not only about improving the design, but more generally about human learning and sociality. This study concerns itself with iteratively designing and developing a socio-technical environment, and studying the outcomes to shed light on the relationship between innovative ICTs and collaborative learning. Although this study does not specifically consider how design iterations impact human factors, such as the methods discussed by Barab and Squire (2004), DBR as an approach to research is important because it highlights the ways in which design can impact social and psychological factors. The DBR literature is especially useful because it underscores the kinds of knowledge that designs can generate as well as how designs often diverge in ways that cannot be expected once introduced into the social learning environment.

Diffusion, Change, and Innovation
This study looks to understand the effects of introducing a Web 2.0 environment into a pre-existing learning environment. Further, I am not only investigating whether the ICT is adopted by users in the community, but also whether it is used in an innovative fashion, in this case to promote a more creative and participatory culture in the sense described by Jenkins (2006). To better understand this process, there are two strands of literature that are particularly important. The first is the literature related to diffusion research, most notably described by Everett Rogers (2003). The second is the literature related to technology and organizational change. The reason to investigate the issue of organizational change is that since the ICT is situated in an institutional context, understanding the ways in which new technologies are incorporated (to varying degrees) into organizations that lead to change is a particularly salient aspect of this investigation.

Rogers (2003) defines diffusion as "the process in which an innovation is communicated through certain channels over time among the members of a social system" (p. 5). By "communication," Rogers means the "process in which participants create and share information with one another in order to reach a mutual understanding" (p. 5). Rogers notes that diffusion "is a kind of social change, defined as the process by which alteration occurs in the structure and function of the social system" (p. 6). By innovation, Rogers means "an idea, practice or object perceived as new by an individual or other unit of adoption" (p. 36). Diffusion research has been used by a number of different disciplines, such as communication, sociology, and education, to study a number of factors, including rate of adoption, innovativeness of members of a social system, and opinion leadership. Some of the earliest diffusion studies in the field of education were completed in the 1920s and 1930s by Dr. Paul Mort at Teachers College.
to show how local school control was related to innovativeness. Overall, one of the most prominent and widely cited findings from diffusion research is the categories of innovation adoption, as measured by the time at which an individual adopts an innovation (see Figure 5). Given the long history of diffusion research, and the number of findings it has uncovered, what is the relevance for the current study? A diffusion research perspective will be used to initially uncover the extent to which the ICT has been adopted by members of the community, as well as the types of participation that are ultimately exhibited within the ICT.

![Figure 5: Diffusion of Innovations, (Rogers, 2003, p. 281)](image)

One prominent criticism of diffusion research is known as the “pro-innovation bias,” which Rogers describes as “the implication in diffusion research that an innovation should be diffused and adopted by all members of a social system, that is should be diffused more rapidly, and that the innovation should be neither re-invented nor rejected (p. 106). This is an important criticism with respect to the current study because it does not merely consider what is there but intervenes in the context with aims to understand
the ways in which a particular ICT can or cannot create a more participatory culture. Hence, it is inherently biased towards promoting change and innovation. However, what is important is being able to separate the objective of creating an innovation and the actuality and success of an innovation. Thus, it is hoped with this research study that although favoring innovation, it will accurately investigate and report on the success or failure of the innovation.

In addition to understanding the process of diffusion of innovations, it is also important to understand the process by which change can occur in organizational and institutional contexts. Rogers (2003) goes to some length to adapt the diffusion perspective, which he mainly discusses in an individual perspective, to the organizational context. Additionally, there are many theories and studies available that look at how the introduction of a new technology changed (to varying degrees) the organizations which adopted them. For example, Burkhardt and Brass (1990) ask “Does technology drive structure? Or does technology adapt to existing structure, reinforcing established, stable patterns?” (p. 104). In their study, they looked at the introduction of an information technology into a branch of the federal government and found that “individuals who are the first to recognize and exploit technological opportunities (early adopters) increase their power and centrality within the organization, just as innovative organizations increase their competitive advantage within the industry” (p. 122). Although the findings from studies such as Burkhardt and Brass’ are compelling, they are most relevant to organizations where the members must adopt the technology (at some point) in order to complete their work rather than adopting a technology simply for its educational or intrinsic value. A study that more nearly describes the elective nature of the
circumstances surrounding this examination is provided by Venkatesch and Shin (2005), who looked at the introduction of a broadband civic networking initiative, called Urban-net, which was designed to deploy advanced telecommunications infrastructure/services in economically poor and underserved areas. The initiative was complicated because it looked not only to become financially viable, but also to achieve a set of social aims. In studying the project, the researchers found that over time the social aims of the project became “dormant at best” and the locus of attention switched to “‘getting the network off the ground’ and averting the ‘crisis’” (p. 58). The researchers attribute this shift to the change in power arrangements from general managers of the public organizations on the committee to the project’s technical managers. To understand the dynamics that led to this change, the researchers used institutional theory as a way of understanding how the process of institutionalization stabilized the social arrangements of the actors involved in realizing the project, as well as how the stabilization of social arrangements impacted “the particular material form assumed by the artifact” (p. 60). The researchers cite DiMaggio and Powell (1991), who describe institutionalism as “rejecting the rational actor model of purposive behavior, new institutionalists view order-affirming action stemming from taken-for-granted worldviews that socialized actors reproduce without conscious thought; such behaviors reproduce the existing order” (p. 60). To look at the process of institutionalization, the researchers analyze both the macro-structure which the project operated under, which is the “‘broader social structure that will constrain the forms they can develop,’” (p. 61) as well as the micro-politics, which allows a “study of meanings, interests, identities and relations as actors construct and reconstruct them in discourse en route to forging strategic coalitions and stabilizing the social (and
technological) order” (p. 61, Ranson et al., 1980 and Fligstein, 1999). In looking at the situation from both these lens, the researchers conclude:

Urban-net was proposed to institute new relational patterns across organizations and functional sectors, infusing structural diversity into the field. Despite this aim, the resulting form reproduced existing social arrangements; instead of catalyzing new relations, the Urban-net’s technological and social configuration affirmed prevailing ones. (p. 61)

This can be seen in the macro-structural sense: the technical managers focused on cost-cutting rather than on societal aims because of their familiarity in using “institutionalized, standardized criteria to evaluate such opportunities in technical and financial terms,” as well as “their interpretation of the project reflected the way their organizational superiors likely evaluated their role performance” (pp. 64-65). In the micro-politics sense, the discourse shifted from its social aims to a technical discourse, where the “backbone’s data switching capabilities were stressed over its function as an enabled of social interconnectivity” (p. 68). This study is important because it highlights how technology projects with social aims can be easily squelched by acculturated modes of practice.

Venkatesh and Shin (2005) mention an important criticism of the institutionalism viewpoint, which is if institutions constrain behavior in both a macro and micro sense, where do new organizational forms come from? In education, Rogers (2003) notes that it took nearly fifty years for kindergartens to be completely adopted by U.S. schools (1900-1950), yet it only took eighteen years (from 1935 to 1953) for drivers’ training to reach widespread adoption (pp. 61-62). Hence, innovation does happen in education, yet in an uneven fashion. With respect to higher education, Levine (1976) notes that even when an innovation is introduced into a higher education environment, it may take a while for the
innovation to be terminated once the innovation's efficacy is found to be lacking. He finds that “the university appears a rather generous organization in its reluctance to terminate innovations” (p. 205). The tension between diffusion of innovations and its ability to cause change in organization, as well as the micro- and macro-level forces of institutionalism, are important factors worth considering with respect to the possibility of ICTs to affect change in organizations.

Historical, Cultural, and Personal Context

This study concerns itself with the effects of introducing a Web 2.0 technology into a pre-existing learning environment. Given this aim and taking a big step back, the very notion that a relatively small educational institution could support the movement and storage of any digital communications amongst its community members is a rather novel idea (when taking an expansive view of communication over time) and a topic worthy of reflection. Although a thorough investigation of the rise of symbolic communication and its eventual manifestations in inexpensively-communicable digital form are beyond the scope of this study, some historical, cultural, and personal reflections will be discussed because they shed light on the context of this study.

The role of information and communications technology as a constitutive force in creating a shared sense of reality is most poignantly articulated in the pioneering works of Marshall McLuhan and Harold Innis (e.g., McLuhan, 1964/2002; Innis, 1951/1999). Both McLuhan and Innis viewed the source of social change in technological innovation,
finding the printing press to be the initial source of social change in the mechanical age, and the telegraph as the initial source in the electronics age. A causal consideration of this perspective might not hint at its epistemological and ontological significance. McLuhan does not merely mean that television changes how individuals spend their leisure time, but rather, as Carey (1967) notes, that its “meaning and effect of any communications innovation is to be found in the way it structures thought and perception” (p. 20) and that “communications media, broadly used to include all modes of symbolic representation, are literally extensions of mind” (p. 7). The viewpoint that technological innovation is as a primary force affecting social change is captured under the label “medium theory,” which Deibert (1997) describes as:

At the heart of medium theory is the argument that changes in modes of communication—such as the shift from primitive orality to writing or the shift from print to electronic communications—have an important effect on the trajectory of social evolution and the values and beliefs of societies.

As alluded to by Deibert, Ong (1982) traces the ways in which writing as a technology restructures consciousness from earlier forms of consciousness typified in oral cultures. This perspective is continued by such scholars as Carey (1989), who found that the introduction of the telegraph brought about “changes in the nature of language, of ordinary knowledge, [and] of the very structures of awareness” (p. 202). Medium theory continues into the digital age by scholars such as by Deibert (1997), who tracks how social change was brought about by technological innovations, such as the Guttenberg press in Medieval Europe to hypermedia in the present-day, postmodern world order. What is particularly salient about the medium theory perspective, and the scholars who apply it, is that it hypothesizes that new information and communication technology, in a
symbiotic relationship with the humans who breathe life into them, will lead to new ways of being human and different social arrangements. The perspective heightens our awareness to technological innovation: how might a particular new innovation change the individuals who use them and alter the prevailing social order? How might the individuals who grow-up with such technologies, never knowing a world without them, view themselves and their world?

A broad, theoretical viewpoint of how innovations in ICTs lead to social change can also be viewed in a more micro-sense, or more concretely as a process by which individuals slowly incorporate the new ICTs into their daily lives. Wonderful examples abound from both personal experience and popular culture that illustrate this process. One of my favorite examples of the early cost of long-distance communication over the telephone was illustrated in the film, “Meet Me in St. Louis,” (Minnelli, 1944) where the character playing Judy Garland’s sister is called by her beau and the entire family sits enamored and amazed with the prospect that a man from New York is calling their home directly in Saint Louis, Missouri (see Figure 6). The phone call is momentous in the family’s lives for two reasons. First, because the cost is so prohibitively high that it is assumed that the only possible reason for the call would be to propose to Garland’s sister. Second, the phone call is in itself a spectacle, where the near entirety of the phone conversation is devoted to how wonderful it is that they can talk directly over thousands of miles. Despite the excitement surrounding this event, the phone conversation is completed without a proposal and the audience is left merely with the spectacle of the long-distance phone call. What is interesting about this episode is that it illustrates several features that are common to the diffusion of innovations in ICTs. First, if the cost
is high (true of most new innovations), it is taken up most quickly by the affluent. And second, much of the actual communicated content is about how wonderful or amazing the mere possibility of such an act is. This may very well be what McLuhan (1964/2002) meant by the “medium is the message” (p. 7). This example, although a recreation of a historical period, points to how the diffusion of new technologies impacts the individual, small group (e.g., the family), and the larger social order in a profoundly structural way.

Figure 6: Early long distance telephone communication in "Meet Me in St. Louis" (1944, Metro-Goldwyn-Mayer)

As with many, my experiences with new ICTs are similar to the family in “Meet Me in St. Louis,” whether that is with computer-based communication (first over a dial-
up modem to a local Bulletin Board System), or with a cellphone, or any number of other new innovations in ICTs. My early understanding of networked computing began in the early 1990s, when I began connecting to local Bulletin Board Systems (BBS). One particularly salient experience occurred when I dialed into a local BBS located in the Riverside, California region, which was free to call with local phone service. I would download different programs from the site (such as freeware, shareware, fonts, clipart, etc.), and I was contacted by the owner of the BBS over an early form of instant message. He explained to me that he noticed I was downloading a good deal of content and not giving anything back. I explained to him that I would be happy to, but I didn’t have anything from my own repository to give back (since this Bulletin Board System was my primary source of downloads). This example highlights what was then a digital scarcity: there was both a lack of digital content combined with a high cost to communicate that content (e.g., the BBS required expensive computers and telephone lines to operate). Looking back, this was my initial realization that interacting in a networked digital environment was inherently a social activity. Simply because the giving and receiving were being mediated by sophisticated computer technology (or at least it was sophisticated by the standards of the time), did not exempt such exchange from the normative practices within the culture. Rather, the early, pre-Internet exchange was situated within the social and culture context and the computer and dial-up network were complex mediators. As networked computing has expanded far beyond dial-up networks, and into globally interconnected, high-speed communications networks, the notion that social and cultural factors persist is a reoccurring theme. The idea that there is a social component to computing has been captured in the widespread use of the term social
media, sociable media, social software, and online social networking. The prospect that a social component should be incorporated in the making of any computer system is aptly captured by the cartoon in Figure 7 with the statement, "and where is the social component?" Understanding the "social component" of computing is indeed a central theme to this project.

Figure 7: The intersection of computing and "social"
(http://www.fastforwardblog.com/2008/07/29/it-used-to-be-all-1s-and-0s-now-its-social-too/)
CHAPTER III

RESEARCH METHODOLOGY

Overview

The purpose of the research design is to shed light on the extent to which ICTs can be used to advance a participatory culture. To understand this, it is necessary to have an analytic framework for interpreting usage data. The analytic framework used is highly related to the four hypotheses stated in chapter one, and shares a good deal in common with some of the analytic techniques argued for by Shafer (2008) in attempting to understand participatory culture. It further coincides with the micro-, meso-, and macro-levels of analyses that are discussed by Jones with respect to Network Learning (2006). The analytic framework for understanding the relationship between the ICT and participatory culture is shown in Table 1.
## Table 1: Analytic Framework for relationship between ICTs and participatory culture

<table>
<thead>
<tr>
<th>Key Questions Levels</th>
<th>Communication Structures</th>
<th>Discourses</th>
<th>Interpersonal Networks</th>
<th>Social Influence</th>
<th>Design, Affordance, and Appropriation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Micro-level</strong></td>
<td>Which users communicate with what other users?</td>
<td>What users contribute what types of discourse?</td>
<td>What users were influenced to join because of a pre-existing social network?</td>
<td>What design affordances communicate social influence?</td>
<td>How do specific design affordances (pages, button, graphics) influence participation?</td>
</tr>
<tr>
<td><strong>Meso-level</strong></td>
<td>How does the ICT allow users to communicate with other users across social or organizational structures?</td>
<td>What discourses develop and flourish within this ICT?</td>
<td>What role does an individual's social network play in the involvement in an ICT?</td>
<td>How does the ICT facilitate social influence?</td>
<td>What specific affordances allow for greater participation?</td>
</tr>
<tr>
<td><strong>Macro-level</strong></td>
<td>How do ICTs allow users in one community to communicate with members from different or diverse communities?</td>
<td>What kinds of discourses are developing and flourishing within ICTs?</td>
<td>How are an individual's social network spread across various ICTs? Where do they intersect and overlap?</td>
<td>How is social influence translated across the Internet?</td>
<td>What design similarities across ICTs have the most impact on participation?</td>
</tr>
</tbody>
</table>

The analytic framework looks to capture how the micro-level interactions (someone contributing some content) influences one’s immediate social network and the greater community (or the meso-level), as well as influences the macro-level (what the contribution means for higher education and for the world as a whole). Where Shäfer argues for a three-pronged analytic framework (the dispositif, actor-network level, and socio-technical ecosystem level), I also advocate for a three-pronged approach (micro-level, meso-level, and macro-level) which relates specifically to the frame of reference (user, community, world-at-large). This study will use the micro-level interactions
Designing the Environment

Enacting Web 2.0 Design Patterns

Designing the technical environment involves leveraging knowledge resources on best design practices, as well as introducing new innovations whose efficacy may not be well researched. The basic design rationale captured in the term Web 2.0 is the notion that the web should be used to buttress connections between individuals and provide them unfettered opportunities to express themselves, rather than attempt to curate all possible combinations of knowledge resources or attempt to censor individual contributions. For the design of this technical environment (PocketKnowledge), Web 2.0 design patterns were explicitly employed, most notably the patterns that a) users can...
control their own data, b) users should be trusted, c) flexible tags are preferable to hierarchical taxonomies, d) the attitude should be playful, and e) the expectation that the software gets better when more people use it (O’Reilly, 2005). These patterns manifest themselves in concrete design affordances, and in some cases in combination with continued use of the system by users. For example, the pattern a) users control their own data, is manifested in a design affordance which allows the user to post or delete any of their own content at any time. The design pattern that the software gets better the more people use it is both an outcome based on the interactions of the users as well as something that is manifested in concrete design affordances. In designing a Web 2.0 system, it can never be known ahead of time if it will be used by a large number of individuals, but the system can be designed in such a way that if it does get used it should get better with that increased interaction. To accomplish this, the design affordance of making prominent the richness of increased interaction to users is instantiated in design affordances. For example, PocketKnowledge displays visual clues (see Figure 8) which indicates the size and composition of where the increased user activity is coming from. For example, the colors indicate the role of the contributor (student, faculty, staff, other) and the size of the pie chart provides a visual clue of the extent of that interaction. Figure 8 also illustrates some other concepts, such as the primacy of the individual user in the context of the system as a whole.

These particular design patterns are made particularly salient when compared against other similar systems that do not use Web 2.0 design patterns. For example, a system in use for the same community (Teachers College) called the Community Program Collections aimed to provide the same basic functionality of allowing
community members to share their knowledge products and resources they think others would find useful. However, Community Program Collections did not specifically employ Web 2.0 design patterns. Instead, it used more traditional hierarchical models, such as a) organizing information based on a taxonomy derived from institutional structures (e.g., programs and departments), b) lack of user control over their own content (e.g., a user cannot remove their content from the site), and c) centrality of authority (e.g., a user can only suggest content to be added to the collection; however, ultimate authority resides with an institutional librarian). These design patterns are manifested in concrete design affordances, or the omission of design affordances (such as the lack of a "Delete" button or inability to add new categories of classification). Figure 9 is a screen capture from Community Program Collection that illustrates how information is organized according to institutional structures.
Figure 8: Individuals maintain a high degree of control (a user's view of his collection of materials in PocketKnowledge)
Figure 9: Community Program Collections is organized by institutional structures

The design differences exhibited in PocketKnowledge and CPC are most evident when viewed in terms of affordances and constraints (Norman, 1988). With a web-based system, this refers specifically to those functions and features that allow a user to accomplish some action, as well as the barriers (intentional and unintentional) that the system enforces. One particularly salient constraint that CPC enforces is the inability for users to directly post materials to the system, but rather to make “suggestions” for addition. Before a user is allowed to make a suggestion, a warning message is displayed in caps and bold that reads “IMPORTANT – PLEASE READ CAREFULLY” as well as a three paragraph statement on copyright (see Figure 10).
Suggest an Addition to the Arts & Humanities Program Collection

IMPORTANT — PLEASE READ CAREFULLY
If the library owns the copyright, or has explicit permission to display a copyrighted work, then the library can display the full copyrighted work from this web site. If the library does not own the copyright, or has not been granted the proper permissions from the copyright holder, then the most the library can do is provide a link to the item.

Given these copyright restrictions, please upload files only if (a) you are the copyright owner, and (b) are granting the library permission to display the work from this library site.

If you do not own the copyright for the work you are suggesting, you may provide a link to that work, and we will make every effort to send library patrons to the proper, third-party web site.

Please choose a method:

- I will provide a link
- I will upload a file (you must be the copyright owner to do so)
- I have no link or file, but I do have the following suggestion:

Figure 10: CPC shows a warning message and information on copyright before a suggestion can be made.

After a user makes a suggestion, the system displays the following message:

Thank you for your suggestion. We will review the item, and if possible, make it a part of the Arts & Humanities Program Collection. You will receive an e-mail either way.

This particular set of constraints highlights certain attitudes toward the end-user. First, the warning message in bold and caps indicates that the system distrusts that the user will read the copyright statement. Secondly, the system reinforces the knowledge authority relationship between library or university and the individual by allowing users only to make “suggestions” and if a suggestion is made, it must be “reviewed.” Given these set of constraints, it is plausible to believe that many users, especially those who are less
confident in their knowledge expertise (e.g., students), would hesitate to make a suggestion out of fear of being rejected by the knowledge authority. This hypothesis is borne out by the contributions to CPC over a nearly two year period (November 2004 to August 2006), which prompted involvement predominantly from faculty at a rate twice that of students (see Figure 11).

![Bar chart showing contributions by role.]

Figure 11: Number of “Suggested Additions” to Community Program Collections by role from November 2004 to August 2006.

This design approach is in sharp contrast to PocketKnowledge, which allows any user to post any files instantly and trusts that an addition does not violate copyright laws. Figure 12 shows the “add an item” window, which asks the user if the file violates copyright laws, giving the option for cases where the user “doesn’t know” if copyright
would be violated. This type of design choice illustrates that the system trusts the user to a high degree, with the realization that true violations of copyright are relatively rare and can be handled on a case-by-case basis.

Figure 12: PocketKnowledge includes a simplified copyright compliance policy

In sum, this singular example illustrates a broad distinction in design approach between PocketKnowledge and CPC systems. The point is that differences in design patterns, which manifest themselves in design affordances that look to promote certain user outcomes (e.g., a system getting better as more people use it), lead to very different systems when employed in practice. Because of the importance of the design approach, I will discuss several more examples of how Web 2.0 design patterns are captured in PocketKnowledge.
One important design pattern captured under the term Web 2.0 is the idea that you trust the community to a high degree. This notion is captured in Figure 13, where any logged-in user can change the name and about entries for a pocket. Many systems, especially those used in higher education and academic libraries, go to great lengths to ensure that information is secure and cannot be changed by anyone other than those who are authorized. The Web 2.0 paradigm reverses that trend and allows anyone to edit these entries. This is a radical break from the way things used to be done. Tapscott and Williams (2006) describe how this is indeed a radical break:

If you consider the vernacular, the term “open” is loaded—rich with meaning and positive connotations. Among other things, openness is associated with candor, transparency, freedom, flexibility, expansiveness, engagement, and access. Open, however, is not an adjective often used to describe the traditional firm, and until recently, open would not have appropriately described the inner works of the economy either. (pp. 20-21)

Although Tapscott and Williams are speaking of the corporate firm and the economy, the use of openness within higher education technologies rarely happened either. Because of the novelty of this approach, when it came time to roll-out PocketKnowledge to the community, it was collectively decided that database backups should be very frequent in case “trusting the community” did not work and all the entries are trashed by some disaffected community member. In the over two year period that PocketKnowledge has been available to the Teachers College community, restoring data because of destruction by disaffected community members was never needed. In fact, no one has ever done anything that could be considered transgressive (illegal, derogatory, offensive, etc.).
Rather, all contributions could be considered constructive, well-intentioned, and pro-social.

Figure 13: Illustrates the design pattern that you trust the community to a high degree

Another important Web 2.0 design pattern is the non-authoritative information organization. This is the idea that some central authority (academic library, Library of Congress, or other authority) cannot possibly decide ahead of time all the possible metadata words, phrases, or combinations that can be used to describe content. This is a result of the speed with which knowledge gets created. It would delay in making information available if researchers had to wait until some authority recognizes their new content area.
as a valid field of study and worthy of classification as such. Hence, the idea with non-authoritative information organizations is that users themselves know best how to describe the information that they are providing since they are often the creators of the information. In PocketKnowledge, this idea is captured in Figure 14, where information can be organized based on tags, which is just a term a user decides to assign to the contribution he provides. In Figure 14, you can see that terms like “case studies,” “adult education,” and “instruction and study” have been assigned to user contributions. This design pattern is related to the notion of community trust: if a member of the community is able to create his own content, there is a high likelihood that he should be able to describe it using a few phrases or tags that others can understand. The basic notion is that if an individual is contributing some distinctive piece of work, he wants it to be accessible to others as clearly as possible. The best way to do this is to describe it appropriately.
Another important design pattern captured under the term Web 2.0 is the notion that the system should be fun and playful. The notion of enjoyment and play are central to understanding the motivations and inner-workings of successful participatory communities, and thus should be instantiated into the design of the ICT. For example, Benkler (2006) discusses the role of enjoyment in motivating the types of social production exhibited on the Internet:

For all of us, there comes a time on any given day, week, and month every year and in different degrees over our lifetimes, when we choose to act in some way
that is oriented towards fulfilling our social and psychological needs, not our market-exchangeable needs. It is that part of our lives and our motivational structure that social production taps, and on which it thrives. There is nothing mysterious about this. It is evident to any of us who rush home to our family or to a restaurant or bar with friends at the end of a workday, rather than staying on for another hour of overtime or to increase our billable hours; or at least regret it when we cannot. (p. 98)

Hence, enjoyment and fun (however that is defined for the individual) are central to creating a participatory culture. One way to make people feel more playful and at-ease is to integrate fun imagery into the ICT design. With regard to PocketKnowledge, this was accomplished through the use of playful iconography (see Figure 15). The iconography is playful, welcoming, and makes light of serious situations (like system errors). The notion is that people will have more fun (and be more open to participating) if they feel at ease and welcomed. This is rather different from many other academic technologies, which embody a certain seriousness that do not tap people’s intrinsic motivations for enjoyment and well-being.
Welcome to the social archive of Teachers College

we're sorry, pocketknowledge encountered an internal error.

don't give up browse for more stuff

Figure 15: The "Playful Attitude" design pattern is instantiated into PocketKnowledge. Imagery created by Ian Toledo.
The first design pattern, that users maintain a high degree of control, is achieved in PocketKnowledge by allowing users to upload a profile picture, enter a description of themselves, and upload and download anything they want (see Figure 8). They also have the option to remove anything they have uploaded at any time. This differs from many institutional repositories, where new contributions need to be approved to be added or removed. Users also have a high degree of control by being able to assign their work to any pocket (there are hundreds of pockets available at this time), assign extra fields to describe their work, and describe how their respective roles will be displayed to outside users (this is especially helpful for users who may be students, faculty, staff, or other roles at different times throughout their affiliation with Teachers College). Users can also decide who has permissions to access their work (only themselves, a group of friends, the entire University—available with an institutional login, or the whole Internet). They also have the option to create their own pockets, assign friends or colleagues to them, and read an RSS feed from their personal blog. Hence, giving users a lot of leeway with what they get to do with their content, illustrates that users are trusted to a high degree by the system designers (in this case, my colleagues and I), which should prompt greater involvement.

The last Web 2.0 design pattern is the idea that the systems get better the more people that use them. The idea with this design pattern is that greater contributions by users will make the system richer, more engaging, and an interesting place to be. If the user believes this to be the case, he will spend more time contributing and hence contribute to a strong participatory culture. Being able to illustrate to people that the system itself is being used by others and is in fact getting more interesting is an idea that
was specifically built into the design of the ICT. This is accomplished by creating
graphics that illustrate where the production is coming from. There are several options
for displaying how this kind of information gets displayed (as a pie chart or as a tag
cloud, see Figure 16 and Figure 17, respectively). What gets visualized as a pie chart or a
tag cloud can be toggled between content that is greatest in volume (which author,
uploader, tag, or pocket has the most content), recency (which author, uploader, tag or
pocket has the most recent content), and comments (which author, uploader, tag or pocket
has the most discussed content). Note that the uploader is the same as the author in most
circumstances, but not always (especially for archival content where the author is no
longer available to upload the content). Giving individuals these options allows them to
see for themselves that the system is getting more interesting the more that it is used.
Welcome to the social archive of Teachers College

More information is available on the FAQ page. Learn about:
  - Uploading and organizing your items
  - Restricting access to your items
  - Browsing pockets, tags, etc.
  - View the walkthrough
  - Need more help? View the full tutorial

Or, view the Pocket to share our enthusiasm for this innovative product.

Figure 16: Design pattern showing that the system gets better the more people that use it is illustrated by pie charts
The notion that the software gets better the more people that use it can be further extended by the use of RSS feeds. RSS (standing for Really Simple Syndication) allows for content being contributed to be syndicated to other websites and RSS readers that the user may employ. By making user contributions as visible as possible by using syndication technologies like RSS, the goal of creating a more participatory culture is advanced by showing people that the system is a vibrant and interesting place to be. For example, with PocketKnowledge every distinct page has its own RSS feed. Additionally, many feeds are fed into other websites that have RSS readers, such as the Teachers
College Library home, Learning Management Systems like Blackboard, and in the Fall of 2009 into the new Teachers College portal (see Figure 18, Figure 19, and Figure 20, respectively). The notion of showing new content available in PocketKnowledge in as many places as possible should help users feel that PocketKnowledge is an interesting resource, and hence encourage their participation.

Figure 18: PocketKnowledge feeds are prominently displayed on the Teachers College Library homepage
Online Course Support:

Resources to support you with your online course:
- Blackboard Quick Tutorials
- Technical Support FAQs

Specific Online Course Information: Contact the appropriate academic department and/or course instructor. Academic department information is located at http://www.tc.columbia.edu/academics/index.html.

Online Course Technical Difficulties:
If you are experiencing technical difficulties in your online course, contact us and be sure to include the following information:
- First name and last name, cuny ID, email address, and phone number
- Course ID, name and section number of the course for which you require assistance (e.g. MISTU4037, Computers & Uses Of Info In Ed, Section 10)
- A detailed description of the problem

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Figure 19: PocketKnowledge feeds are integrated into Learning Management Systems like Blackboard

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Figure 20: PocketKnowledge feeds are integrated into an institutional portal
In conclusion, Web 2.0 design patterns were explicitly employed in PocketKnowledge to promote greater participation and involvement by the community. These patterns include: a) users control their own data, b) users should be trusted, c) flexible tags are preferable to hierarchical taxonomies, d) the attitude should be playful, and e) the expectation that the software gets better when more people use it (O’Reilly, 2005). All of these patterns were instantiated in system design and affordances. In the case of “the software gets better when more people use it,” this pattern was both instantiated in the design and involved how the content gets used by other websites (e.g., through the use of RSS feeds).

Iterative Design

In addition to designing using Web 2.0 design patterns explicitly, it is also worthwhile to mention the ways in which the design was arrived at. Although this project did not explicitly use design-based research in the sense that each iteration was thoroughly studied and used to highlight both design changes and generate social science research data (as described by Barab and Squire, 2004), it was however designed iteratively and reviewed with interested parties (particularly staff of the EdLab, the Gottesman Libraries, and Academic Computing Services at Teachers College). The design phase began on September 29, 2005, during a design event held at the EdLab at Teachers College where a group of people from around Teachers College came together to design a digital archive for the college. The attendees of the event included Gary Natriello, Dan Mallinger, Hugo Ortega, Brian Hughes, Hui Soo Chae, Nabeel Ahmad, Suzanne Saba Hughes, Christine Jacknick, George Schuessler, and Larry Furnival.
During this event, two groups were formed and each sketched out how they thought the archive could function. The two ideas that were arrived at were PocketKnowledge and GLaDAS (for Gottesman Libraries Digital Archiving System), and each of these sketches are included in Figure 21 and Figure 22, respectively.

Figure 21: PocketKnowledge initial design sketch
Reviewing the designs, the attendees of the design event felt that the idea of PocketKnowledge had the most promise, and I used it as an inspiration for furthering its design. I produced an initial set of prototypes, which incorporated the notion of circles and "where the knowledge was coming from," as illustrated in Figure 23.
I worked with Gary Natriello, Daniel Mallinger, Brian Hughes, Ian Toledo and Hui Soo Chae in consultation with the rest of the members of the EdLab to further refine the design (see Figure 24) and to integrate the use of Web 2.0 design patterns in these iterations.
Finally, once the design was settled (or when the members of the EdLab felt like it was a basically sound design), I implemented wireframes (see Figure 25), and Dan Mallinger and I implemented all the system components using PHP and Microsoft SQL Server as the database backend.
Figure 25: PocketKnowledge wireframes needed for system implementation

This discussion and adjoining prototypes illustrates how PocketKnowledge was iteratively designed and implemented.

Data Description

Data was collected from PocketKnowledge from September 6, 2006 to September 6, 2008. The system collected a large variety of data regarding its use, including who uploaded and downloaded what material, the search strings used, and information about
the user collected from the administrative system, including institutional role (e.g., student, faculty, etc.) and organizational unit (e.g., academic program, administrative unit, etc.). During this time, 2,344,066 items were either downloaded or the item description page was viewed. Excluding users who were not logged in, 108,584 items were either downloaded or the item description page was viewed. Additionally, 2,580 unique logged-in users downloaded or viewed some piece of material in PocketKnowledge. Users who were not logged in were excluded from the dataset because of the inability to identity who these individuals were, if they were individuals at all and not automated agents. Note that data was not available from November 2, 2007 to January 8, 2008, because logging was deactivated over concerns regarding data storage space for log files.

Knowledge Sharing Networks

The objective with this analysis is to understand the extent to which knowledge sharing networks formed and the degree to which they allowed individuals to communicate across institutional structures. To study this, I will use a social network analysis to identify the cliques that formed through the sharing of contributions and make note of the organizational unit a user is a member of (Wasserman & Faust, 1994). The use of social network analysis has been used by a number of scholars interested in the interplay between communication and the resulting knowledge-sharing networks. For example, Cho, Stegaone and Gay (2002) describe the need for greater research emphasis on the "communicative processes involved in successful (and unsuccessful) peer
interactions rather than just learning outcomes” (p. 43). Reffay & Chanier (2003) have investigated the influence of group cohesion in Computer Supported Collaborative Distance-Learning (CSCDL). Others have used SNA to clarify the impact of social structures on knowledge construction in an asynchronous learning environment (e.g., Aviv, Erlich, Ravid, & Geva, 2003). Further studies have used social network analysis as a way of understanding online social networks. For example, Huberman, Romero, and Woo (2009) used a social network analysis to show how the number of friends that Twitter users have is actually much smaller than the number of friends that they declare to have on their Twitter account. Despite the insights that SNA affords, there are a number of concerns regarding the scope, depth, and richness of network data (de Nooy, Mrvar, and Batagelj, 2005). To address this concern, Martínez et al. (2002) augmented their SNA with qualitative research to gain a deeper understanding of a CSCL environment.

In this study, I will consider the user cliques knowledge sharing networks. I am particularly interested in whether people within the cliques are members of the same academic program, or if they are from other programs. Given this objective, what exactly is a clique? According to Hanneman and Riddle (2005), a clique is a “sub-set of a network in which the actors are more closely and intensely tied to one another than they are to other members of the network” (2005). For example, assume that person A uploads a document, and person B downloads it, and person C downloads a document that B uploaded, and person A downloads something that C had uploaded (see Figure 26).
For the purposes of this study, this arrangement would be considered a clique. Some cliques are much stronger than others. For example, cliques where members more frequently download a variety of contributions of others in the clique would be considered a stronger and more consistent clique. In this study, I will be looking at these cliques over a two-year period divided into six time segments (the dates for the six segments are included in Table 2). I will also consider that the minimum size of a clique be three members (a triad). In practice, however, some cliques are bigger.

Table 2: Data is divided into six date segments

<table>
<thead>
<tr>
<th></th>
<th>Start Date</th>
<th>End Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>September 6, 2006</td>
<td>December 20, 2006</td>
</tr>
<tr>
<td>2</td>
<td>December 20, 2006</td>
<td>April 5, 2007</td>
</tr>
<tr>
<td>3</td>
<td>April 5, 2007</td>
<td>July 19, 2007</td>
</tr>
<tr>
<td>4</td>
<td>July 19, 2007</td>
<td>November 2, 2007</td>
</tr>
<tr>
<td>5</td>
<td>February 8, 2008</td>
<td>May 23, 2008</td>
</tr>
<tr>
<td>6</td>
<td>Mary 23, 2008</td>
<td>September 6, 2008</td>
</tr>
</tbody>
</table>
These time period chunks are somewhat arbitrary; they are used to highlight patterns over time but don’t have any particular importance other than that they are equal in size. All analyses do not include downloads from users who were not logged in, as well as the downloading of materials from the library, or the organization dedicated to making digital materials available to the community. The quantity of materials downloaded from the library will be discussed, but will not be included in the clique analysis because this study concerns itself with the knowledge-sharing networks that formed and not necessarily the one-way consumption of content provided by the library.

The data was stored in a Microsoft SQL Server 2000 database file and was converted into a text-format matrix, and analyzed using the clique analysis tool included with UCINET for the six time periods (Boragatti, 2002). The results of the clique analysis for the six time periods were loaded back into the SQL Server to be queried and analyzed.

**Network Content Semantics**

In addition to finding the knowledge-sharing networks, it is also important to know what is being communicated. What I am interested in is whether the Web 2.0 environment provided a forum for people to share unique contributions that diverge from typical discourse within a graduate school of education. Or rather, were all contributions mirrors of academic discourse within the field of education? The objective is to uncover whether the Web 2.0 environment provided a space where people felt comfortable enough to contribute to something out of the norm, or whether they constrained
themselves to a strictly academic discourse. To analyze this, a Latent Semantic Analysis (LSA) was conducted on all textual content and used it to generate an ontology to represent all the materials. According to Gruber (2008), “An ontology defines a set of representational primitives with which to model a domain of knowledge or discourse.” For the purposes of this study, these representational primitives are keywords that when taken as a whole describe the discourse. To create the corpus of text that was analyzed, all Microsoft Word documents, Text-based PDFs and Powerpoint slides are converted into text documents and assembled in large text files with the name of the text file being the indicator for the user. All titles and abstracts are included with the full-text documents within the text documents. One limitation of this method is that it only allows written texts to be included in the semantic analysis (and is therefore unable to include visual imagery or scanned documents in the analysis). For example, JPGs and image-only PDFs are unable to be included in the semantic analysis. The OntoGen program was used to generate the ontology (Fortuna, Grobelnik, & Mladen, 2007).

The same procedure was performed on five years (September 2000 to September 2006) of articles from the Teachers College Record, an academic journal in the field of education. This corpus of text is considered the acceptable, appropriate, and the highest level of discourse within the field of education. A similarity analysis was conducted to see the extent to which the ontology generated by contributions of users within the Web 2.0 system coincided with the content of the Teachers College Record. The objective is to see whether the discourse within the Web 2.0 environment mirrors that of the discourse of the academic journal, or if the discourse diverges. To measure the similarity...
of the discourses, the Jaccard similarity coefficient is used, which simply measures the similarity between two sets. It is defined as:

\[ J(A, B) = \frac{|A \cap B|}{|A \cup B|}. \]

In order to use this method, I will first provide some background on Latent semantic analysis (LSA). LSA was introduced by Landauer, Foltz, and Laham (1998) and it a statistical theory and method for extracting and representing the contextual meaning of words. According to Landauer, Foltz, and Laham (1998), LSA is different in that it “represents the meaning of a word as a kind of average of the meaning of all the passages in which it appears, and the meaning of a passage as a kind of average of the meaning of all the words it contains” (p. 6). LSA has been used in a variety of applications, most notably in search engines. For example, assume that I was concerned with finding documents about “violence” in a Latent Semantic Analysis-backed search engine. An LSA-backed search would not necessarily find the result with the highest occurrence of the word “violence” in its text, but rather the result that is most about “violence” compared to the other texts within the corpus. Although LSA “allows us to closely approximate human judgment of meaning similarity between words and to objectively predict the consequences of overall word-based similarity between passages”, there are certain inherent limitations (Landauer, Foltz, & Laham, 1998, p. 4). The greatest limitation is that the results are “somewhat sterile and bloodless” in that none “of its knowledge comes directly from perceptual information about the physical world, from instinct, or from experimental intercourse with bodily functions, feelings and intentions”
(p. 4). It also does not make use of word order or the logical arrangement of sentences (p. 5). Although LSA results work “quite well without these aids,” “it must still be suspected of resulting incompleteness or likely error on some occasions” (p. 5).

Laudauer, Foltz and Laham (1998) analogize LSA’s knowledge of the world in the following way: “One might consider LSA’s maximal knowledge of the world to be analogous to a well-read nun’s knowledge of sex, a level of knowledge often deemed a sufficient basis for advising the young” (p. 5). Hence, LSA’s knowledge is based on word counts and vector arithmetic for very large semantic spaces, and is deprived of more sense-driven information.

In addition to viewing LSA as a practical means of obtaining text similarity and performing keyword searches, Landuaer, Laham and Foltz (1998) claim that LSA is also a “model of the [human] computational process and representations underlying substantial portions of the acquisition and utilization of knowledge” (p. 4). Thus, along with having a practical component, LSA is hypothesized to underlie human cognitive processes. This is not directly based on neurological evidence, but rather on how well it works in practice:

It is hard to imagine that LSA could have simulated the impressive range of meaning-based human cognitive phenomena that it has unless it is doing something analogous to what humans do. (p. 33)

Hence, the authors claim that since it works most of the time, then it must have some underlying basis in human cognitive processes. Although the authors admit that “LSA’s psychological reality is certainly still open” (p. 34), they do believe that the “brain uses as much analytic power as LSA to transform its temporally local experiences to global knowledge” (p. 34).
Network Influencers

In addition to the previous two analyses discussed, a survey was completed to find out why users arrived at PocketKnowledge. The survey was given to users the first time they arrived at PocketKnowledge, and the presentation of the survey can be found in Figure 27. As stated earlier, Web 2.0 technologies are designed to facilitate inter-individual connections, and I hence hypothesize that the portion of people who arrived at PK did so because they were prompted by interpersonal connections. I will use descriptive statistics (frequency counts) to report on the results of this survey.

Figure 27: The "How" Survey (bottom of figure)
In addition to the survey, an analysis was conducted to ascertain the extent to which the viewing of others work was followed by a user deciding to contribute his or her work. To conduct this analysis, the upload dates for each user's first contribution was recorded as well as the number of items he or she downloaded or viewed from other users (and not the library) before making that first contribution. Using this data, a test was conducted on if, on average, users viewed the work of others first before deciding to contribute themselves (hypothesis 4). This hypothesis can be formally stated as:

H0: mean views or downloads before first contribution = 0
Ha: mean views or downloads before first contribution > 0

I will perform a one-sample, one-tailed t-test to ascertain if the average number of views before the first contribution is greater than zero, or that individuals viewed the work of others first before deciding to contribute themselves. If the null hypothesis is rejected (individuals did not view the work of others before contributing), it can be concluded that users viewed the work of others first before deciding to contribute.

Summary

In summary, an analytic framework was presented that looks to understand the relationship between an ICT and participatory culture. I also presented specific research methods for analyzing data with respect to the analytic framework, particularly with regard to communication structures, discourses, interpersonal networks, and social influence. This project, however, does not study the impact of particular design
affordances with respect to participatory culture, although it instantiates several design affordances within the design of an ICT. The study of the relationship between specific design affordances and its impact on participation will be saved for future projects and studies.
CHAPTER IV

FINDINGS AND INTERPRETATIONS

Overview

The results of the analysis with regard to knowledge sharing networks, content semantics, and network influence analyses will be discussed first. These results will be followed by an interpretation of the findings.

Knowledge-Sharing Networks

Before the knowledge-sharing networks analysis can be discussed, it is worthwhile mentioning the role that the library plays. The library contributes a large number of materials into PocketKnowledge for download by members of the community. For the analysis of cliques, downloads from the library were removed from the dataset because this study is interested in the extent to which members of the community use the Web 2.0 technology to share content amongst themselves. As you will notice from the graph in Figure 28, the proportion of users downloading materials from the library is slightly more than twice (on average) than users downloading materials from each other. You will notice a large jump in downloads from the library between time period two and five. This can be accounted for by a large number of materials that were digitized and made available to the community by the library. This would indicate the importance of
providing content from an expert source to a community. However, more importantly, what is interesting is the relatively steady stream of downloads amongst users over time (it varies relatively little over time, as the graph indicates). There is an average of 2,500 downloads each time period between users, which are the communicative exchanges of importance to this study.

![Downloads Graph](image)

Figure 28: Downloads from library versus downloads from user-to-user over time

Given the role the library has played, the investigation of cliques found amongst users will be discussed. 402 unique users were a member of one or more cliques. A basic description of the number of cliques, as well as the size of the cliques, is included in Table 3.

Table 3: Cliques found over time in PocketKnowledge

<table>
<thead>
<tr>
<th>Time Segment</th>
<th>Number of Cliques</th>
<th>Average Size of Clique</th>
<th>Std. Dev. of Clique Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>280</td>
<td>3.83</td>
<td>1.07</td>
</tr>
</tbody>
</table>
The research questions are interested in the extent to which the Web 2.0 technology allowed individuals to create knowledge-sharing networks that diverged from institutional structures, notably academic programs. The results of this analysis are shown in Figure 29, which illustrates the number of cliques over time divided by academic program. As the graph indicates, the system did not prompt the creation of many cliques where all members were of the same academic program. Hence, with regard to academic programs, the knowledge-sharing cliques were notably heterogeneous and quite few were homogenous with respect to academic program. This result indicates that the Web 2.0 technology indeed did provide a forum for community members to create knowledge-sharing networks that do not mirror institutional structures, notably academic programs.
As described in the methods sections, the objective of analyzing the content semantics found in a network is to uncover the extent to which individuals make unique contributions that were discursively different from what would be considered normal discourse in a graduate school of education. The interest here is ascertaining whether individuals felt constrained and only shared academic content, or whether individuals felt comfortable enough to contribute non-academic content. To create a base of what is considered normal academic discourse, five years of article content (September, 2002 to September, 2006) from the Teachers College Record, a peer-reviewed academic journal in the field of education, was used to create an ontology that represents the content of the articles. A Latent Semantic Analysis algorithm that is included in the OntoGen program was used to generate the ontology (Fortuna, Grobelnik, & Mladeni, 2007). The program was used to generate 77 keywords to describe the content, which can be found in Figure 30. Upon inspection, the keywords generated are very sensible and aptly describe the contents of the five-year archive. For example, the keywords “freire, critical theories, and pedagogy” as well as “technology, online and distance” are all sensible clusters to
describe the contents of a potential article in the *Teachers College Record*.

Upon plotting the articles in a two-dimensional semantic space using the Document Atlas tool created by Fortuna, Grobelnik, and Mladenic (2006), it is clear upon visual inspection that there is not a high degree of clustering. For example, documents that have semantics that are similar would be closely grouped together. However, these documents are fairly well spaced out in the semantic space. This is a sensible arrangement: the *Teachers College Record* would not likely publish articles within a five-year period that are highly alike.

Figure 30: An ontology of the 5-year contents of the Teachers College Record
The same procedure was performed on the contents of PocketKnowledge, and items contributed by the library were removed to highlight the contributions by community members. The ontology created can be found in Figure 32, where some categories are quite sensible (e.g., “students, schools, teachers”), while the relationship among others is less clear, such as “Google, literacy, ADHD.” When the documents are plotted into a two-dimensional semantic space, the representation shows a high degree of clustering in the center, and a number of items that diverge significantly from the center.
Figure 32: Ontology for PocketKnowledge
Figure 33: PocketKnowledge documents plotted in 2-dimensional semantic space

In comparing these two ontologies, there are only 14 terms that overlap among the 77 terms, leading to a Jaccard similarity coefficient of .18. It can be concluded that the discourse contained within PocketKnowledge diverges from that of the academic journal. By casually looking at the PocketKnowledge ontology, one will notice that it is more informal (e.g., “video, photo, card”), less academic (e.g., no reference to scholars), more technical (e.g., “install, driver, window”), and more local (“tc, tc_website, website”). Interpreting these characteristics, it appears that the Web 2.0 environment provides a space for individuals to figure out how to do things (e.g., “database, merge, survey”) and isn’t necessarily the forum to present reified and reviewed knowledge (like the academic journal).
During the September 6, 2006 to September 6, 2008 time period, 1,708 individuals completed the survey about how they arrived at PocketKnowledge. The purpose of this survey is to uncover if individuals arrived at PocketKnowledge because they were influenced by a socially significant other or some form of mass-marketing device (advertisement or web site). Since Web 2.0 technologies are meant to promote inter-individual connections, I am hypothesizing that inter-individual influence will be the greatest factor. The survey included an “other” field where someone could provide free form text. These responses (158) were added to one of the existing categories, or one of the two new categories that were added (alumni and web search). The results of the survey include the following:

<table>
<thead>
<tr>
<th>Response</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>From a friend or colleague</td>
<td>359</td>
</tr>
<tr>
<td>From a professor or instructor</td>
<td>390</td>
</tr>
<tr>
<td>From a library staff member</td>
<td>442</td>
</tr>
<tr>
<td>From a library advertisement</td>
<td>79</td>
</tr>
<tr>
<td>From the library website</td>
<td>396</td>
</tr>
<tr>
<td>Alumni outreach</td>
<td>10</td>
</tr>
<tr>
<td>Web search</td>
<td>32</td>
</tr>
</tbody>
</table>

The survey results indicate that inter-individual connections, such as through a friend, colleague, professor or instructor, was the largest factor (749). Second to that was the influence of a library staff member (442), which is a form of inter-personal contact, finally followed by the library website (396) and a library advertisement (79). Hence, I
can conclude that individuals were influenced to join PocketKnowledge because of inter-individual connections (friends, colleagues, professors), followed by a library staff member which is a form of inter-individual communication, followed by mass-marketing devices (website or advertisement). Hence, the influence of inter-individual connections was the most salient factor influencing participation compared to non inter-individual factors (such as advertisement or website promotion).

An analysis of the influence of viewing other peoples work and a user's decision to contribute was also conducted. To analyze this, I looked at the first time a user contributed something, and the number of items that user downloaded or viewed (excluding any views of materials contributed by the library) before making that first contribution. For the $N=670$ users who contributed something to PocketKnowledge during this time, on average each of these people viewed 3.24 items before deciding to contribute (with a standard deviation of 10.98). This indicates that on average most users had to view between three and four items from one or more other users before deciding to contribute themselves. However, as our standard deviation indicates, there were users who viewed more items. A test of the hypothesis was also conducted to ascertain if the mean number of items that individuals viewed before deciding to contribute themselves was greater than zero. I performed a one-sided, one-sample t-test, where $t(669) = 7.651$, $p < .001$. The null hypothesis is rejected, and the conclusion can be drawn that the mean number of views before deciding to contribute is greater than zero. Hence, the fourth hypothesis proves true: on average, users viewed the works of others first before deciding to contribute themselves.
Interpretations

Given the results of the four analyses, each of our four hypotheses were found to be true: 1) the Web 2.0 system allowed for the formation of knowledge-sharing networks that diverged from institutional structures, notably academic programs; 2) the Web 2.0 system allowed for the communication of content that diverged from academic discourse within the field of education; 3) users were prompted to join the Web 2.0 system because of interpersonal connections to a higher degree than non-interpersonal connections, and 4) users viewed the works of others first before deciding to contribute themselves. Given that our four hypotheses proved true, I will conclude that the system does show evidence of providing a forum for a participatory culture to take shape.

First, the Web 2.0 provided a space where people could communicate with others based on voluntary interest, which is indicated by the fact that knowledge sharing cliques were heterogeneous with respect to academic program. The assumption being made is that individuals in the same academic program may be communicating with each other out of necessity rather than voluntary interest (e.g., students organizing a program colloquium). Although people within the same academic program may be communicating with each other out of voluntary interest, or people within the different academic programs may be forced to communicate with each other, the assumption is that going outside of one’s program is more elective (and hence motivated by voluntary interest) in comparison to communications within one’s academic program. Hence, it is normal to hear on a college campus the distinction being made between taking a course
that is "elective" versus a "required" course, where "required" courses largely come from one's academic program, where "elective" courses usually come from outside of the primary academic program. However, there are certainly exceptions to this since it is possible to imagine a student taking elective courses from within his or her academic program. The notion that people contribute based on voluntary interest is an important factor in making up a participatory culture (Jenkins et al., 2006). As a side note, patterns of communications that are more elective are less likely to have well established communications channels compared to communications within academic programs, where there may be established courses, colloquia and social events. Hence, it is not surprising that the Web 2.0 system addressed this gap, as indicated by the high degree of heterogeneous knowledge-sharing cliques.

Second, the Web 2.0 system provided a space where a discourse could develop that was different from normal academic discourse within a graduate school of education. In this discourse, people could "figure things out," which is indicated by the fact that it is more informal, less academic, more technical, and more local. This type of discourse would certainly have lower barriers to entry compared to academic discourse (especially that of an academic journal). This indicates that the space did not have especially high barriers to entry with respect to discourse, unlike the academic journal, which can be interpreted as individuals feeling comfortable enough to contribute and not fear rejection. An ability to contribute and not fear rejection is an essential factor needed in order for a participatory culture to develop. Also as a side note, creating a learning environment that doesn't have unreasonably high barriers to entry, where learners can begin participating as a novice and gradually become more like an expert, is an important factor for
developing a healthy learning community (Lave & Wegner, 1991). This is indeed what one would expect of a culture of learning: an informal space to figure things out and learn to navigate the locality before venturing out into a more formal and demanding environment (e.g., submitting an article for publication in a journal).

Third, the Web 2.0 provided a space where social influence matters. As indicated by Jenkins et al. (2006), a participatory culture is “one in which members believe their contributions matter, and feel some degree of social connection with one another (at the least they care what other people think about what they have created)” (p. 3). From proving hypothesis three and four true, I found that social influence does matter. Hypothesis 3 showed that the greatest factor influencing people to become a member was interpersonal connections. Hypothesis 4 showed that on-average people viewed the work of others first before deciding to contribute themselves. Both of these hypotheses indicate that the influence of others, and the contributions of others, matters with respect to how people ultimately behave.

Despite the fact that all four hypotheses proved true, it would seem that the participatory culture is relatively small in comparison to the consumer culture, which is characterized by users downloading materials and not contributing back. For example, there are only 402 users included in one or more knowledge-sharing cliques; however, there are 2,404 logged-in users who have downloaded one or more pieces of material. Using these figures as a guide and making a crude estimate, it would appear that the participatory culture is one-fifth the size of the culture of consumption. This does not factor in the individuals who chose not to or did not know about PocketKnowledge and hence had no involvement. Given this statistic, how can these findings be interpreted? I
shall conclude that participatory cultures can and do persist alongside more consumer-oriented cultures. The question hence becomes not whether an ICT promotes a participatory culture, but rather how large is the participatory culture and what are the communication dynamics within that community.

In using YouTube as an example, the ratio of consumers versus contributors of YouTube content has been found to be much less than 1%. A common statistic is that 65,000 videos per day are contributed to YouTube, where 100 million are downloaded a day (Business Intelligence Lowdown, 2007). Gill, Arlitt, Li, and Mahanti (2007) have found that this ratio remains true on an educational network after having analyzed the uploads and downloads of YouTube content on the University of Calgary network. They analyzed the YouTube activity over an 85 day period, and found that 556,353 videos were downloaded. In the analysis, the researchers captured both the HTTP GET and HTTP POST data. The HTTP GET data are for “fetching content from YouTube,” where HTTP POST “is used by a client’s browser to place content on a server” (p. 20). Of these requests, 99.87% of the content was HTTP GET content, and only 0.12% was HTTP POST content (and 0.01% was Others). Of the HTTP POST content, most of it was determined to be YouTube users rating videos or writing comments. Only 133 were uploaded video attempts. The researchers believe that the ratio of contributors to consumers at the University of Calgary is similar to the ratio of producers to consumers on YouTube as a whole. Given this ratio of contributions to consumers, how is it possible to say that a site like YouTube offers affordances that make a participatory culture possible? Isn’t it just as possible to say that it primarily acts as a way of distributing content, more like an interactive and online version of the television? In
essence, how can these cultures be characterized when there seems to be a contradiction: it makes participation in a public dialogue possible, yet not an overwhelming number of people actually do participate (they rather watch or read, or otherwise consume, the work of others).

Given the results of the analysis, I conclude that Web 2.0 technologies act primarily as ways of making the cultures of the communities who use them visible. This increased visibility does have an effect on people's decision to contribute, as indicated by hypothesis four which found that people viewed the work of others first before deciding to contribute. Hence, Web 2.0 technologies promote the formation of participatory cultures by making the cultural, intellectual, and creative work of a community visible, and that visibility in-turn encourages individuals to participate. Benkler (2006) has similarly described this as a process that "makes culture more participatory, and renders it more legible to all its inhabitants" (p. 300). In the case of PocketKnowledge, its primary cultural impact was that it made the culture of learning visible in a way that it was accessible across space and time (e.g., you could query the contributions and consumptions from years back from anywhere in the world).

Before Web 2.0 technologies, higher education primarily had communications methods that did not offer affordances for making the culture of learning visible across space and time. With respect to ICTs, the primary way in which people could easily use an ICT to participate in knowledge-sharing networks was through email, which is effectively a private conversation between a few people. Listservs provided a more public way of sharing information with a large community of people; however, the permanency of the listserv (being able to query it over time) varied from one list to
another. For formal higher educational settings, the learning management system (LMS) is a way that could capture the culture of learning. However, the highly restrictive nature of the LMS (e.g., only people enrolled in a course can participate or consume the content) made it an ineffective way for individuals to access and get a sense of the culture of learning across an institution. With respect to communications methods that are not ICT-based (face-to-face), the primary way in which the work of higher education is communicated is via academic conferences and journals. With academic conferences, the proceedings are usually not captured (or not very completely) and the process of "figuring out" (or learning) is not made visible. Similarly with academic journals, the knowledge presented is usually so succinct that it is difficult to discern the process a scholar went to to arrive at a particular point. The point is that Web 2.0 technologies offer an opportunity for the culture within an institution to be made accessible over space and time for the first time. As the culture becomes more visible, individuals are encouraged to contribute by others through direct means (a suggestion from an interpersonal connection) as well as through viewing the work of others, creating a participatory culture that diffuses in a truly networked fashion.

Given the evidence that the Web 2.0 technology allowed a space for a participatory culture to form, what conclusion can be reached with regard to the organizational culture at large? Did the Web 2.0 technology have an impact beyond the online environment? By a large portion of the community accepting the ICT, the overall culture changed by allowing portions of it to be world accessible, effectively loosening the restrictions on who could access it. Hence, technological change afforded the means to loosen the restrictions, where the culture itself allowed the technological change to
happen, and the loosening process was furthered by more individual contributions and suggestions to join (as indicated by the analysis on network influencers). Although this study did not look at the impact that these contributions had on opportunities for sharing and collaboration outside of the institution, it opens up possibilities for this type of activity. Thus, the overall culture allowed the shell around the community to be cracked opened and be made accessible to the outside world. In effect, the overall culture became more open. Or stated differently, it is possible to imagine that one or more people could have made it a point to stop this process of loosening, even if they themselves were not a user of the Web 2.0 system. Hence, by not encountering resistance to this loosening process, the overall culture in affect changed its “access policy.” Although not all members of the overall community are members of the Web 2.0 system, the access points to parts of the overall culture (for which the Web 2.0 culture is now apart) have changed. Whether the community understood it was doing this is a different study altogether.
CHAPTER V

IMPLICATIONS, CONCLUSIONS, AND FURTHER QUESTIONS

Summary

The analyses offered in this study looked to understand the relationship between ICTs and their potential for creating and sustaining a participatory culture. In particular, I pointed to a set of factors that highlight the existence of and mediate involvement in a participatory culture, particularly with the extent to which the ICT allows communications across structures, such as academic programs, development of alternative discourses, involvement with interpersonal networks, and social influence as an engagement factor. To understand potential relationships between ICTs and participatory culture, this study analyzed an ICT that was used electively by a graduate school community for a two-year period of time (September 6, 2006 to September 6, 2008) by N=2,580 students, faculty and staff. This ICT was studied specifically by testing four hypotheses:

- Hypothesis 1: Communication Across Structures: The Web 2.0 environment will prompt the sharing of materials among members of the community that
were not formally grouped together by institutional structures, such as programs, to a higher degree than individuals within the same program.

Hypothesis 2: Alternative Discursive Spaces: The Web 2.0 technology will promote the sharing of knowledge that diverged from typical academic discourse within a graduate school of education.

Hypothesis 3: Interpersonal Networks: Users will be prompted to join the Web 2.0 system because of interpersonal connections (e.g., professor, friend, colleague, or library staff member) at a higher degree than non-interpersonal sources (e.g., advertisement, or website).

Hypothesis 4: Social Influence: On average, users will view the works of others before deciding to contribute themselves.

Each of these four hypotheses was found true, indicating that the Web 2.0 environment provided a space for a participatory culture to form. However, this study also concludes that this participatory culture is relatively small, as indicated by 670 users (27.9%) who made one or more contributions, and 402 users (16.7%) who were involved in knowledge sharing networks. The level of contribution, although on first glance small, is far greater than participation rates on other Web 2.0 platforms within and outside of higher education institutions. For example, the rate of YouTube contributions was found to be 65,000 videos uploaded per 100 million downloads both inside and outside of higher education institutions (Gill, Arlitt, Li & Mahanti, 2007). With the case of YouTube, the proportion of contributors to consumers is indeed very small, or much less than .001%. 
With respect to institutional repositories, the participation rate achieved here is high compared to other institutional repositories. For example, a study of the institutional repository at Cornell University has described participation, especially for faculty, as varying between low and "non-use" (Davis & Connolly, 2007). Further, a survey of 40 institutions using the DSpace platform as their institutional repository found that the faculty participation rate was 4.6% per archive with a median of 1.9% (Hong, 2008). Although these studies were primarily concerned with faculty participation as a way of building rich and robust institutional collections, and this study was interested in using the institutional repository as a way of building a more participatory learning community, I do conclude that changes in approach to design of the online environment as discussed here can positively impact participation.

Overview

I conclude that the Web 2.0 technology that was examined in this study facilitated the formation of a participatory culture by making the cultural, intellectual, and creative work of its community visible, and that visibility in-turn encouraged individuals to participate. Given this major conclusion, there are a number of implications, including those for 1) Design of Online Environments, 2) Policy and Practice in Higher Education, and 3) Methodology. In the remainder of this chapter, future possibilities for ICTs in education as well as limitations of the current study will be discussed. I will conclude with a set of further questions.
This study found that the design of the ICT that was studied had an impact on the participatory nature of the community that was formed within the ICT. This was a result of an essential shift in design thinking and practice from Web 1.0 to Web 2.0; or the use of the web to buttress connections between individuals and provide them unfettered opportunities to express themselves, rather than attempt to curate all possible combinations of knowledge resources or attempt to censor individual contributions. Although this study did not attempt to make precise measurements of which design affordances prompted what kinds of behavior, it is clear that trusting the users (e.g., providing them virtually unrestricted access to add or access anything), combined with the openness and visibility of the materials made available by users, and the adjacency of users to socially relevant others, are significant factors in influencing a participatory culture. This is most saliently captured in the comparison between PocketKnowledge and Community Program Collections (CPC, a Web 1.0 system), which showed that involvement was much lower in a Web 1.0 system versus a Web 2.0 system (see Chapter 3).

For the creation of online environments, this study has several implications for designers. The first is derived from the finding that this study illustrated that individuals are interested in communicating with others in knowledge-sharing networks that span institutional structures. This implies that designing affordances into a system that specifically allow this and highlighting the resulting functionality is important and could
prompt greater participation. For example, from an individual’s view within an online system, highlighting the relevant work of others that may not be within one’s specific organizational unit could generate greater interest and collaboration opportunities. The analysis presented in chapter 4 implies that it is unnecessary to provide added functionality to prompt knowledge sharing among users formally grouped together by organizational structures, since this does not seem to occur very frequently in practice. That is, individuals grouped by formal institutional structures likely already have established forms of communications, such as social events, colloquia and courses, and feel less need for the affordances in a system such as the one studied here.

This study also illustrated that integrating existing social networks is essential to spawning participation. This is supported by the survey results indicating that interpersonal networks are the more salient factor in prompting involvement. However, as our second implication implied, once individuals join, they do not necessarily engage in knowledge sharing networks with those people grouped within their academic program. In the design of online environments, this can be further buttressed by highlighting the work of individuals within one’s interpersonal network so that they feel greater connection to the individuals who initiated their interest in participating in the first place. This can be achieved by asking users more explicitly who are the friends or colleagues that they would be most interested in following. Being able to follow the activity of socially relevant others is indeed a useful design affordance for providing greater participation, as indicated by the recent success of Twitter and Facebook, among others.
With regard to the fourth hypothesis, individuals view the works of others before deciding to contribute themselves, implying that designing affordances into a web-based system that utilize this data may promote greater participation. For example, if, on average, each user views the work of three to four other individuals before contributing themselves, it could be useful to keep individuals apprised of further work from those individuals who influenced their contribution in the first place.

Finally, the test of the second hypothesis implies that in a Web 2.0 system such as PocketKnowledge, individuals are interested in sharing a variety of content. This diversity of content is best illustrated in Figure 33, which showed documents from PocketKnowledge plotted in a 2-dimensional semantic space. In this space, there is a good deal of clustering on some key topics (such as schools and education) but there are also a number of divergent areas. Community interest in sharing divergent content is also illustrated in the comparison between contributions to Pocket Knowledge and contributions to an academic journal in the field of education, particularly the Teachers College Record. This comparison indicated that the ontologies representing these two text corpuses were not similar. This finding demonstrates that individuals are interested in sharing content that diverges from academic discourse into areas that are more informal and local. With regard to the design of online environments, it would be sensible to attempt to provide users with suggested areas of discourse based on their particular interests to promote greater community participation. For example, an incoming Masters student may be interested in more local content (e.g., which student residence is the best to live in?) compared to a doctoral student writing her dissertation proposal (e.g., who has used social network analysis as an inquiry method?).
Additionally, the use of a playful attitude in the design of the online environment promotes more informal discourse because it appears to alleviate fears of being rejected by what could be perceived as a knowledge authority. Although more informal discourse may not hold the same esteem as the more reified and reviewed discourse that is available in an academic journal, it may be the type of discourse needed to advance students in their initial stages of discovery to higher levels of inquiry.

**Policy and Practice in Higher Education**

Web 2.0 technologies provide affordances for creating spaces for knowledge sharing networks to form, alternative discourses to develop, and for further integrating one's existing social network into an online community. This case study of the design and use of a Web 2.0 technology at Teachers College illustrates how Web 2.0 technologies make the culture of the communities who use them visible, and in doing so promotes greater participation within the community and creates new possibilities for greater access to the community's contributions from diverse groups. Although this study did not look at how this increased visibility affects opportunities for collaboration and sharing from outside groups, it is worthwhile to further study how an ICT such as PocketKnowledge can be used to promote greater sharing and collaboration among individuals across institutions.

In sum, Web 2.0 technologies may further "open-up" the organizations that use them. The goal of openness is, fortunately, well aligned with the missions and goals of
higher education institutions, and thus Web 2.0 technologies mesh very well with these types of organizational contexts. For other types of organizations, Web 2.0 technologies may not be an appropriate fit if there are concerns about making the work and culture of the organization open to larger groups of people. For example, organizations that depend on individuals ordered within hierarchical structures, where little information is allowed to spread, would not be good candidates for these types of technologies. However, if such an organization was looking for some ways to begin to change, Web 2.0 technologies may be an appropriate solution since they allow for communication across organizational structures (as indicated by the test of the first hypothesis).

Web 2.0 technologies provide a new way of thinking and designing technologies for use in higher education. For example, prior learning management systems provided a rich set of functionality, yet continued the tradition of grouping and isolating learners into courses, hence providing no functionality for someone to apprehend the culture of learning that may be taking place. In the volume *Opening Up Education*, Lee (2008) provides a thorough analysis of why the "underlying model used by these systems [learning management systems] causes concern" (p. 48). He notes first that assigning individuals into one of three roles ("administrator, tutor, or student") acts to "pigeonhole" users and these limitations are "rigidly observed" (p. 48). Attempts by learning management systems to offer personalization are superficial because they are "controlled, managed, restricted, and channeled" (p. 50). And further, learning management systems offer no functionality for making course materials available to the greater Internet because of site license agreements that restrict access to students and faculty within the institution. Lee finds that it is essential to move away from this arrangement and that
"learning management systems, repositories, etcetera, should be built in a flexible manner that allow for the easy exposure of material to all system users and to people external to the system" (p. 48). However, Lee notes that cultural barriers persist in making higher education more open, notably with regard to policy decisions such as around copyright, fair-use and the attitudes of individuals. With regard to the attitudes of individuals, Lee finds that there is some resistance among academics to making their educational materials more open to the outside world because of fear of being criticized (e.g., "Look, they’re teaching that all wrong!") (p. 53). However, despite this fear, he finds that academics are much more willing to share their intellectual works within "meaningful communities to advance their discipline (but not for some common good of education)" (p. 57).

Lee’s findings correspond to the analysis presented here: individuals are willing to contribute because they are influenced by individuals within the community (as the tests of hypothesis 3 and 4 showed). Hence, designing open ICTs that connect users to communities that are meaningful to them can encourage their participation, and in doing so orient the culture toward openness and mitigate fear of rejection.

Fortunately, the notion of using ICTs to strengthen and enhance the capabilities of education institutions has taken hold, as expressed in the National Science Foundation’s 2008 Report, *Fostering Learning in the Networked World: The Cyberlearning Opportunity and Challenge*. This report includes the recommendation to help “build a vibrant cyberlearning field by promoting cross-disciplinary communities of cyberlearning researchers and practitioners including technologists, educators, domain scientists, and social scientists” (p. 7). As indicated in this study, Web 2.0 technologies afford
opportunities for people to communicate with one another across disciplinary lines; however, people still must feel as if the tool allows them to connect with meaningful communities. As Lee (2008) describes, it is usually not enough to get people to participate in an ICT community if the primary goal is highly abstract (e.g., education for all people of the world). Another recommendation of the cyberlearning initiative is to adopt “programs and policies to promote open educational resources” (p. 7). As seen from this study, Web 2.0 technologies allow people to make their own intellectual and knowledge resources accessible because they are motivated by social influence. This study suggests that individuals are more motivated to open-up and share their educational resources when this influence exists (e.g., as indicated by hypothesis three and four), and hence these types of motivators should be incorporated into the cyberlearning development strategy. In sum, Web 2.0 technologies have the potential to aid cyberlearning goals by: 1) offering greater visibility into the learning and intellectual work of a university, and 2) by providing cross-disciplinary and cross-institutional visibility, allowing scholars from one university to gain access to work of colleagues from another university.

Web 2.0 technologies situated in a teaching and learning environment allows for learners to share with other learners from different disciplinary areas. Additionally, these technologies allow for discursive spaces to develop that have barriers to entry that are lower than academic discourse, such as the discourse captured in an academic journal. These spaces allow learners room to “figure things out” and experiment, and not fear rejection. This type of environment aligns itself well with the more informal and comfortable learning environment that is discussed in the communities of practice.
literature. In this type of environment, learners have “opportunities to make the culture of practice theirs” (Lave & Wegner, 1991, p. 95). With respect to teaching, the lowered barriers to entry should help make the sharing of teaching materials more easily completed because there is less fear of rejection. The potential of social software to act as a tool for scaffolding communities of practice has been recognized by diverse scholars. For example, Shirky (2008) finds that by “lowering transaction costs, social tools provide a platform for communities of practice” (p. 100). He means that:

By providing an opportunity for the visible display of expertise or talent, the public asking of questions creates a motivation to answer in public as well, and that answer, once perfected, persists even if both the original asker and answerer lose interest. Communities of practice are inherently cooperative, and are beautifully supported by social tools, because that is exactly the kind of community whose members can recruit one another or allow themselves to be found by interested searchers. (p. 101)

Hence, the public display of expertise, coupled with the constant influx of less experienced learners (e.g., new students), make social tools a rich site for communities of practice to form that persist across time.

Although not discussed in great detail in this study, the academic library played an important role (and encouraged use of the ICT) by providing digitized resources to collections. Data analysis relating the importance of the academic library can be found in Figure 28, which illustrates how users downloaded library-contributed materials at a higher rate than they downloaded materials from one another. Implications for libraries include the following:
1) With regard to institutional digital repositories, relaxing some of the restrictions on what and how something can be contributed should lead to greater participation by members of the institutional community.

2) Providing digitized resources within an online environment where other user activity is taking place (such as through a Web 2.0 environment) can encourage the downloading and use of those materials.

3) The role of library staff in promoting participation is quite strong, as indicated by the survey. Thus, engaging library staff in outreach activities can have a positive impact on community participation in a knowledge sharing ICT.

Methodological Implications

This thesis offers several implications in the area of research methods. First, it offers a way to analyze ICT data to uncover the existence of a participatory culture. Second, it offers some ways to understand the factors that mediate involvement in a participatory culture (such as the ability to communicate across organizational boundaries and participate in alternative discourses).

A clear understanding of Web 2.0 and participatory culture can be limited by the research methods used to elucidate this relationship. By this, I mean there is a possibility that a researcher may see a contribution (e.g., anything from a home-made video or work of fan fiction), and make premature generalizations about the culture in which that
contributor is situated (e.g., youth are using Web 2.0 technologies to create participatory cultures). Or stated differently, notable examples of a certain type of activity within a community do not necessarily imply that such activity is occurring throughout the community. Although this may be the case, it is important not to generalize about a culture if access to a representative sample is unobtainable. Rather, understanding what portion of a community is contributing to an online community is essential as well as understanding the communication dynamics. If the portion of contributions is really small, can’t one simply surmise that these Web 2.0 technologies are acting more like sophisticated consumer devices (like televisions) rather than mediums to promote active involvement and engagement with others?

The research methods used here illustrated the extent to which a participatory culture had formed, particularly by noting that it did form and that it was relatively small. Hence, understanding the size and the dynamics of the entire interaction network is essential to making generalizations about the culture exhibited within the network. Additionally, methods for understanding communication patterns, such as social network analysis, as well as methods for doing content analysis, such as latent semantic analysis, provide ways to quickly access “who” and “what” within an entire given network. Further, the use of “backend data” from an ICT allows for the capturing of the entire communication network, and hence doesn’t require sampling as a way of getting at the general or overall activity taking place.

This study made the case that patterns of communications other than written or verbal dialogue are important factors that influence individual behavior and action. For
example, I made the case that the downloading of someone else's work was in fact an act of communication in itself. This is viewed as a very reasonable form of communication in some fields (such as Computer Science), yet insufficient in others (such as Anthropology). For example, in Computer Science the transmission of bytes of data from one host to another can be considered a form of communication.

Regardless of the different standards with respect to what constitutes communication, this study pointed to the need to capture and analyze data that coincided with the ways in which people use the Internet. By this, I mean that individuals are increasingly downloading wide arrays of content from the Internet, and the content they choose to download (and presumably read, watch, or otherwise interact with) is in fact a meaningful activity. Or, restated, simply because the reading of an article downloaded on the Internet did not result in the reader making a comment or some other form of dialogue to the author, does not mean there was a failure or lack of communication. Rather, the fact that an article was downloaded is a useful metric to indicate that the user was interested in it, and there is a high probability that some or all of its contents will be read. Of course, downloads as a metric may not indicate that meaning between a writer and reader was established as well as some forms of data, such as a person choosing to cite someone or a recorded transcript of computer-mediated communication. Download activity may, however, be more useful in a way because it occurs at such a higher rate than either citation or computer-mediated dialogues. In terms of “old media” this makes sense: a person reads a newspaper, but the percentage who actually write a letter to the editor or author is very rare. In this case, one shouldn’t assume that people didn’t read the newspaper, but rather the most useful metric is the number of papers sold and not the
number of letters to the editor. In the “new media” era, the metric for understanding diffusion of content is primarily page views and downloads. Other metrics that require more user involvement include inter-links, more traditional forms of citation and commenting.

**Future Possibilities for ICTs in Education**

Although this study was firmly situated in a graduate-school, higher-education context, the relevance for engaging youth in participatory cultures, particularly teenagers and college-aged learners, can be speculated upon. There are notable differences between a higher education context and the types of educational contexts youth encounter. Further, there is a good deal of difference between the types of educational environments that youth encounter, particularly schools that vary between rich and poor, public and private, among many other differences. Despite these limitations, some possibilities will be suggested with respect to using Web 2.0 tools in learning environments with pre-graduate-level students.

Web 2.0 tools allow for greater knowledge sharing and group forming, as indicated by the finding that individuals used Pocket Knowledge to form knowledge sharing networks. Clay Shirky notes that this is one of the hallmarks of social software, adding that such tools provide for “ridiculously easy group-forming” (citing Seb Paquet, p. 54). Such affordances can be used in young adult learning environments, just as in the context studied here, to allow for ad-hoc communities of practice to form around areas of interest that may go beyond classroom content. Additionally, social software allows
individuals to do more on their own in a less structured environment, such as find information, produce media, and form groups. In doing so, they have opportunities to become involved in and a part of meaningful learning communities. For example, Wilber (2009) describes how she uses social software, such as blogs, in remedial college writing courses to have students effectively “write themselves into the academy.” Such a process is not only about teaching writing skills, but also to make students feel included in a larger common endeavor (the academy).

With respect to secondary schools, the types of learning opportunities made possible by social software are unlikely to substantially disrupt the essential structure of these schools, as they are organized in a hierarchical fashion around a principal, other administrators, and teachers. However, attempting to integrate some of the activities taking place in informal learning environments into formal learning environments could make schools more impactful in a high-technology, globally interconnected world. Shirky (2008) discusses how social tools will impact hierarchical organizations, such as corporations and governments:

Most of the institutions we had last year we will have next year. In the past the hold of those institutions on public life was irreplaceable, in part because there was no alternative to managing large-scale effort. Now that there is competition to traditional institutional forms for getting things done, those institutions will continue to exist, but their purchase on modern life will weaken as novel alternatives for group action arise. (p. 22)

I would posit that secondary schools face a similar challenge as government and corporate institutions in that they will be competing with alternative ways for doing what they do; in the case of schools, providing education to youth. Under an informal learning scenario, youth will use social tools to connect with content and individuals who are
interested in the same things they are. They will form groups and co-produce content or media around their areas of interest. The kinds of skills they learn in this environment are both meaningful to the individual and a valuable twenty-first century skill-set (particularly collaboration and technical skills). Given this scenario, educators and researchers are encouraged to look to ways of using such intrinsic motivations within the school program.

It is unclear if the new affordances for sharing and collaborating made possible by Web 2.0 will lead to a greater participatory culture in education and society-at-large. Jenkins (2009) makes the case that "'Web 2.0' is not the same thing as 'participatory culture,'" meaning that the types of positive social and cultural constructs that educators and activists are interested in fostering are not simply the byproduct of using Web 2.0 (para. 10). Rather, they require constant nurturing and action to maintain their educational efficacy. Jenkins discusses these tensions, finding that the technology alone does not guarantee the sustainability of a participatory culture: "nothing inevitably grows out of the technology and there is no guarantee unless we collectively put our energy together around ensuring the survival of participatory culture" (Jenkins, 2007, audio recording). Hence, Jenkins sees that the discussion must move from being about access to technology to being more about fostering "the skills and cultural knowledge necessary to deploy those tools toward our own ends" (Jenkins et al., 2006, p.8). In sum, participatory culture is made possible by the innovations in ICTs; however, sustaining the culture must be the undertaking of the community.
Limitations

This study has several strengths but also has a series of limitations. These will be discussed in terms of methodology, data and representativeness. With respect to methodology, this study has the limitation of being a case study and evaluation and is hence unable to make scientifically precise comparisons between factors (such as specific design decisions) that may be more possible by using an experimental design. For example, it is possible to imagine setting up an experimental design that teases out how particular design decisions prompted certain kinds of user behaviors using a variety of control and experimental conditions. This would be important work that could follow from the present study that shows general design decisions' effects. However, this project has the strength of perhaps more accurately capturing “in the world” user activity than studies using either an artificial context (a tool or condition that would not be realistically used) or user population (individuals who may only be doing something for the sake of the study).

Related to this issue of methodology is the issue of the data that was collected, which does not capture the verbal or written utterances from the user population with regard to how they felt the ICT was impacting themselves or the community. Hence, this study does not capture the rich qualitative data that is often used in ethnographies and strongly qualitative studies. Also with regard to the data that was collected, there was no data collection between the period of November 2, 2007, to January 8, 2008, because of a technical problem related to the digital space for storing data.
The above limitation relates to representativeness. Although this study was interested in shedding light on how Web 2.0 technologies are used in learning environments, both the tool (PocketKnowledge) and the community (Teachers College) may not entirely represent either Web 2.0 or other learning communities. For example, it is possible to imagine some Web 2.0 environments that share some but not all of the design patterns with PocketKnowledge. Similarly, the Teachers College community is at-best illustrative of a graduate-level learning community and may not well represent other contexts, such as undergraduate learning communities or other institutional contexts.

Further Questions and Concluding Remarks

Given the results of this study, a wide variety of related questions naturally arise. The most pressing of these questions include:

1) What kinds of interaction dynamics (e.g., abuses of power, anti-social activity, proprietary interests, etc.) lead to the failure of participatory cultures (e.g., decline of community interest and engagement)?

2) How do the use of multiple ICTs scaffold an individual’s involvement in a participatory culture? How does a learner move among these diverse online spaces?

3) Are there specific methods and/or interventions for using Web 2.0 tools to support participatory culture beyond simply design affordances?
4) What specific design affordances prompt what kinds of behavior? Are there specific design affordances that prompt the spreading of knowledge better (beyond simply the usage of Web 2.0 design patterns)?

5) What kind of content or knowledge creations generate the most interest? Are there common attributes among them?

6) How consistent are this study’s findings with other Web 2.0 systems that may or may not be situated in a higher educational setting?

7) How does the sharing of knowledge impact the individual sharer? How does it impact the community of receivers? What does this say about the theory of diffusion with respect to knowledge?

8) How do individuals who use social tools adapt to working in environments where such tools are prohibited (e.g., technically savvy youth in a restrictive environment like many schools)?

9) What impact does opening up educational resources have beyond the community in which they were created (regional, national, and international levels)?

10) How can mobile computing be used to scaffold participatory cultures?

The preceding questions address issues in attempting to understand how to best harness innovations in ICTs for positive social and cultural gains. The analyses offered in this study begin to address this domain of questions, particularly by illustrating some ways in
which an ICT can be used for creating a participatory culture. In particular, I pointed to a set of factors that highlight the existence of and mediate involvement in a participatory culture, particularly with the extent to which an ICT allows communications across structures, development of alternative discourses, involvement with interpersonal networks, and social influence as an engagement factor.

In our time of great informational and media flux, it is unclear if such changes ushered in by new technologies will lead to a better world. Although technological determinism has lost its sway in academia, it is difficult to avoid the reality that new technologies will radically reshape our social, political, and educational contexts. Benkler (2006) argues that these forces will have deeply structural effects, in essence describing them as going “to the very foundations of how liberal markets and liberal democracies have coevolved over the last two centuries” (p. 1). These changes present an opportunity for reshaping the world in a way that provides great equity and potential for individual development. Benkler describes this possibility as providing "individuals a significantly greater role in authoring their own lives, by enabling them to perceive a broader range of possibilities and by providing them a richer baseline against which to measure the choices they in fact make" (p. 9). Such a possibility of the future aligns itself well with the realities sought-after by a century of educators, humanists, and philosophers, including John Dewey, Maxine Greene and Paulo Freire (Dewey, 1927/1954; Greene, 1988; Freire, 1971). With the above-noted questions in mind, it is with great hope that people will come together to leverage new ICTs to create a better world—one that is undoubtedly more globally interconnected, yet also sustaining, equitable, and potentially fulfilling for all its constituents.
REFERENCES


O’Reilly, T. (2005). What is Web 2.0: Design patterns and business models for the next
http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-
20.html

Routledge.

Pea, R. D. (2004). The social and technological dimensions of scaffolding and related
theoretical concepts for learning, education, and human activity. *Journal of the


Ranson, S., Hinings, R., & Greenwood, R. (1980). The structuring of organizational

collaboration in distance-learning groups. In S.A. Cerri, G. Guardères, & F.
Paraguaçu, (Eds.), *Proceedings of the 6th international conference on intelligent
tutoring systems* (pp. 31-40). Biarritz, France.

cohesion in collaborative distance-learning. In B. Wasson, S. Ludvigsen, & U.
Hoppe (Eds.), *Designing for change in networked learning environments.
Proceedings of the international conference on computer support for
Academic Publishers.


