

2000

Collaboration Technologies and Learning Processes: A Brief Look at Past Research and Future Changes

Ned Kock

Temple University, kock@joda.cis.temple.edu

Kelly Hilmer

Virginia Tech, khilmer@vt.ed

Craig Standing

Edith Cowan University, c.standing@ecu.edu.au

Stanley Clark

Stevens Institute of Technology, sclark@stevens-tech.edu

Follow this and additional works at: <http://aisel.aisnet.org/amcis2000>

Recommended Citation

Kock, Ned; Hilmer, Kelly; Standing, Craig; and Clark, Stanley, "Collaboration Technologies and Learning Processes: A Brief Look at Past Research and Future Changes" (2000). *AMCIS 2000 Proceedings*. 130.

<http://aisel.aisnet.org/amcis2000/130>

This material is brought to you by the Americas Conference on Information Systems (AMCIS) at AIS Electronic Library (AISEL). It has been accepted for inclusion in AMCIS 2000 Proceedings by an authorized administrator of AIS Electronic Library (AISEL). For more information, please contact elibrary@aisnet.org.

Collaboration Technologies and Learning Processes: A Brief Look at Past Research and Future Challenges

Ned Kock, Temple University, kock@joda.cis.temple.edu

Kelly Hilmer, Virginia Tech, khilmer@vt.edu

Craig Standing, Edith Cowan University, c.standing@ecu.edu.au

Stanley Clark, Stevens Institute of Technology, sclark@stevens-tech.edu

Abstract

This paper builds on published empirical and theoretical research on the use of collaboration technologies to support learning processes. Our focus is on a key element of learning, namely knowledge communication. Key empirical studies and relevant theories are reviewed. We conclude the paper with suggestions for future research.

A brief look at past research: Disappointing results

There has been increasing interest, particularly since the 1990s, in the use of collaborative technologies to support work groups in organizations. A great deal of this interest has been fueled by the emergence of the Internet and of organizational forms characterized by their low dependence on physical structures for employee interaction (Barnatt, 1995; Davidow and Malone, 1992). There has also been growing interest in organizational structures and processes geared at promoting organizational learning (Moingeon and Edmonson, 1996), particularly in the development of organizational knowledge structures and group-based knowledge sharing processes.

A particular area of concern related to the trends above has been the nature and extent of the impact of collaborative technologies on organizational knowledge sharing. Despite euphoric optimism by some, empirical findings have often been disappointing. For example, Orlikowski's (1992) study of an implementation of an asynchronous computer conferencing system (Lotus Notes) at a large consulting firm concluded that organizational culture and reward systems prevented knowledge sharing among consultants, in spite of the availability of technological support. Ackerman's (1994) study of usage patterns and perceptions of an organizational memory system (Answer Garden) by software engineers yielded a mix of positive and negative results regarding organizational knowledge sharing involving experts and users. Research conducted after the mid-1990s paints an even more negative picture regarding the impact of collaborative technologies on organizational knowledge sharing. Riggs et al.'s (1996) study, for

example, suggests that current collaborative technologies lack enough maturity to effectively support the sharing of organizational knowledge. In the same line, Neilson's (1997) non-controlled longitudinal study of Lotus Notes users in a public organization concludes that collaborative technologies do not prevent the departure of knowledgeable employees from having a negative impact on organizational knowledge retention. The same study suggests that, without adequate group processes, technology itself is unlikely to have any conclusive impact on organizational knowledge sharing.

Expectations based on relevant theories: Media richness and social influences

A number of theoretical frameworks have been used to explain the effects of collaborative technologies in organizational settings. Examples of such theories are media richness theory (Daft and Lengel, 1986), adaptive structuration theory (Poole and DeSanctis, 1990; Poole and Jackson, 1993), systems rationalism (Lea, 1991), genre-based communication structuration (Yates and Orlikowski, 1992; Orlikowski and Yates, 1994), the affective reward suppression model (Reinig et al., 1995), and the social influence model (Fulk et al., 1990).

Among these theories, media richness theory and its key hypotheses have been particularly influential among designers and users of collaborative technologies. According to media richness theory, different communication media can be classified as lean or rich, depending on their ability to support communication in equivocal tasks. The classification scheme proposed by media richness theory places face-to-face as the richest communication medium, and computer-mediated media in general as relatively lean media (Daft and Lengel, 1986; Fulk et al., 1990; Lee, 1994). Media richness theory hypothesizes that lean media are not appropriate for knowledge communication (or "equivocality" reduction, using the theory's terminology), and claims that the selection of media and the outcomes of its use will always reflect this hypothesis (Daft et al., 1987; Lengel and Daft, 1988). Several tests of the theory have suggested that its basic tenets are generally true (Rice, 1992; Webster and Trevino, 1995). Also, media richness theory has been often used in its original form as a basis for the

understanding of empirical findings of research on contemporary communication issues in organizations and society as a whole (Allen and Griffeth, 1997; Jackson and Purcell, 1997; Whitfield and Lamont, 1996).

A theory that is relevant for our discussion and that has also played an important role in highlighting limitations of media richness theory is the social influence model (Fulk et al., 1990). In contrast with media richness theory, which focuses on technology characteristics, the social influence model argues that social influences can strongly shape individual behavior toward technology in ways that are relatively independent of technology traits. Examples of social influences are technology use patterns observed in other individuals (Bandura, 1986), whether they lead to positive or negative consequences, as well as formal or informal social norms of accepted behavior followed by a group to which an individual belongs.

A landmark study by Markus (1994) shows that social influences can shape individual behavior toward communication media in ways that are inconsistent with media richness theory predictions. The study focused on media choices made by managers at a large risk management services provider and questioned the correctness of the media richness scale, which places computer-mediated interaction behind face-to-face interaction in terms of richness. It suggested that social pressures can change key computer-mediated media's attributes that are seen as static by media richness theory. For example, the study showed that pressure from senior managers on subordinates to reply quickly to e-mail messages increases e-mail's feedback immediacy, and therefore shifts e-mail up from its relative position on the richness scale proposed by media richness theory.

Based on the discussion above, it is reasonable to expect that certain social activities and norms, such as those related to specific group processes, may lead to social influences that could be conducive to knowledge sharing. These social influences may also induce behavior toward technology that is inconsistent with media richness theory predictions, by creating conditions for effective knowledge sharing through computer-mediated media.

Suggestions for future research

Future research on collaboration technologies and learning processes needs to address some of the main issues raised above, particularly those related to the media richness vs. social influence debate. We need to understand the claims made by media richness theory, and why they have been supported by some empirical studies (many of which were carefully designed and executed, which makes it difficult to simply ignore them). We also need to understand the social mechanisms that make users

select and use media other than face-to-face for knowledge sharing.

Understanding the claims by media richness theory.

One of media richness theory's main hypotheses has been strongly supported by empirical evidence (Daft et al., 1987), even in empirical studies that ultimately questioned the theory's validity (Markus, 1994). This hypothesis is that users perceive certain communication media as more adequate (or "rich") for certain tasks, such as those that involve knowledge sharing, than other media. Perhaps biology can be used to understand why this may be the case.

Even though this is seldom mentioned in the business communication literature, the above hypothesis is also supported by strong evidence that human beings have been "engineered" by Darwinian evolution to communicate face-to-face, and face-to-face only. The human species evolved by means of "natural selection", a slow process in which random genetic mutations introduce individual traits that are selected based on their usefulness for survival and mating (Darwin, 1859; Dawkins, 1989; Dozier, 1992). During the vast majority of this process, human beings and their ancestors have communicated face-to-face. Research evidence points at the use of facial expressions and discrete sounds for communication as early as 5 to 2 million years ago by members of the australopithecine genus (Boaz and Almquist, 1997). The evidence also suggests that the development of a sophisticated biological apparatus to communicate through facial expressions and sounds was an important element in the evolution path that led to the human species. Such apparatus includes a complex web of facial muscles, nerves, specialized brain functions, and a larynx located relatively low in the neck, which Laitman (1993) believes to be a key morphological trait that differentiates human beings from their early ancestors (and modern primates). This morphological trait considerably increased the variety of sounds that could be generated, leading over millions of years to the appearance of rudimentary forms of speech, and later complex speech (Isaac, 1993; Laitman, 1993).

Given the above, it is reasonable to expect that most people will favor face-to-face as a medium for communication. As a corollary, it can also be expected that most people will perceive face-to-face as the most adequate medium for tasks that require knowledge communication and learning, as hypothesized by media richness theory. While this does not invalidate the refutation presented by Markus (1994) of the static nature of the media richness scale, it does pose some significant questions. Perhaps two of the key questions for future research would be: When a group interacts through a non-face-to-face communication medium to share knowledge (or "learn"), will it adapt its behavior in order to

compensate for the lack of perceived "adequacy" of the medium for the task? If yes, what are the social, psychological and biological mechanisms underlying this adaptation?

Understanding the social mechanisms for knowledge sharing. Differently from other animal species not as well-endowed in terms of brain size and configuration, much of the behavior in the human species is learned through social interactions. Therefore, biology is not the only influence on behavior toward technology. Recent empirical research findings suggest that certain group processes can be conducive to knowledge sharing even when "lean" media are used for communication. For example, Kock's (1999; forthcoming) studies show that, when combined with appropriate social processes, collaborative technologies may foster organizational knowledge sharing. The studies focused on process improvement groups, and showed that: (a) Process improvement is a catalyst to organizational knowledge sharing; and (b) A lean communication medium, namely e-mail conferencing, had no negative impact on organizational knowledge sharing when used to support process improvement initiatives. The studies show that the users' decision to engage in process improvement led to secondary social influences (e.g. perceived group mandate, expected individual behavior) that were conducive to knowledge communication. These influences, combined with the technology's support to asynchronous and distributed communication, contributed to remove material and scheduling obstacles to group interaction.

Some related questions to be addressed by future research can be derived from the above discussion: Will "more" necessarily be better in terms of collaboration technology features and sophistication in the context of knowledge sharing? If not, could simple yet ubiquitous tools such as email be creatively used to support effective knowledge communication and, as a consequence, give companies a competitive edge in today's organizational world of fragmented process-related knowledge? If yes, what group processes would be more conducive to knowledge communication?

The suggestions for future research on collaboration technologies and their impact on learning processes outlined above are not new, and certainly not the only worthy of investigation. Yet, they reflect a belief that research on new technologies (e.g., e-business systems, knowledge management tools) can benefit from building, in a cumulative way, on longstanding theories and theoretical problems.

References

- Ackerman, M. (1994), *Augmenting the Organizational Memory: A Field Study of Answer Garden*, *Proceedings of CSCW'94 Conference*, Furuta, R. and Neuwirth, C. (Eds), The Association for Computing Machinery, New York, NY, pp. 243-252.
- Allen, D.G. and Griffeth, R.W. (1997), *Vertical and Lateral Information Processing: The Effects of Gender, Employee Classification Level, and Media Richness on Communication and Work Outcomes*, *Human Relations*, V.50, No.10, pp. 1239-1260.
- Bandura, A. (1986), *Social Foundations of Thought and Action*, Prentice Hall, Englewood Cliffs, NJ.
- Barnatt, C. (1995), *Office Space, Cyberspace and Virtual Organization*, *Journal of General Management*, V.20, No.4, pp. 78-92.
- Boaz, N.T. and Almquist, A.J. (1997), *Biological Anthropology: A Synthetic Approach to Human Evolution*, Prentice Hall, Upper Saddle River, NJ.
- Daft, R.L. and Lengel, R.H. (1986), *Organizational Information Requirements, Media Richness and Structural Design*, *Management Science*, V.32, No.5, pp. 554-571.
- Daft, R.L., Lengel, R.H. and Trevino, L.K. (1987), *Message Equivocality, Media Selection, and Manager Performance: Implications for Information Systems*, *MIS Quarterly*, V.11, No.3, pp. 355-366.
- Darwin, C. (1859), *On the Origin of Species*, John Murray, London, England.
- Davidow, W.H. and Malone, M.S. (1992), *The Virtual Corporation*, HarperCollins, New York, NY.
- Dawkins, R. (1989), *The Selfish Gene*, New Edition, Oxford University Press, New York, NY.
- Dozier, R.W., Jr. (1992), *Codes of Evolution*, Crown Publishers, New York, NY.

- Fulk, J., Schmitz, J. and Steinfield, C.W. (1990), A Social Influence Model of Technology Use, *Organizations and Communication Technology*, Fulk, J. and Steinfield, C. (Eds), Sage, Newbury Park, CA, pp. 117-140.
- Isaac, G.L. (1993), Aspects of Human Evolution, *The Human Evolution Source Book*, Ciochon, R.L. and Fleagle, J.G. (Eds), Prentice Hall, Englewood Cliffs, NJ, pp. 263-273.
- Jackson, M.H. and Purcell, D. (1997), Politics and Media Richness in World Wide Web Representations of the Former Yugoslavia, *Geographical Review*, V.87, No.2, pp. 219-239.
- Kock, N. (1999), *Process Improvement and Organizational Learning: The Role of Collaboration Technologies*, Idea Group Publishing, Hershey, PA.
- Kock, N. (forthcoming), Sharing Interdepartmental Knowledge using Collaboration Technologies: An Action Research Study, *Journal of Information Technology Impact*.
- Laitman, J. (1993), The Anatomy of Human Speech, *The Human Evolution Source Book*, Ciochon, R.L. and Fleagle, J.G. (Eds), Prentice Hall, Englewood Cliffs, NJ, pp. 56-60.
- Lea, M. (1991), Rationalist Assumptions in Cross-Media Comparisons of Computer-Mediated Communication, *Behaviour & Information Technology*, V.10, No.2, pp. 153-172.
- Lee, A.S. (1994), Electronic Mail as a Medium for Rich Communication: An Empirical Investigation Using Hermeneutic Interpretation, *MIS Quarterly*, V.18, No.2, pp. 143-157.
- Lengel, R.H. and Daft, R.L. (1988), The Selection of Communication Media as an Executive Skill, *Academy of Management Executive*, V.2, No.3, pp. 225-232.
- Markus, M.L. (1994), Electronic Mail as the Medium of Managerial Choice, *Organization Science*, V.5, No.4, pp. 502-527.
- Moingeon, B. and Edmonson, A. (Eds) (1996), *Organizational Learning and Competitive Advantage*, Sage, Thousand Oaks, CA.
- Neilson, R.E. (1997), *Collaborative Technologies and Organizational Learning*, Idea Group Publishing, Hershey, PA.
- Orlikowski, W.J. (1992), Learning from Notes: Organizational Issues in Groupware Implementation, *Proceedings of CSCW'92 Conference*, Turner, J. and Kraut, R. (Eds), The Association for Computing Machinery, New York, NY, pp. 362-369.
- Orlikowski, W.J. and Yates, J. (1994), Genre Repertoire: The Structuring of Communicative Practices in Organizations, *Administrative Science Quarterly*, V.39, No.4, pp. 541-574.
- Poole, M.S. and DeSanctis, G. (1990), Understanding the Use of Group Decision Support Systems: The Theory of Adaptive Structuration, *Organizations and Communication Technology*, Fulk, J. and Steinfield, C. (Eds), Sage, Newbury Park, CA, pp. 173-193.
- Poole, M.S. and Jackson, M.H. (1993), Communication Theory and Group Support Systems, *Group Support Systems: New Perspectives*, Jessup, L.M. and Valacich, J.S. (Eds), Macmillan, New York, NY, pp. 281-293.
- Reinig, B.A., Briggs, R.O., Shepherd, M.M., Yen, J. and Nunamaker, J.F., Jr (1995), Affective Reward and the Adoption of Group Support Systems: Productivity is not Always Enough, *Journal of Management Information Systems*, V.12, No.3, pp. 171-185.

- Rice, R.E. (1992), Task Analyzability, Use of New Media, and Effectiveness: A Multi-Site Exploration of Media Richness, *Organization Science*, V.3, No.4, pp. 475-500.
- Riggs, W.M., Bellinger, W.H., Krieger, D.B. (1996), The Impact of Groupware: Work Process Automation and Organizational Learning, *Technology Analysis & Strategic Management*, V.8, No.3, pp. 271-283.
- Webster, J. and Trevino, L.K. (1995), Rational and Social Theories as Complementary Explanations of Communication Media Choices: Two Policy-Capturing Studies, *Academy of Management Journal*, V.38, No.6, pp. 1544-1573.
- Whitfield, J. and Lamont, M. (1996), The Effects of Organization Design on Media Richness in Multinational Enterprises, *Management Communication Quarterly*, V.10, No.2, pp. 209-237.
- Yates, J. and Orlikowski, W.J. (1992), Genres of Organizational Communication: A Structural Approach to Studying Communication and Media, *Academy of Management Review*, V.17, No.2, pp. 299-326.