The Social Informatics of Elearning[1]

Caroline Haythornthwaite
haythorn@uiuc.edu
Graduate School of Library and Information Science
University of Illinois at Urbana-Champaign
Paper presented at the Information, Communication & Society (ICS) 10th Anniversary International Symposium, York, England, Sept. 20-22, 2006

Abstract

This paper presents the background, arguments and examples to support a social informatics of elearning. In more than 25 years of studies of information and communication technology, social informatics draws our attention to how technologies work in practice and in context. Extending the principles of social informatics to elearning requires attention to the history of IT implementation to identify parallels between IT and elearning development, and to use these to produce a foundation for educational informatics. These parallels suggest the usefulness of approaching elearning as an IT implementation, and learning from past experiences with large-scale IT change. Yet the case has not been made. Although a necessary and important component of elearning as a whole, as we have seen in the implementation of computer systems, lack of attention to social and technological impacts, and their co-evolution, leave us at a disadvantage for understanding organizational and institutional transformation. Thus, it is important to learn from IT development to inform elearning development.

Introduction

The national and international transformations occurring because of online education are only just beginning to be felt. Online initiatives are changing the way we teach and learn, who we learn with, and where we are learning. Yet, while there are many initiatives that examine pedagogical techniques for online teaching, there is little work that considers the larger picture of social, organizational, and technical change that accompanies and drives elearning. Both formal and informal learning, in institutes of higher education and in the workplace, are being transformed by the combination of this social and technological event. As a large-scale social and technical implementation, elearning deserves the kind of attention given to workplace computer transformation; it deserves attention from multiple perspectives, looking at the transformative effects of this social and technological innovation (Haythornthwaite & Kazmer, 2004).

This paper argues, through review and examples, for a social informatics of elearning: the "*interdisciplinary study of the design, uses, and consequences of ICTs that takes into account their interaction with institutional and cultural contexts*" (Kling, Rosenbaum & Sawyer, 2005, p.6, italics in original). Drawing on more than 25 years of studies of information and communication

[1] **Acknowledgement**: This paper extends ideas presented in the Introduction to the *Handbook of E-learning Research* by Richard Andrews and Caroline Haythornthwaite, drawing on the sections written by Haythornthwaite, and with permission of the publishers. In particular, the section "Social Processes and Technology: Review" is drawn from that chapter, as is the section on institutional contexts and Table 1.

technology (IT, and ICT), social informatics draws our attention to how technologies work in practice and in context. Extending the principles of social informatics to elearning requires attention to the history of IT implementation and impacts to identify parallels between IT and elearning development, and to use these to produce a foundation for *educational informatics*: i.e., "the study of the application of digital technologies and techniques to the use and communication of information in learning and education" (Levy, Ford, Foster, Madden, Miller, Nunes, McPherson & Webber, 2003, p. 299).

Many parallels are evident between the development and transformative effects of IT, and what is unfolding for elearning. For instance, there are parallels between current elearning implementations and the way information technologies were first received in the workplace. Instructors and administrators have resisted adopting this learning option, some because of fears of technological constraints, some because of the risk of investing in untried, expensive, technology-based ventures, and others through failure to see the burgeoning demand for online offerings. These reactions echo impacts found when computers first entered the workplace in the 1980s, and particularly from the literature on diffusion and adoption of technologies (Rogers, 1995). The literature abounds with examples of trying to overcome resistance to the new information and communication technologies (IT, and ICTs), and of coming to terms with the "fit" between existing work practices and computerized processes (e.g., Kiesler and Sproull, 1987; Markus, 1983; Markus and Robey, 1983; Noble and Newman, 1993; Zuboff, 1988). As for earlier IT implementations, there is also a need to keep up with offerings by competitors. Student (aka 'customer') use and demand for technology, plus technology use at other campuses, are driving campus and course management system development in the same way organizational technology use was driven in the 1980s and 1990s.

Another parallel is found in the way instructors first came online with the expectation of transferring courses and existing teaching practices wholesale to the online enterprise. Information technologies were also implemented at first to re-create existing, paper-based systems (Yates, 1993). In both teaching and the workplace, use has been transformed by IT, with new computer-based practices arising in a productive transformation of both social and technical processes. Teachers interested in good pedagogy have modified their practices, taking advantage of online features (e.g., asynchronous communication), and adopting new relations between instructor and student, and among students (e.g., Pelz, 2004; Swan, 2006; Garrison & Anderson, 2003). With this experience, the notion of transferring courses to online delivery is giving way to courses, programs, campuses, and whole universities that are developed first for the online environment.

Elearning is still a new process. Indeed, the innovation of elearning is still so radical that it is – in most cases – kept separate from mainstream educational practices. Just as businesses may start up a new endeavor as a separate entity that can be cut off and set adrift if the initiative fails, universities and educational institutions are doing this now with elearning. Examples include the separation of online universities from the existing institutions of higher education (e.g., the successful Phoenix University in the US, the failed UK eUniversity in the UK, the newly projected Global Campus of the University of Illinois at Urbana-Champaign in the US), the separation of online course enrollment from on-campus

enrollment (e.g., enrolling students through academic outreach), the separation of off-campus students from on-campus students in classes (e.g., in restricting or denying enrollment in online courses to students enrolled on campus), the separation of online versus in-school offerings in high schools (e.g., in the US, online university 'advanced placement' (AP) courses are being offered for those in areas not able to support a full class of students), and separate hiring of adjunct faculty/tutors to teach online courses.

These parallels suggest the usefulness of approaching elearning as an IT implementation, and learning from past experiences with large-scale IT change. Yet the case has not been made; instead, the overwhelming quantity of research and attention in elearning is on teaching practice. Although a necessary and important component of elearning as a whole, as we have seen in the implementation of computer systems, lack of attention to social and technological impacts, and their co-evolution, leave us at a disadvantage for understanding organizational and institutional transformation. It is important to learn from IT development to inform elearning development.

To explore this further, the paper turns now to a short review of IT history regarding socio-technical systems that leads to the definition of the umbrella field of social informatics. The paper then turns to socio-technical processes in elearning, and ends with consideration of emerging transformative trends that affect and also emanate from elearning. In this paper, the discussion generally addresses elearning in higher education. However, similar changes are happening throughout all levels of education, and in informal learning and education made possible through access to online news, information, resources, and expertise. Thus, the full scope of a social informatics examination should not be constrained to formal educational venues, but instead address learning in all forms.

Social Processes and Technology: Review

Researchers have been examining the interplay between social processes and ICTs for many years, building on a foundation of the study of social processes and workplace interventions that include the time and motion studies by Taylor (1911), the wiring room group behavior studies by Roethlisberger and Dickson (1939) and the longwall miners studies by Trist and Bamford and the Tavistock group (1951). These studies identified the importance of context on the presentation of *technology-in-use* and recognized that similar technologies will take dissimilar forms depending on the social, political, and institutional contexts in which they are implemented. This has become known as a *socio-technical systems* approach. It is popular in management for jointly optimizing the social and technical systems in the workplace (for recent work from this perspective, see Coakes, Willis & Lloyd-Jones, 2000).

With the advent of computing, the socio-technical perspective became an important approach for understanding changes in work practices brought about by the implementation of computer systems. When researchers looked at early computing systems, they observed impacts that today are present in contemporary uses and presentations of ICT. These are reviewed briefly here because the history of the progression of computer systems provides background to the kinds of processes seen in relation to current systems and helps tease out where effects of ICT on learning may be found.

Computers Automate and Informate

Early computing systems were designed with the primary purpose of automating office processes, reproducing paper-based systems for the maintenance of records and automating the production of statistical reports. Terms like 'electronic data processing' captured the essence of these computing applications. However, as Zuboff (1998) first noted, these systems *informate* as they automate. This is one of the key transformative effects of computerization. The very act of entering, communicating, or collecting data online, stores not just the data but also the attendant transaction information, increasing the observability of work processes.

IT provides the infrastructure for monitoring data activity – input, search and retrieval – and human actvity – who performed the data activities, when and from where. Communication technologies also informate: every email, bulletin board posting, online chat message, etc. is stored, identified with a unique users, known to come from a particular computer address, etc. This all leads to new ways to monitor individual performance and activity. Information is gathered seamlessly as part of the system definition and operation, now usually fed to further programs that summarize and analyze data patterns. The intermediary role of data entry present in early computer systems, as well as the analysis process, are now invisible, with data collected and processed directly from transactions.

Zuboff eloquently demonstrated the impact of this computerization on individuals at work. Clerical workers who had worked in social groups now found themselves isolated at computer terminals, performing data entry work on their own. Their productivity could now be assessed in terms of keystrokes. The social impact of this instance of computerization was both the isolation of data entry personnel and increased monitoring of the minutiae of performance. Elearning is susceptible to the same impact: bulletin boards provide a persistent record of class participation, providing the database from which summaries of student and instructor posting frequency and timing can be extracted and analyzed.

Interconnection Affords Data Sharing

Interconnectivity of systems has been an essential component in building monitoring systems, by making electronic data interchange from remote transaction to local analysis a reality. The best known platform now for such connection is Internet connectivity and its attendant data format standards (e.g., XML). Data exchange depends on fixed, agreed formats, following defined rules. Although defined and refined by individuals (e.g., see Marty, 2005), such systems often appear to users as technology that drives their work habits and limit their options for interaction. To communicate around such rules, electronic data forms often included a 'memo' field, which provided space for explanations, social comments, and data unanticipated by forms designers.

From Prescriptive to Permissive Systems

In hindsight, these memo fields may be seen as the thin edge of the wedge that opened the door for electronic communication systems. Exchange of data in prescribed formats gave way to more open text exchange as use of systems was "reinvented" to local use and needs (Rice and Rogers, 1980; Rogers, Eveland and Klepper, 1977), and as new systems were

developed. As Galegher and Kraut (1990) describe, 'permissive' (rather than 'prescriptive') systems appeared that did not constrain input to specific choices from a list or entries of only a fixed field length. These permissive systems are more interpretively (or interpretatively) flexible (Orlikowski, 1992; Bijker, 1995) – i.e., tailorable by the user. As such, they permit a greater likelihood of reinvention. Such trends can be seen playing out once again in the development and implementation of elearning. Since the mid-1990s, online learning has been passing through similar phases: creation and use of data forms (e.g., in registration systems) to informate-ing educational processes (e.g., discussions on bulletin boards), and appropriation of permissive systems (e.g., email, online chat).

Task-Technology Fit

Technological determinists see such changes as the inevitable outcome of technology, with human activity shaped by the technologies that are imposed on them. Others see technology use as more malleable and affected by strategies of individual or joint human action: strategies such as non-use, or more complicated appropriations of the technology to local contexts (Rogers, 1995; Rogers, Eveland and Klepper, 1977; Rice and Rogers, 1980; Danziger, Dutton, Kling and Kraemer, 1982). These two sides are often portrayed against each other – technology determining social behavior, or social behavior determining technology – with neither technology nor social behavior changing. This approach to computing followed earlier work in management trying to find the best *task-technology fit*, i.e., the fit between how work is organized and the types of transformations required to convert inputs into outputs (Thompson, 1967; Perrow, 1970), and the context in which the work takes place (e.g., contingency theory, Lawrence and Lorsch, 1967).

This idea of looking for fit was transferred directly to examination of computing implementations because the data management capabilities of information technologies (IT) reconfigured organizational structures and processes. For a while there was an effort to explore computer system-organization fit, including communication-technology fit (Daft and Lengel, 1986; Trevino, Daft and Lengel, 1990). Studies of fit in the computing arena are best summed up in notions of *organizational validity* and *invalidity*, which refers to how well the computing system corresponds to existing organizational structures and what could or should be done about it (Markus and Robey, 1983; Noble and Newman, 1993). Noble and Newman (1993) in particular noted that where fit was not made, the system could change, the people could change, or both could change. The socio-technical systems approach to computing emerges from this kind of observation. Aligning social practices and technological support in the service of work outcomes is the essence of socio-technical systems evaluation, an approach that begins to make headway in thinking about systems design and implementation.

Social Construction and the Role of Users

But, it is not enough to view the problem as one of accommodation, of making technology "fit" the social or vice-versa, or even of simultaneous adjustment, in part because this assumes a knowing observer, and relatively stable and identifiable social/technical conditions. However, the rapid development of computing technology, at first the personal computer revolution and now the mobile technology revolution, have pushed change ahead of planned fit, making developers out of users. Grassroots movements such as Usenet, the

web and open source software show that systems and use have a general, societal level implementation that is under the control of no one organization or entity. New practices are emerging at a societal level that influence what can be done, and what is expected, within any organization or institution.

A number of systems design approaches emerged during the 1980s and early 1990s that take into consideration the role of the user. These include: *workplace studies* that articulate everyday workplace processes, using this as input to systems design that better reflects actual practice (e.g., Suchman, 1987; Luff, Hindmarsh & Heath, 2000); *participatory design* that brings the user into the design process rather than leaving the process to systems specialists alone (also known as user-centered design; e.g., see the work by Pelle Ehn, Morton Kyng); and *shared cognition*, with its emphasis on joint processes of learning and collaboration (e.g., Resnick, Levine and Teasley, 1991; Engeström and Middleton, 1996). Whole sectors of computer science have emerged to engage with human-computer issues, such as *human-computer interaction* (HCI, e.g., Nielsen, 1994; Carroll, 2002), and *computer-supported cooperative work* (CSCW) (e.g., Baecker, 1993; Bannon & Schmidt, 1991; Crabtree, Rodden, Benford, 2005; Schmidt & Bannon, 1992). Research in *computer-mediated communication* (CMC; e.g., Herring, 2002), owes much of its heritage to the initiators of the CSCW field with their focus on understanding social processes and collaborative work on the way to designing support systems. Examination of computing systems has also inherited from historical and *social studies of technology* (e.g., MacKenzie and Wajcman 1985; Williams and Edge, 1996). Reviewing this area is beyond the scope of this paper, but the attention these researchers give to the shaping of technology are important constructs for considering the place and presentation of elearning technologies, and should prove a useful resource for researchers interested in this perspective. (For further reading, see for example, Bijker, Hughes & Pinch, 1987; MacKenzie & Wajcman, 1985; Pinch & Bijker, 1984; Williams & Edge, 1996).

Collectively, these approaches have provided a more holistic view of systems development: one that sees the social and technical sides of computerization not as two immutables in tension, but as two forces shaping each other. As a whole, these new approaches to systems development and analyses, and the co-evolution of social and technical practices, are gathered under the name *social informatics* (Kling, 1999; Kling, Rosenbaum & Sawyer, 2005). Social informatics provides a solid theoretical foundation for addressing the social and technical synergy of elearning, derived from the sociology of contemporary culture, particularly where it intersects with computing use by groups, organizations, communities, and societies.

From Social Informatics To Educational Informatics

Extending the principles of social informatics into the learning sphere leads logically to the adoption of the term *educational informatics*, as Levy et al. (2003) have done. These authors describe the main concerns as twofold:

> First, research in educational informatics seeks to understand the effects on people of using digital information (re)sources, services, systems, environments and communications media for learning and education. It examines the issues and

> problems that arise from their practice and how these relate to factors such as educational and professional context, communication and information practices, psychological and cognitive variables, and ICT design and use. Second, it seeks to contribute to the development of practical knowledge that is relevant to diverse forms of ICT-supported learning. (Levy et al., 2003, p. 299)

In reviewing how computer systems have been received, there are many parallels in the receipt of learning technologies. For instance, unquestioned technological or social deterministic views hold back an effective transformation to elearning. Avoiding online teaching because of fears that technology will inhibit existing teaching practices represents a technological determinist view, with the innovation resisted through non-use. Transferring courses online with the expectation of running them exactly as done offline represents a social determinist view, expecting no change in pedagogical practice. Neither approach is practical in a time when rapid change in technology, and in student and faculty experience with technology, drives the need for everyone to keep up and adjust practices in both online and offline courses. Teaching and learning practices – whether online or off – do not stand separate from technological advances. Instead, as for work practices, teaching and learning co-evolve with technology. The triadic, evolving relationship of teaching, learning and technology is what is captured in the term elearning. As such, it does not mean just online. One of the most intriguing outcomes of the recent history of elearning is that the developments made online are now in demand from instructors for use in their on-campus classes (e.g., in the move toward 'blended learning'), thus driving change in all venues of teaching and learning.

The view that technologies are not something imposed from above, but instead emerge from and are modified by practice, follows John Dewey's notion of *pragmatic technologies* (Hickman, 1992). In Dewey's view a technology is the embodiment of the state of the art at the time of its creation.

> "A tool is in this sense a theory, a proposal, a recommended method or course of action. It is only a proposal and not a solution per se because it must be tested against the problematic material for the sake of which it has been created or selected. " (Hickman, 1992, p. 21)

As a theory, a proposal, the technology is amenable to change. On-campus, face-to-face teaching can and does give way to online teaching, and the latter, in turn, modifies the former. Thus, technologies can be seen as both *antecedent and consequent* to group interaction, and users as able to both adopt and adapt technologies to their needs (Bruce, 2003).

Data Activity

Computerization automates and informates elearning in the same way it has done for other operations. Formerly transient and ephemeral processes are now routinely recorded as part of the delivery process. Conversations, discussions, and lectures that remain in digital records facilitate asynchronous participation, but their persistence also allows interrogation and review (Erickson, 1999). They create a source of information about course progress and conduct. As Berge (1997, p. 15) notes, an "interesting line of research involves the fact that computer conferencing programs can produce complete transcripts of all interactions they

have mediated. These transcripts are a rich data source." Beyond research, however, they are also an interesting source of data for monitoring, accountability, and benchmarking of both students and instructors. For better or worse, class participation need no longer be a matter of an instructor's judgement of contribution, but can be counted by webboard postings. Although quality of contribution is an essential element, the ability to see number, size, and timing of postings may form a much too easy alternative to evaluation and take over as measures of contribution without proper evaluation of their value as indicators of participation. Instructors' voices are recorded also. How are these likely to be used in future to evaluate their performance?

Human Activity

Paralleling Zuboff's concern about workers isolated from human contact because of their computer work (see also Kraut et al., 1998 for similar concerns about Internet use), elearning has been depicted as isolating, with an individual working alone at their computer as in a correspondence model of distance education. What is different now is that the so-called isolated student is just as likely to be carrying on conversations with many others via class discussion boards, email, and chat, molding and forming the communication dialogue they prefer. Invisible to the outside observer is the communication that goes on between students, and between students and instructors, as the student sits "alone" at their terminal. Perhaps now we should say that computers automate, informate and 'communicate,' in the sense that computers create a communication stream as much as an information stream.

Communication Drives Social Network Formation

CSCW meets elearning in concern for matters of collaboration, particularly in the area of *computer-supported collaborative learning* (CSCL; Koschmann, 1996). Bannon connected the ideas from CSCW to online learning in 1989, describing the computer's role "as a medium through which individuals and groups can collaborate with others" (Bannon, 1989, p.271; see also Crook, 1989; Kaye, 1991, 1995; O'Malley, 1989). CSCW interests in collaboration have led to the development of more all-embracing systems developments for supporting knowledge work, such as collaboratories (or collaborative virtual environments, CVEs; Finholt, 2002) which leads naturally to the idea of collaborative learning and collaborative learning environments (Lunsford & Bruce, 2001). The emphasis on collaborative learning transforms the interdependencies of the traditional classroom, advocating learning that is student- rather than teacher-centered. The result is a redefinition of authority and support relations from those of the traditional, instructor-led lecture approach.

Collaboration leads to a concern for communities – of learners, co-workers, knowledge creators. Education is as much concerned about the *community of learners* as it is about educational content and delivery. Indeed, community may be considered involved in both the content and delivery. Education plays a role in passing on and enculturating individuals into their local (geographical) culture, and into the disciplinary culture of the subject being learnt (Bordieu, 1986; Crook, 2002; Knorr-Cetina, 1999; Haythornthwaite, Lunsford, Bowker & Bruce, 2006; Haythornthwaite, 2006). Community is, thus, part and parcel of the content of education. Community is also the delivery mechanism, through literatures, mentoring, classroom contexts, and the interactions among learners. In elearning the

community dimension of delivery is particularly strong because of the emphasis on collaborative learning, learner-centered activity, and instructors in mentoring roles.

Important background to 21st century online learning communities includes the many different approaches taken to community, including

- social network definitions (Wellman, 1979, 1999; Wellman & Berkowitz, 1997[2])
- discourse communities (Miller, 1994; Warschauer, 2000)
- knowledge communities (e.g., Knorr-Cetina, 1999; Collins, 1998)
- actor-networks (Latour, 1987),
- social worlds (Strauss, 1978)
- communities of practice (Wenger, 1998)

Researchers in education has provided background on learning community, particularly taking up issues relating to its new definition online, and including collaborative as well as teaching environments in the definition (Barab, Kling & Grey, 2004; Lunsford & Bruce, 2001; Riel, 2004; Renninger & Shumar, 2002; Scardamalia & Bereiter, 1996). Interdisciplinary research has drawn on sociology, linguistics, and communication to contributed to our understandings of online interaction and community, include *studies of online community and online work practices* (e.g., Baym, 2000; Cherny, 1999; Haythornthwaite, Kazmer, Robins & Shoemaker, 2000; Kendall, 2002; Yates, Orlikowski & Okamura, 1999; Orlikowski, 2002; Warschauer, 2003; Wellman et al, 1996; Wellman, 1997).

Other areas deserve more consideration with respect to elearning. Perhaps not as well integrated into social informatics as it might be, but of particular importance to elearning is work on *literacy*, particularly online literacy (Andrews, 2004), computers and writing (Hawisher & Selfe, 1999, 2007), language (Clark, 1996; Crystal, 2001), linguistics (e.g., Herring, 2002; Cherny, 1999), and genre (Bregman & Haythornthwaite, 2003; Herring, Scheidt, Bonus & Wright, 2005; Orlikowski & Yates, 1994). Still to be integrated with elearning is the relation between community information systems and elearning, including *information sources* (i.e., online and in physical and digital libraries; Searing, 2004; Bishop, Van House & Buttenfield, 2003), and the interplay between offline communities and online interaction (e.g., in studies of community networking initiatives, an area of research now often referred to as *community informatics*; e.g., Keeble & Loader, 2001; Cohill & Kavanaugh, 2000; Bishop, 2000; Wellman & Haythornthwaite, 2002). Elearning in the (regional) community has yet to be explored.

Community and the Meaning of Local

One issue that stands out in trying to grasp the idea of community for elearning is the relation to the local. What does 'local' mean in the context of elearning? What is the elearner's 'local' community? When students are distributed, how does their experience of local differ – from each other, and from the local of the instructor (which may still be the physical campus)? The change in the meaning and shared experience of the 'local' represents

[2] A number of elearning researchers also examine network ties and relations associated with elearing, e.g., Aviv et al, 2003; Cho, Stefanone, & Gay, 2002; Haythornthwaite, 2002a, 2002b; Hrastinski, 2006; Saltz, Hiltz & Turoff, 2004.

a major transformation in social interaction. Although distributed learning has been going on for years, the new technologies transform the distance student's experience into a collective one, located in cyberspace.[3]

Two quite different examples show the impact of a redefined 'local' for elearning. First, libraries remote from the enrolling institution are beginning to experience the impact of their geographically local elearners. Pedagogical requirements for use of online resources have the unexpected consequence of distributing responsibility to public access points, e.g., public and university libraries at locations local to the students; such institutions then act as nests for the distributed learning 'cuckoos' (Searing, personal communication). Libraries are carrying the load for assignments set at educational institutions remote from their own site and clientele, with consequent impacts on inter-library agreements and collection development.

Second, students are often taking classes while embedded in the workplace, and always while embedded in their local community. Resources for internships, interviews, and data gathering are all now remote to the degree granting institution, but local to the student. This can be a benefit that can run both ways: communities local to the student can benefit as remote knowledge is brought into the workplace or community, even with the possibility of engaging remote expertise in helping to solve local problems (Kazmer, 2007); students in the online class benefit from the multiple experiences from diverse locations that can be brought into class discussion (Montague, 2006).

The Role of Users

At the center of the elearning endeavor are the elearners themselves. What is emerging is evidence of a reconfiguration of social relations around online activity that, in turn, further drives and extends the social configuration of elearning. The many areas, studies, and theories under the social informatics umbrella share a common focus on the way new technologies change social interaction, with new language, meeting places, means of meeting, and meaning of associations. Castells (2001), for example, argues that "a new system of social relationships centred on the individual" (p. 128) is emerging, in which the individual creates his or her own individualized communities in a society which creates emphasis on the individual (p. 129). Wellman (2001; Wellman et al, 2003) has described this as *networked individualism*, with the individual in charge of their personal universe of contacts spread across different contexts and roles. Although individual networks have existed for a long time, supported through letters, travel by car and plane, and the telephone (Wellman, 1979, 1999), the Internet in particular has been cited as supporting (and creating) such individualized sociability (Wellman et al, 1996; Wellman, 2002; Wellman et al, 2003). Reports are divided over whether the consequences are positive or negative for individuals and their

[3] There is also a growing concern that the effort to understand distance experience, built up from years of work on distance education and reinforced with new online delivery, may be forgotten as focus shifts to elearning, and then effort is spent on integrating elearning technology into oncampus courses. In the US, there is a particular effort to address 'blended learning', which largely means elearning on campus. This is led by Sloan-C a major mover in asynchronous learning. See Thompson, 2007, for a plea to remember the importance of including distance students in elearning efforts.

local contacts. Some describe the Internet as taking people away from local, interpersonal, and face-to-face interaction and as having negative effects on individual's well being (e.g., Nie, 2001; Kraut, Patterson, et al, 1998, but see also Kraut, Kiesler et al, 2002). By contrast, others praise the connectivity the Internet affords, and describe how this increases individual well being (e.g., LaRose et al, 2001). (For a review of these two positions, see Haythornthwaite & Wellman, 2002).

Although these researchers do not address elearning *per se*, the implications are that elearners sit at the center of their universe, rotating and participating in multiple social worlds. Unlike on-campus learners who come to class and interact as directed by the instructor, elearners may be quite different, coming on and offline at times and places of their own choosing, and participating according to different motivations than traditional students. However, this view may be quite utopic. Kazmer & Haythornthwaite (2001) describe how the elearner is not so much at the control center of their own universe, but is more often at the beck and call of many universes: work, children, spouse, etc. Indeed, student reports suggest that their relations with members of these worlds determine to a large extent whether the student finds the online program manageable. Support from these various universes, given as understanding and support to the elearners presence in the elearning universe, is a key to a successful experience (Kazmer & Haythornthwaite, 2001).

While the elearner may not be independent of local demands, they may, however, exercise more control in the learning context. The more individuals become used to being master of their own cyberlife, the more they may want to pick and choose what, when, and from whom they learn. This may increase participation and self-directed learning, but may also have the impact of leading learners away from packaged programs. Indeed, the informal learning opportunities rapidly appearing on the Internet may provide just the venue for a society of elearners. This is an area for future research.

Emergent Effects On and From Elearning

We turn now to applying the social informatics view to elearning, looking at the forces driving change in the institutional and the cultural context. What is presented is a beginning to the work of identifying the major push-and-pull between developments in each of these areas. The ideas presented in the table are not intended to be exhaustive, but instead illustrative of the kind of iterative action and reaction that it is important to examine for elearning. This kind of social informatics inquiry needs to be taken up, expanded and tested by future elearning research.

Institutional Context

In reviewing the literature and elearning activity, four areas of action stand out drivers for change in elearning processes at the institutional level. These are actions taken by or emanating from *administration, pedagogy, technology,* and *community*. Change in any of these areas not only drives further change within the area itself, but also drives and is driven by change in each other area. *Administration* encompasses the decisions made about elearning initiatives in education, and the decision makers who direct this agenda. *Pedagogy* entails the knowledge accumulated about teaching and learning, as well as the teachers and instructors who build

and deliver courses. *Technology* in this instance is narrowly defined as the delivery mechanisms for elearning, i.e., primarily computer-based technology, including course management systems, email, the Internet, and newly emergent information and communication technologies. *Community* refers here to potential and actual elearners and the communities they live in, both physical and virtual, on-campus and off.

As decisions and implementations are made in each area, they have direct and indirect effects on other areas. Table 1 presents a first run at sorting out and describing the complex interactions of the four prime drivers. It is offered as a beginning of such explanation. Future research will be able to refine and verify impacts, as well as considering other drivers. In Table 1, the direct and indirect effects are classified as *driver, passenger, emergent* and *second-order effects. Driver effects* are evident when an action stemming from one of the four identified areas has an impact on other aspects of elearning, e.g., when administrative decisions about technology drive what options are available for giving online classes and for maintaining an online community. *Passenger effects* are evident in the way practices are transformed by the driving forces, e.g. in the way pedagogy can or must now proceed because of an administrative choice about technology. All driver effects have an impact on a passenger, but to save redundancy the passenger side impact is not given in the table. Instead, identification of a passenger effect is limited to instances where the effect is less immediately expected. Readers may, however, prefer to see them all as driver effects, since even the unexpected passenger effect then becomes a driver for further change.

Outcomes in an area that arise from action within the same area are identified as *emergent effects*; these appear along the diagonal in Table 1. Such influences may come from action within the local institution or program, but also from outside, e.g., as institutions look to and emulate peers, as colleagues share pedagogical techniques at conferences, and as new technologies appear (see Scott, 1992, for more on the many kinds of ways organizations pay attention to their environments, for example, following the actions of peer institutions, regional competitors, etc.).

Finally, outcomes that emerge because of new practices are indicated in the table as *second-order effects*. These do not arise immediately but emerge later in time as a set of less expected outcomes; sometimes these become further driver, passenger, or emergent effects.

Space considerations make it necessary to leave readers to make their own way through the table to examine and consider the effects listed. In brief, one part of the table is described. Reading the first cell under the "Pedagogy drives …" column, the first effect noted is a driver effect: early adopters bring technology into their classrooms, beginning the process of changing classroom practice, and, finding they like it, drive change in practice and technology. These early experimenters play an important gatekeeping role, becoming aware of and trying out new ways of teaching and discovering what works before the unit as a whole needs to take on the new practice. The second effect shown is a second-order, driver effect. As individuals adopt new technologies, their critical mass drives units to adopt the larger infrastructure of elearning, e.g., including technology and student support for its use. The table continues with effects across the four areas considered.

Cultural Context

Social informatics also addresses wider impacts than organizational level or industry sector impacts. Shifts have already happened in the way information is managed because of ICT, and are still unfolding in the way communication is handled. Similar effects are now appearing and spreading rapidly in the learning field. What follows is a short list of transformative effects happening now to affect and drive elearning, as well as what effects are emanating from elearning.

Effects Driving Elearning

Mobility and Affordability: Two trends in technology combine to liberate learning from the classroom: internet connectivity is the obvious one, but equally important in driving where and when people can learning online is the portability and affordability of new devices, from laptops to PDAs to mobile phones. An important transformation has occurred from corporate to personal ownership because of more affordable computing devices and Internet access. While it has been possible for a long time to own a personal computer, many were still constrained to the use of PCs at work for Internet connection. Even for those who could afford a PC and connection at home, this only extended their online activity to one more fixed place of access. And even for those with laptops, Internet access beyond work and home was, until quite recently, not widely available. The spread of wireless computing across cities, and the implementation of Internet access as near standard in hotels, combine to make the transformation from here and there access to anywhere access.

Add to this trend the rise of recreational activities online and it is only a small step to see the coming transformations of student readiness. We are already seeing that online games and chat used for recreation yesterday are becoming the classroom and corporate application of tomorrow (e.g., see Gee, 2003; McFarlane, 2007; Quan-Haase, Cothrel & Wellman, 2005). This is a major change in corporate technology adoption. Whereas in the past technologies were designed for the workplace and migrated into common use – the telephone, computer processing – now recreational, non-work technologies are driving workplace use. Educational institutions play catch-up in this arena, as place-based and time-fixed class activity gives way to remote, asynchronous interaction, whether primary or secondary to the educational endeavor (i.e., in fully online, or as a supplement to on-campus activity).

Changing Student Base: Perhaps the biggest driver of the use of technology in teaching and learning is the push by students for education that incorporates the ICT they already know how to use and/or anticipate using in their careers. Some of these are the young, incoming students who have been playing online for years, and others are adults already learning and using these technologies in daily work. Also changing is the base of adult learners forced by changing technology and knowledge bases to upgrade their skills on a regular basis. The latter often are constrained by their lack of mobility: responsibilities of home and family, the need to remain physically located where they are because of their own job or that of other household members, and the wear and tear of mega-city commuting, all combine to increase the appeal and the necessity of online learning.

Globalization: Internet access makes being online nationally or internationally just as close as locally. Barring synchronous contact, time zone differences do not interrupt a multi-national gathering. With awareness of the rhythm of posting and response across time zones, many collaborations function well online, as can elearning. The challenges are now more social than technical, and particularly in need of social informatics examination. For example, common language and culture cannot be assumed, affecting things like politeness, responsiveness, participation, interactivity (Rafaeli and Sudweeks, 1997), use English and/or its ESL variants, as well as acceptance and familiarity with new cultures and practices of elearning such as learner-centered activity, collaborative learning, and learner-leader models (Koschmann, 1996; Montague, 2006).

Effects Emanating from Elearning

Dual learning of subject and technology: Interviews with distance learners who did not start out as technology savvy report they receive a dual education when learning online, gaining both subject and technology knowledge (Haythornthwaite, Kazmer, Robins & Shoemaker, 2000). Similarly, as Andrew Whitworth remarks, there is learning by all about the technology: "learning is taking place *about* the technology (its nature, its affordances, its consequences) just as much as it is taking place *via* the technology. And this is happening (or should happen) in students and teachers alike" (personal communication, August 11, 2006; see also Whitworth, 2007). In a sequence of social construction, such learning drives future uses of technologies for learning which acts again to affect future learning. It may also drive the assessment of priorities in skill sets taught to and acquired by students as preparation for future work and life, e.g., emphasizing distributed, computer-mediated teamwork and communication over (or as well as) more traditional formal speaking and writing skills. (See also Andrews and Haythornthwaite, 2007 for Andrews' discussion of co-evolutionary processes of technology and learning.)

Third shift: As Kramarae (2001) notes, online learning is added on top of work and home, creating a third shift for those already carrying these two worlds (see also Kazmer and Haythornthwaite, 2001). Unlike traditional, on-campus learning, elearning is spliced into existing routines, with few engaging full-time in remote learning. Where elearning becomes a more pervasive trend, expectations of what happens at home and at what stages in life can expect to be adjusted. Lifelong learning may become actualized in lifetime commitment to degree programs conducted part time.

Latent tie structuring: As I have written elsewhere (Haythornthwaite, 2002a, 2005), Internet connections lay the groundwork for social ties to form. The particular social and technical interconnection and commitment to the joint educational purpose provide an ideal opportunity for individuals to create social ties. In this way, elearning has the potential to act as a mechanism for bringing people together from across regions and countries who might not otherwise meet. This has long been the effect of place-based college campuses, but narrowly circumscribed in terms of age, work status, income, class, country and region of origin, and educational achievement. Although elearning will not break down all barriers, particularly in terms of socio-economic status, students can be drawn from different regions within a country, different work places, ages and work experiences (Montague, 2006), and international programs can bridge national cultures

Transformation of relationships: As discussed above, predictions of a system of individual centered relationships, controlled at the computing console rather than embedded in geographic locale, signal a change in the attitudes and expectations of potential elearners. Even if individuals do not, in fact, exercise the kind of control these writers have predicted, it is evident that the overwhelming control of physical location is being eroded. Individuals can exercise choice between online and offline education, with more options for online arising daily. As well as the individual choice in educational venue, elearning is driving a system of pedagogical relationships that is different from past models, characterized by a redefined, collaborative relationship between learner and instructor, with learners themselves as key players in the educational experience as they bring in diverse work, location, family, and cultural experiences into online discussion.

Conclusion

Historical trends in IT development are well-known to those who study IT, but are not discussed in relation to elearning, despite the fact that elearning is a massive transformation in social and technical processes, affecting educational practices for individuals, institutions, societies, and globally. As argued by Haythornthwaite and Kazmer (2004), a multidisciplinary approach is essential for understanding the complex interactive effects associated with elearning. It requires consideration of IT history drawn from management, computer science, information science, as well as pertinent background from sociology, linguistics, rhetoric, communications, and other fields. And, as Levy et al (2003) have described, there is a need for an *educational informatics* approach to learning and education. With IT and ICTs as major factors in how we spend our time and efforts, it is important to be aware of general trends in innovation adoption, and particularly of IT, as well as the emergent processes already evident from IT and ICTs that affect our practice and attitudes to the learning process. The social informatics approach, originally championed by Rob Kling, provides an excellent foundation on which to explore and anticipate changes driving, accompanying, and emanating from elearning initiatives, and deserves the attention of all interested in elearning practice and research.

References

Andrews, R. & Haythornthwaite, C. (2007). Introduction to e-learning research. In R. Andrews & C. Haythornthwaite (eds.), *Handbook of Elearning Research* (pp. 1-52). London: Sage.

Andrews, R. (ed.) (2004). *The Impact of ICT on Literacy Education.* London: RoutledgeFalmer.

Aviv, R., Erlich, Z., Ravid, G. & Geva, A. (2003). Network analysis of knowledge construction in asynchronous learning networks. *Journal of Asynchronous Learning Networks*, 7 (3): 1-23.

Baecker, R. (ed.) (1993). *Readings in Groupware and Computer-Supported Cooperative Work*. San Mateo, CA: Morgan Kaufmann.

Bannon, L. (1989). Issues in computer supported collaborative learning. In C. O'Malley (ed.), *Computer Supported Collaborative Learning* (pp. 267-282). Berlin: Springer-Verlag.

Bannon, L. & Schmidt, K. (1991). CSCW: Four characters in search of a context. In J.M. Bowers & S.D. Benford (eds.), *Studies in Computer Supported Cooperative Work: Theory, Practice, and Design* (pp. 3-16). Amsterdam: Elsevier.

Barab, S. A., Kling, R. & Gray, J. H. (eds.) (2004). *Designing Virtual Communities in the Service of Learning*. NY: Cambridge University Press.
Baym, N. K. (2000). *Tune In, Log On: Soaps, Fandom and Online Community*. Thousand Oaks, CA: Sage.
Berge, Z. L. (1997). Computer conferencing and the on-line classroom. *International Journal of Educational Telecommunications*, 3(1): 3-21.
Bijker, W., (1995). *Of Bicycles, Bakelites, and Bulbs: Toward a Theory of Sociotechnical Change*. Cambridge, MA: MIT Press.
Bijker, W., Hughes, T.P., Pinch, T. (eds.) (1987). *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*. Cambridge, MA: MIT Press.
Bishop, A. P. (2000). Communities for the new century. *Journal of Adolescent and Adult Literacy*, 43 (5): 472-478.
Bishop, A., Van House, N. & Buttenfield, B. (eds.) (2003). *Digital Library Use: Social Practice in Design and Evaluation*. Cambridge, MA: MIT Press.
Bordieu, P. (1986). The forms of capital'. In J.G. Richardson (ed.), *Handbook of Theory and Research for the Sociology of Education* (pp. 241-258). Greenwood..
Bregman, A. & Haythornthwaite, C. (2003). Radicals of presentation: Visibility, relation, and co-presence in persistent conversation. *New Media and Society*, 5 (1): 117-140.
Bruce, B. C. (2003). *Distributed Knowledge Research Collaborative*. Professional Development Workshop, Academy of Management Annual Meeting. Seattle, Washington. Available at: http://dkrc.org/aom.shtml
Carroll, J.M. (2002). *Human-Computer Interaction in the New Millennium*. Addison-Wesley.
Castells, M. (2001). *The Internet Galaxy: Reflections on the Internet, Business and Society*. New York: Oxford University Press.
Cherny, L. (1999). *Conversation and Community: Chat in a Virtual World*. Stanford, CA: CSLI Publications.
Cho, H. Stefanone, M. & Gay, G. (2002). *Social Network Analysis of Information Sharing Networks in a CSCL Community*. Proceedings of the Computer-Supported Collaborative Learning conferences, Boulder, CO.
Clark, H.H. (1996). *Using Language*. Cambridge, UK: Cambridge University Press.
Coakes, E., Willis, D., & Lloyd-Jones, R., editors (2000). The New SocioTech: Graffiti on the Long Wall. Godalming, England: Springer-Verlag.
Cohill, A. M. & Kavanaugh, A. L. (2000). *Community Networks: Lessons from Blacksburg, Virginia* (2nd ed). Boston, MA: Artech House.
Collins, R. (1998). *The Sociology of Philosophies: A Global Theory of Intellectual Change*. Cambridge, MA: Belknap Press of Harvard University Press.
Crabtree, A., Rodden, T. & Benford, S. (2005). Moving with the times: IT research and the boundaries of CSCW. *Computer Supported Cooperative Work*, 14 (3): 217-251.
Crook, C. (1989). Educational practice within two local computer networks. In C. O'Malley (ed.), *Computer Supported Collaborative Learning* (pp. 165-182). Berlin: Springer-Verlag..
Crook, C. (2002). Learning as cultural practice, in M. R. Lea & K. Nicoll (eds.), *Distributed Learning: Social and Cultural Approaches to Practice* (pp. 152-169). NY: RoutledgeFalmer.
Crystal, D. (2001). *Language and the Internet*. Cambridge, UK: Cambridge University Press.
Daft, R.L. & Lengel, R.H. (1986). Organizational information requirements, media richness and structural design. *Management Science*, 32 (5): 554-571.

Danziger, J.N., Dutton, W.H., Kling, R. & Kraemer, K.L. (1982). *Computers and Politics*. NY: Columbia University Press.
Engeström, Y. & Middleton, D. (1996). *Cognition and Communication at Work*. Cambridge: Cambridge University Press.
Erickson, T. (1999). Persistent conversation: An introduction. *Journal of Computer-Mediated Communcation*, 4 (4). Available online at: http://www. ascusc. org/jcmc/vol4/issue4/ericksonintro.html
Finholt, T. (2002). Collaboratories. *Annual Review of Information Science and Technology*, 36: 73-107.
Galegher, J. & Kraut, R.E. (1990). Technology for intellectual teamwork: Perspectives on research and design. In J. Galegher, R.E. Kraut & C. Egido (eds.), *Intellectual Teamwork: Social and Technological Foundations of Cooperative Work* (pp. 1-20). Hillsdale, NJ: Lawrence Erlbaum.
Garrison, D. R., & Anderson, Terry. (2003). *E-learning in the 21st century: A framework for research and practice*. RoutledgeFalmer, NY.
Gee, J. P. (2003). *What Video Games Have to Teach Us About Learning and Literacy*. NY: Palgrave Macmillan.
Hawisher, G. & Selfe, C.L. (eds.) (1999). *Passions, Pedagogies, and 21st Century Technologies*. Logan and Urbana: Utah State University Press and NCTE.
Hawisher, G. & Selfe, C.L. (2007). On computers and writing. In R. Andrews & C. Haythornthwaite (eds.), *Handbook of Elearning Research* (pp. 73-96). London: Sage.
Haythornthwaite, C. & Kazmer, M. M. (2004). Multiple perspectives and practices in online education. In C. Haythornthwaite & M. M. Kazmer (eds.), *Learning, Culture and Community in Online Education: Research and Practice*. NY: Peter Lang.
Haythornthwaite, C. & Wellman, B. (2002). Introduction: Internet in everyday life. In B. Wellman & C. Haythornthwaite (eds.), *The Internet in Everyday Life* (pp. 3-44). Oxford, UK: Blackwell.
Haythornthwaite, C. (2002a). Strong, weak and latent ties and the impact of new media. *The Information Society*, 18 (5): 385- 401.
Haythornthwaite, C. (2002b). Building social networks via computer networks: Creating and sustaining distributed learning communities. In K.A. Renninger & W. Shumar, *Building Virtual Communities: Learning and Change in Cyberspace* (pp. 159-190). Cambridge: Cambridge University Press.
Haythornthwaite, C. (2005). Social networks and Internet connectivity effects. *Information, Communication and Society*, *8*(2), 125-147.
Haythornthwaite, C. (2006). Articulating divides in distributed knowledge practice. *Information, Communication & Society*, *9*(6), 761-780
Haythornthwaite, C., Kazmer, M.M., Robins, J. & Shoemaker, S. (2000). Community development among distance learners: Temporal and technological dimensions. *Journal of Computer-Mediated Communication*, 6(1). Available online at: http://www.ascusc.org/jcmc/vol6/issue1/haythornthwaite.html
Haythornthwaite, C., Lunsford, K.J., Bowker, G. C., & Bruce, B. (2006). Challenges for research and practice in distributed, interdisciplinary, collaboration. In C. Hine (ed.), *New Infrastructures for Science Knowledge Production* (pp. 143-166). Hershey, PA: Idea Group.
Herring, S.C. (2002). Computer-mediated communication on the Internet. *Annual Review of Information Science and Technology,* 36: 109-168.

Herring, S. C., Scheidt, L. A., Bonus, S., and Wright, E. (2005). Weblogs as a bridging genre. *Information, Technology & People*, 18 (2), 142-171.
Hickman, L. A. (1992). *John Dewey's pragmatic technology*. Bloomington, IA: Indiana University Press.
Hrastinski, S. (2006). Introducing an informal synchronous medium in a distance learning course: How is participation affected?' *Internet and Higher Education* (in press).
Kaye, A. R. (1995). Computer supported collaborative learning. In N. Heap, R. Thomas, G. Einon, R. Mason & H. MacKay, *Information Technology and Society* (pp. 192-210). London: Sage.
Kaye, A. R. (ed.) (1991). *Collaborative Learning Through Computer Conferencing: The Najaden Papers*. Berlin: Springer-Verlag.
Kazmer, M. M. & Haythornthwaite, C. (2001). Juggling multiple social worlds: Distance students on and offline. *American Behavioral Scientist, 45*(3), 510-529.
Kazmer, M.M. (2007). Community-embedded learning. In R. Andrews & C. Haythornthwaite (eds.), *Handbook of Elearning Research* (pp. 311-327). London: Sage.
Keeble, L. & Loader, B. (eds) (2001). *Community Informatics: Shaping Computer-Mediated Social Relations*. London: Routledge.
Kendall, Lori (2002). *Hanging Out in the Virtual Pub: Masculinities and Relationships Online*. University of California Press.
Kiesler, S. B., & Sproull, L. S (eds) (1987). *Computing and Change on Campus*. NY: Cambridge University Press.
Kling, R. (1999). What is Social Informatics and Why Does it Matter? *D-Lib Magazine, 5*(1). Available online at: http://www.dlib.org/dlib/january99/kling/01kling.html.
Kling, R., Rosenbaum, H. & Sawyer, S. (2005). *Understanding and Communicating Social Informatics*. Medford, NJ: Information Today.
Knorr-Cetina, K. (1999). *Epistemic Cultures: How the Sciences Make Knowledge*. Cambridge, MA: Harvard University Press.
Koschmann, T. (ed.)(1996). *CSCL: Theory and Practice of an Emerging Paradigm*. Mahwah, NJ: Lawrence Erlbaum.
Kramarae, C. (2001). *The Third Shift: Women Learning Online*. AAUP.
Kraut, R., Kiesler, S., Boneva, B., Cummings, J., Helgeson, V. & Crawford, A. (2002). Internet paradox revisited. *Journal of Social Issues*, 58(1): 49-74.
Kraut, R., Patterson, V.L., Kiesler, S., Mukhopadhyay, T. & Scherilis, W. (1998). Internet paradox: A social technology that reduces social involvement and psychological well-being?. *American Psychologist,* 53(9): 1017-1031.
LaRose, R., Eastin, M. S., & Gregg, J. (2001). Reformulating the Internet paradox: Social cognitive explanations of Internet use and depression. *Journal of Online Behavior, 1*(2). Available at: http://www. behavior. net/JOB/v1n2/paradox. html
Latour, B. (1987). *Science in action: How to follow scientists and engineers through society*. Philadelphia, PA: Open University Press.
Lawrence, P.R. & Lorsch, J.W. (1967). Differentiation and integration in complex organizations. *ASQ*, *12*, 1-47.
Levy, P., Ford, N., Foster, J., Madden, A., Miller, D., Nunes, M. B., McPherson, M. & Webber, S. (2003). Educational informatics: an emerging research agenda. *Journal of Information Science*, 29(4): 298-310.
Luff, P., Hindmarsh, J. & Heath, C. (2000). *Workplace Studies: Recovering Work Practice and*

Lunsford, K. J. & Bruce, B. C. (2001, September). Collaboratories: Working together on the web. *Journal of Adolescent and Adult Literacy, 45*(1): 52-58.
MacKenzie, D. & Wajcman, J. (1999). *The Social Shaping of Technology*. Buckingham: Open University Press.
Markus, M. L. (1983). Power, politics & MIS. *Communications of the ACM*, 26, 430-444.
Markus, M. L. & Robey, D. (1983). The organizational validity of management information systems. *Human Relations*, 36 (3): 203-226.
Marty, P. (2005). Factors influencing the co-evolution of computer-mediated collaborative practices and systems: A museum case study. *Journal of Computer-Mediated Communication, 10*(4), article 12. http://jcmc.indiana.edu/vol10/issue4/marty.html
McFarlane, A. (2007). Alone together, the experience of digital gamers. In R. Andrews & C. Haythornthwaite (eds.), *Handbook of Elearning Research* (pp. 119-138). London: Sage.
Miller, C. (1994). Rhetorical community: The cultural basis of genre. In A. Freedman & P. Medway (eds.). *Genre and the New Rhetoric* (pp. 67-78). Basingstoke, UK: Taylor and Francis.
Montague, R-A. (2006). *Riding the Waves: A Case Study of Learners and Leaders in Library and Information Science Education*. Unpublished doctoral dissertation. University of Illinois at Urbana-Champaign, Champaign, IL.
Nie, N. H. (2001). Sociability, Interpersonal Relations, and the Internet: Reconciling Conflicting Findings. *American Behavioral Scientist*, 45(3), 420-435. Nielsen, J. (1994). *Usability Engineering*. San Francisco, CA: Morgan Kaufmann.
Noble, F. & Newman, M. (1993). Integrated system, autonomous departments: Organizations invalidity and system change in a university. *Journal of Management Studies*, 30 (2): 195-219.
O'Malley, C. (ed.) (1989). *Computer Supported Collaborative Learning*. Berlin: Springer-Verlag.
Orlikowski, W. J. (1992). The duality of technology: Rethinking the concept of technology in organizations. *Organization Science*, 3 (3): 398-427.
Orlikowski, W. J. (2002). Knowing in practice: Enacting a collective capability in distributed organizing. *Organization Science, 13*(3), 249-273.
Orlikowski, W. J. & Yates, J. (1994). Genre repertoire: The structuring of communicative practices in organizations. *Administrative Science Quarterly*, 39: 541-574.
Pelz, W. (2004). (My) Three principles of effective online pedagogy. *Journal of Asynchronous Learning Networks, 8*(3): 33-46, 2004. http://www.sloan-c.org/publications/jaln/v8n3/v8n3_pelz.asp
Perrow, C. (1970). *Organizational Analysis: A Sociological View*. Monterey, CA: Wadsworth.
Pinch, T. J. & Bijker, W. E. (1984). The social construction of facts and artefacts: Or how the sociology of science and the sociology of technology might benefit each other. *Social Studies of Science*, 14: 399-441.
Putnam, R. D. (2000). *Bowling Alone: The Collapse and Revival of American Community*. NY: Simon & Schuster.
Quan-Haase, A., Cothrel, J., & Wellman, B. (2005). Instant messaging for collaboration: A case study of a high-tech firm. *Journal of Computer-Mediated Communication, 10*(4), article 13. http://jcmc.indiana.edu/vol10/issue4/quan-haase.html
Rafaeli, S. & Sudweeks, F. (1997). Networked interactivity. *Journal of Computer-Mediated Communication,* 2 (4). Available online at: http://www.ascusc.org/jcmc/vol2/issue4/rafaeli.sudweeks.html.

Renninger, A. & Shumar, W. (eds.) (2002). *Building Virtual Communities: Learning and Change in Cyberspace*. Cambridge, UK: Cambridge University Press.
Resnick, L.B. Levine, J.M. & Teasdale, S.D. (eds.) (1991). *Perspectives on Socially Shared Cognition*. Washington, D.C.: American Psychological Association.
Rice, R.E. & Rogers, E.M. (1980). Reinvention in the innovation process. *Knowledge*, 1 (4): 499-514.
Riel, M. & Polin, L. (2004). Online learning communities: Common ground and critical differences in designing technical environments. In S. A. Barab, R. Kling, & J. H. Gray (eds.). *Designing for virtual communities in the service of learning* (pp. 16-50). Cambridge UK: Cambridge Univ. Press.
Roethlisberger, F. & Dickson, W. (1939). *Management and the Worker: An account of a Research Program Conducted by the Western Electric Company, Chicago.* Cambridge: Harvard University Press.
Rogers, E.M (1995). *Diffusion of Innovations*. Fourth Edition. NY: The Free Press.
Rogers, E.M., Eveland, J.D. & Klepper, C. (1977). *The Innovation Process in Organizations*. Ann Arbor, Michigan: Dept of Journalism, The University of Michigan. NSF Grant RDA 75-17952.
Saltz, J.S., Hiltz, S.R., & Turoff, M. (2004). Student Social Graphs: Visualizing a Student's Online Social Network. Proceedings of the CSCW'04 conference, Chicago, Illinois.
Scardamalia, Marlene & Bereiter, Carl (1996). Computer support for knowledge-building communities. In T. Koschmann (ed.) *CSCL: Theory and Practice of an Emerging Paradigm* (pp. 249-268). Mahwah, NJ: Lawrence Erlbaum.
Schmidt, K. & Bannon, L. (1992). Taking CSCW seriously: Supporting articulation work. *Computer Supported Cooperative Work*, 1: 7-41.
Scott, W.R. (1992). *Organizations: Rational, Natural, and Open Systems*. Toronto: Prentice-Hall.
Searing, S. (2004). Reshaping traditional services for nontraditional learning: The LEEP student in the library. In C. Haythornthwaite & M. M. Kazmer (eds.), *Learning, Culture and Community in Online Education: Research and Practice*. NY: Peter Lang.
Star, S. L. & Griesemer, J. (1989). Institution ecology, translations, and coherence: Amateurs and professionals in Berkeley's museum of vertebrate zoology, 1907-1939. *Social Studies of Science*, 19, 387-420.
Strauss, A. L. (1978). A social world perspective. *Studies in Symbolic Interactions*, 1, 119-128.
Suchman, L. (1987). *Plans and Situated Actions: The Problem of Human-Machine Communication.* Cambridge: Cambridge University Press.
Swan, K. (2006). Online Collaboration, JALN, 10(1), online, whole issue. http://www.sloan-c.org/publications/jaln/v10n1/index.asp.
Taylor, F.W. (1911). *The Principles of Scientific Management*. New York: Harper.
Thompson, J. D. (1967). *Organizations in Action*. NY: McGraw-Hill.
Thompson, M. (2007). From distance education to elearning. In R. Andrews & C. Haythornthwaite (eds.), *Handbook of Elearning Research* (pp. 159-178). London: Sage.
Trevino, L. K., Daft, R. L. & Lengel, R. H. (1990). Understanding managers' media choice: A symbolic interactionist perspective. In J. Fulk & C. W. Steinfield. (eds.), *Organizations and Communication Technology* (pp. 71-94). Newbury Park, CA: Sage..
Trist, E.L. & Bamford, K.W. (1951). Some social and psychological consequences of the longwall method of coal-getting. *Human Relations,* 4 (1): 6-24, 37-8.

Warschauer, M. (2000). Language, identity, and the Internet. In B. E. Kolko, L. Nakamura & G. B. Rodman (eds.) *Race in Cyberspace* (pp. 151-170). NY: Routledge.
Warschauer, M. (2003). *Technology and social inclusion*. Cambridge, MA: MIT Press.
Wellman, B. (1979). The community question. *American Journal of Sociology*, 84: 1201-1231.
Wellman, B. (1997). An electronic group is a social network. In S. Kiesler (ed.), *Cultures of the Internet* (pp. 179-205). Mahwah, NJ: Lawrence Erlbaum.
Wellman, B. (2001). The rise of networked individualism, In. L. Keeble (ed.), *Community Networks Online* (pp. 17-42). London: Taylor & Francis.
Wellman, B. (2002). Little Boxes, Glocalization, and Networked Individualism?. In M. Tanabe, P. van den Besselaar and T. Ishida (eds.), *Digital Cities II: Computational and Sociological Approaches* (pp. 10-25). Berlin: Springer.
Wellman, B. (ed.)(1999). *Networks in the Global Village*. Boulder, CO: Westview Press.
Wellman, B. & Berkowitz, S. D. (eds.) (1997). *Social Structures: A Network Approach*. (updated edition) Greenwich, CT: JAI Press.
Wellman, B. & Haythornthwaite, C. (eds) (2002). *The Internet in Everyday Life*. Oxford: Blackwell.
Wellman, B., Quan-Haase, A., Boase, J., Chen, W., Hampton, K., de Diaz, I.I., & Miyata, K. (2003). The social affordances of the internet for networked individualism. *JCMC, 8*(3). Available online at: http://jcmc.indiana.edu/vol8/issue3/wellman.html.
Wellman, B., Salaff, J., Dimitrova, D., Garton, L., Gulia, M. & Haythornthwaite, C. (1996). Computer networks as social networks: Collaborative work, telework, and virtual community. *Annual Review of Sociology,* 22: 213-238.
Wenger, E. (1998). *Communities of Practice: Learning, Meaning, and Identity*. Cambridge: Cambridge University Press.
Whitworth, A. (2007). Researching the cognitive cultures of elearning. In R. Andrews & C. Haythornthwaite (eds.), *Handbook of Elearning Research* (pp. 202-220). London: Sage.
Williams, R. & Edge, R. (1996). The social shaping of technology. *Research Policy,* 25: 856-899.
Yates, J. (1993). Co-evolution of information-processing technology and use: Interaction between the life insurance and tabulating industries. *Business History Review, 67*, 1-51.
Yates, J., Orlikowski, W. J. & Okamura, K. (1999). Explicit and implicit structuring of genres in electronic communication: Reinforcement and change in social interaction. *Organization Science, 10(1)*, 83-103.
Zuboff, S. (1988). *In the Age of the Smart Machine: The Future of Work and Power*. NY: Basic Books, Inc.

Table 1: Elearning Driver, Passenger, Emergent, and Second-Order Effects

🚘 Driver effects 🚌 Passenger effects 🕸 Emergent effects ↻ Second-Order Effects

	Administration drives …	**P**edagogy drives …	**T**echnology drives …	**C**ommunity drives …
Administration	🕸 External A drives A: Decisions about the adoption of new practices that are made at peer institutions drive decisions and practices made for the local institution	🚘 P drives A: Early adopters of technology experiment with new technologies in their classes, driving drive class transformation, outreach programs and distributed learning, even before wider administration choices are made ↻ 🚘 New P drives A: The need to meet new technology-based pedagogy drives administration to implement support mechanisms for non-early adopters to learn to teach online	🚘 T drives A: Availability of learning technology systems determines development versus off-the-shelf purchase options for administrative choices 🚘 T drives A: Local adoption of technologies increases need for hardware and software purchase, management and training and system upgrading	🚘 C drives A: Community use of technology drives administrative response to keep up with incoming student expectations and employers expectations about training
Pedagogy	🚘 A drives P: Administrative decisions and directives drive how education will be delivered and thus the priorities for pedagogy	🕸 External P drives P: Changes in pedagogical practice are discovered and exchanged through professional organizations, research and publication affecting local practice ↻ 🕸 New P drives P: Norms of use are built, creating a comparison set for elearning practices as well as a set to learn from and copy	🚘 T drives P: Technology choices drive how teaching can be delivered and who can receive it ↻ 🕸 P and T co-evolve: Limitations of technology drive changes in pedagogy, but pedagogical requirements drive technology design and improvement	🚘 C drives P: Changing community work and knowledge needs drives need for lifelong learning, distributed and mobile learning
Technology	🚘 A drives T: Administration makes decisions about institution-wide technology adoption and support 🚌 A drives T: Administrative decisions push use of technology and can limit choice of technology (e.g., campus-wide selection of a learning platform limits instructors options to use different systems and approaches)	🚘 P drives T: Teachers adopt and then experiment with technology in their classes determining their technology preferences and sit on working committees determining technology adoptions 🚌 New P drives A & T: Elearning solutions are adopted and implemented in response to opportunities for outreach, new pedagogy, etc.	🕸 External T drives T: Technology trends are matched in elearning, e.g., enterprise-wide systems with course management systems; computer-mediated communication with email accounts and support for students; Internet with online course reserves, electronic publication licenses; distributed computing with distributed learning; mobile computing with mobile learning 🕸 New T drives T: Elearning systems offer a standard range of options driving conformity but also narrowing elearning options	🚘 C drives T: Community expectations about what technology makes an institution and its program progressive drives attention to technology within the institution
Community	🚘 A drives C: Expectations of technology	↻🚌 P drives C: Pedagogical requirements	🚘 T drives C: Technology presence drives	🕸 C drives C: Community technology

	use in classes in higher education drives the need for the community to prepare students appropriately	for online resources distributie responsibility to public access points; need for library resources drives use of facilities close to the student, ↻🚌 P drives External A: Use of local university libraries by non-enrolled students lead to new inter-organizational administrative practices	community efforts to promote information and computer literacy, thus affecting how well students are able to take advantage of technologies and elearning ↻🚌 T drives C: Distribution possible because of technology now places teachers and learners in the community, at work, at home while at school	use, and support for use, bootstraps community readiness to use technology and to take part in elearning ↻🚌 C drives C: Embedded learners enact new relationships with embedding context ↻🚌 C drives C: Increased use of online interactions for education drives norms for how to communicate and do work, changing the skill set available to employers