

IT-supported Collaboration

MIS Quarterly Research Curation

Research Curation Team:

Manju Ahuja (University of Louisville)

Alan Dennis (Indiana University)

Saonee Sarker (University of Virginia)

Suprateek Sarker (University of Virginia)

Since the inception of the *MIS Quarterly* in the 1970s, collaboration has been an important topic for IS researchers. The GSS and GDSS labs in the University of Arizona and University of Minnesota gave rise to a wave of studies examining how IT-mediated collaboration can substitute for, and in some contexts, even surpass traditional face-to-face collaboration. The many advances in collaboration technology over the last few decades coupled with emergent organizational phenomena (e.g., distributed software development, offshoring) has brought seismic changes both in how such collaboration is being used in organizations as well researchers' exploration of the key issues.

An impressive stream of research developed on this topic in the *MIS Quarterly* between 1988 and 2020. These studies have collectively created a body of knowledge that addresses how to make IT-supported groups more efficient and effective, how to deal with the challenges posed by temporal and geographical distances in collaborative settings, and how to best leverage certain characteristics of the technology to make such collaboration as seamless as or better than traditional face-to-face meetings without technology.

1. Focus of the Research Curation

This curation provides an overview of IT-supported collaboration research published in *MIS Quarterly*. We selected research that made contributions to knowledge about collaboration. Studies that used groups but did not primarily focus on generating insights for collaboration were not included. We also did not include works that addressed related contexts, such as online communities, virtual worlds, offshoring, and co-creation where both *groups* and *IT-supported collaboration* were not salient. This process led to a total of 38 articles that were included for this curation.

In the sections below, we first summarize the research by highlighting what we view as the three eras of IT-supported collaboration, and then examine the three major themes that emerged from this body of work.

2. Progression of Research in *MIS Quarterly*

This curation organizes IT-supported collaboration research into three chronological eras: Era 1 (Technology Support of Co-Located Teams: 1988 to 1998), Era 2 (The Rise of Virtual Teamwork: 1999-2009), and Era 3 (Routinization of Collaboration Era; 2010-2020).

Era 1 (1988-1998): Technology Support of Co-Located Teams

The focus of the first era was on supporting teams that worked at the same place and time. While the idea of team members working across different places and/or times was being considered, distributed collaboration was a novelty. This could be attributed to the fact that the for-profit companies were not permitted on the Internet for the first half of this era.

One of the earliest papers in this era was by Dennis et al. (1988) who proposed the concept of electronic meeting systems (EMS). The authors describe EMS as an “information technology to support the group work that occurs in meetings” (Dennis et al. 1988, p. 593). The technology was seen as a hybrid of a group decision support system and computer-supported collaborative work, and this article proposed a research model for studying the effects of EMS on the process of collaboration (e.g., anonymity, leadership, participation), and outcome (e.g., satisfaction with the process and outcome of collaboration, as well as consensus, and outcome quality).

Following this work, a number of studies examined the efficacy of IT-supported technologies in enhancing the effectiveness, efficiency, and group member satisfaction. Most studies considered the technology as either as an augmentation of, or as a replacement for, face-to-face verbal communication. Some studies compared IT-supported groups to traditional groups not supported by IT (e.g., Jarvenpaa, Rao, and Huber 1988; Zigungs and DeSanctis 1988; Alavi 1994), examined factors such as anonymity (e.g., Jessup, Connolly, and Galeghar 1990), and explored key success factors (e.g., Grohowski et al. 1990). Others examined the effect of IT support in groups working on strategic management tasks (e.g., Tyran et al. 1992) and found that there was reduction in evaluation apprehension, more equality of participation, and less production blocking in such groups, leading to greater efficiency in the strategic management process.

Another set of studies focused on the IT-mediated group’s task accomplishment, examining aspects such as information sharing (e.g., Dennis 1996), the role of computer-generated feedback (Sengupta and Te’eni 1993), and the impact of facilitative support and other key roles (Dickson, Partridge, and Robinson 1993; Zigungs and Kozar 1994; Niederman et al. 1996). These studies addressed same time/same place settings where group members communicated with each other using technology. The two notable exceptions to this pattern were studies by Turoff, Hiltz, Bahgat, and Rana (1993) that focused on groups in different time zones, and by Chidambaram and Jones (1993) that examined differences between face-to-face and geographically-distributed groups in terms of task performance. This body of work further confirmed ideas such as anonymity causing “deindividuation”, and thus allowing individuals to contribute more freely without fear of retribution, and hence lead to positive outcomes such as higher number of ideas generated as well as higher satisfaction with the process and outcome.

Era 2 (1999-2009): The Rise of Virtual Teamwork

This era is composed of two distinct sub-eras: (i) studies building on the work of the previous era by examining nuanced components of IT-supported collaboration and (ii) studies reflecting

the expectation that organizations will eventually use IT to enable teams to work in different places and/or at different times. In the first set of papers, researchers focused on how to best structure tasks in such groups (Dennis et al. 1999), and how to facilitate the adoption and adaptation of collaboration software amongst the groups (Majchrzak et al. 2000; Dennis et al. 2001; Dennis and Garfield 2003). Burke and Chidambaram (1999) examined the optimal set of media characteristics for effectiveness in IT-enabled teams.

While the initial papers in this era primarily studied same time/same place teams, the second sub-era saw a rise in the examination of non-located or dispersed teams, and an increased interest in “virtual teamwork”. This pattern was supported by the fact that during this time the Internet and the World Wide Web had become available to the masses, ushering in the use of virtual teams that could work across time and place, either occasionally or all of the time. Using a case study on Boeing, Malhotra et al. (2001) highlighted how inter-organizational and virtual teams that had to compete for the attention of members who also belong to collocated teams within their own organizations, can be effective at innovation using computer-mediated collaborative technology. Griffith, Sawyer, and Neale (2003) helped provide an answer to the question of what is meant by virtualness, recognizing that IT-supported teams can fall anywhere along the dimensions of distance, IT support and time apart. Piccoli and Ives (2003), Iverson, Mathiassen, and Nielsen. (2004), Kanawattanachai & Yoo (2007), and O’Leary and Cummings (2007) examined many important factors that affect virtual teams, namely, trust, risk, coordination, and the geographic dispersion itself. This era also overlapped with the rise in offshoring of software development. IT-supported collaboration researchers therefore studied the impact of virtuality and technology-enabled collaboration in the context of software development—Vlaar et al. (2008) studied co-creation, Ramasubbu et al. (2008) examined learning and the performance of these teams, while Levina and Vaast (2008) examined how status differences affected collaboration in such contexts. New theories related to use of new media were proposed during this era. Recognizing the complexities of virtual teams and the need for more sophisticated communication technologies, Dennis, Fuller, and Valacich (2008) proposed the media synchronicity theory, and Watson-Mannheim and Belanger (2007) proposed the use of media repertoires.

Era 3 (2010-2020): Routinization of IT-supported Collaboration

As we stepped into the third era, we found that IT-supported collaboration was no longer seen as a novelty, but had instead become a routine part of organizational life. Given that most if not all teams at this point were likely to have a virtual component, studies that compared face-to-face teams with virtual teams were no longer in evidence. The limited set of studies in this era investigate the use of a combination of emergent, innovative technologies, with social nuances, for collaborative effectiveness. Srivastava and Chandra (2018), for example, examined how virtual worlds can be reliably used in workplace collaboration, while Harrison and Windeler (2020) examined collaboration using virtual worlds to highlight the importance of anonymity and communication framing in contexts where team members do not share aligned agendas. Saunders, Rutkowski, van Genuchten, Vogel, and Orrego, (2017) proposed and tested a theory of virtual space and place. Curtis, Dennis, and McNamara (2017) examined the differences in using a simple text chat tool versus a combination of text chat and whiteboard in collaborative effectiveness and found mindfulness to increase in the latter condition. Thomas and Bostrom

(2010) studied how team leaders in virtual teams can better use technology adaptation techniques, while Bartelt and Dennis (2014) examined how social structures that develop around the use of different communication tools can play an important role in influencing team performance.

3. Themes

Across the three eras discussed earlier, the IT-enabled collaboration research has examined three primary themes: 1) Technology (IT) as the enabler of collaboration, 2) Group's production function, and 3) Group and member well-being.

Technology (IT) as the Enabler of Collaboration

Technology plays an integral role in the IT-mediated collaboration, and is of significant interest to IS researchers. Studies related to this theme focused on the features of the collaboration technology itself that can help in making such collaboration more effective and efficient. The initial assumption was that the technology can address many of the challenges of face-to-face teams, and therefore can serve as an enabler (e.g., Grohowski et al. 1990; Tyran et al. 1992). Jessup, Connolly, and Galeghar (1990) found anonymity to be very effective in increasing member contribution. Zigurs and Kozar (1994) developed a theoretical model of roles in computer-supported meetings and proposed that technology can fill many important member roles in a group environment. Burke and Chidambaram (1999) drew on bandwidth theories to examine whether richer media result in better performance of such teams.

One of the striking patterns is the change in technology over time. In the first era, commercially available collaboration technology primarily came out of universities. The technology was broad and deep and provided hundreds of nuanced features to support a multitude of different ways of working together that required an experienced facilitator with extensive training to operate properly (e.g., Dennis, et al, 1988; Dickson, et al., 1993; Grohowski, et al., 1990; Turoff, et al., 1993; Tyran, et al., 1992). Today, many technology companies offer collaboration technology that can be used without a trained facilitator, and the dominant commercial tools are text messaging, white boards, shared word processing, and video conferencing (e.g., Curtis, et al., 2017). The simple has driven out the complex.

Studies within this theme also increasingly questioned the universality of technology as the enabler. Bartlett and Dennis (2014) emphasize the importance of fit with the technology that the group uses and suggest that it is the automatic enactment of genre rules for a communication tool that can have as powerful an effect as the actual tool itself. Watson-Manheim and Belanger (2007) proposed the idea of media repertoires as opposed to a single media as the effective technology in such collaboration. Dennis et al. (2008) suggested that the "ability of media to support synchronicity" can help in ensuring better performance in such contexts. Griffith et al. (2003) and O'Leary and Cummings (2007) drew attention to the multidimensionality of dispersion and the technologies that help overcome spatial, temporal, and organizational dispersion of IT-enabled teams and members.

Group's Production Function

The group's production function refers to the group's work accomplishment with a focus toward tangible outcomes. Studies within this theme focused on understanding whether providing IT-support to groups improved their efficiency and effectiveness compared to working face-to-face without technology support. Specifically, questions addressed include: can IT-supported groups produce higher and better quality ideas (e.g., Jessup et al. 1990), can they lead to better quality decisions (e.g., Gallupe, DeSanctis, and Dickson 1988; Turoff et al. 1993), can influence each other (e.g., Ziguers, Poole, and DeSanctis 1988) and can reach consensus faster (e.g., Dickson et al. 1993). Specifically, Gallupe et al. 1988 found that decision quality was significantly better in those groups that received technology support, especially when the task was more difficult. Ziguers et al. (1988) concluded that there were "no significant difference between the overall amount of influence behavior attempted in computer-supported versus unsupported groups, although significant differences were found in the pattern of influence behaviors." Jarvenpaa, Rao, and Huber (1988) found more thorough information exchange and better quality of team performance in IT-mediated teams. Alavi (1994) examined collaborative learning and concluded that IT-supported collaborative learning led to more effective classroom experiences and skill development.

One of the persistent production function challenges in team collaboration—with or without technology—is the common knowledge problem, where team members fail to share information they have and fail to pay attention to information they receive from others and instead focus only on a small subset of common information known to everyone, which leads to poor decisions (Dennis, 1996). This problem was studied in the first era and still remains an issue today (Curtis, et al., 2017; Dennis, et al, 1996).

Studies within this theme also examined the role of other support functions that can help an IT-mediated group to be efficient. For example, Dickson, Partridge, and Robinson (1993) examined the role of facilitators and found that when faced with a "judgment task," IT-enabled groups were more effective with adaptive facilitation. Niederman et al. (1996) found, that given the complexities of these technologies, the experience of the facilitators made a significant impact in such collaboration.

Group and Member Well-being

Group well-being refers to a focus toward moving the group into an effective social unit. Studies within this theme focused on understanding how to increase the satisfaction of the group members (e.g., Jarvenpaa et al. 1988; Niederman et al. 1996) such that the collaboration can be sustained for a long time. Studies also examined how the challenges of cultural differences can be overcome to develop shared frame of reference within the group members, risk management, and participation of all members so multiple voices are heard. For example, Levina and Vaast (2008) examined how IT-mediated distributed team members can rise above the challenges posed by intra-team status differences and boundaries to build effective relationships. Dennis and Garfield (2003) studied six medical project teams and found that participation was more egalitarian and processes were more democratic in IT-enabled teams.

Formation of relational capital, group sensemaking, trust amongst members, and emergence of leaders were also increasingly seen as topics of interest. For example, Vlaar et al. (2008) studied the acts of sensegiving, sensedemanding, and sensebreaking and found that these acts of sense-making allowed IT-enabled group members “to jointly explore and generate value” as well as experience more satisfaction with the engagement. Dennis and Garfield (2003) found that leaders often abdicated their privileged positions in IT-enabled teams, resulting in more voices.

Conclusion

After a rather productive period of research on IT-supported teams spanning three eras (as described above), we now see a gradual tapering down of research in the area. This is to be expected as IT-supported teams or “hybrid” teams (that are engaged in face-to-face as well as IT-supported communication and collaboration) are now as commonplace as traditional face-to-face teams were when the first papers on the IT-supported teams started to appear.

The three decades of research on IT-supported group collaboration has spawned research in new areas such as online/virtual communities, virtual worlds, computer-supported negotiation, open source software, and offshoring that are related to and draw upon the theoretical and empirical findings from the research on IT-supported collaboration. Despite the advances in knowledge through the three eras of research, there will still be a need to continue to investigate, in the context of new technologies and human conditions, how different technological and social factors can help groups collaborate more effectively and efficiently, while achieving a high level of well-being. This curation provides a foundation for this work.

Please cite this curation as follows: Ahuja, M., Dennis, A., Sarker, S., Sarker, S. “IT-supported Collaboration,” in *MIS Quarterly Research Curations*, Ashley Bush and Arun Rai, Eds., <http://misq.org/research-curations>, December 9, 2020.

References

1. Alavi, M. 1994. "Computer-Mediate Collaborative Learning: An Empirical Evaluation," *MIS Quarterly* (18:2), pp. 159-174 (doi: 10.2307/249763).
2. Bartelt, V. L., and Dennis, A. R. 2014. "Nature and Nurture: The Impact of Automaticity and the Structuration of Communication on Virtual Team Behavior and Performance," *MIS Quarterly* (38:2), pp.521-538 (doi: 10.25300/MISQ/2014/38.2.09).
3. Burke, K., and Chidambaram, L. 1999. "How Much Bandwidth Is Enough? A Longitudinal Examination of Media Characteristics and Group Outcomes," *MIS Quarterly* (23:4), pp. 557–579 (doi: 10.2307/249489).
4. Chidambaram, L., and Jones, B. 1993. "Impact of Communication Medium and Computer Support on Group Perceptions and Performance: A Comparison of Face-to-Face and Dispersed Meetings," *MIS Quarterly* (17:4), pp. 465-491 (doi: 10.2307/249588).
5. Curtis, A.M., Dennis, A.R., and McNamara, K.O. 2017. "From Monologue to Dialogue: Using Performative Objects to Promote Collective Mindfulness in Computer-mediated

- Team Discussions," *MIS Quarterly* (41:2), pp. 559-581 (doi: 10.25300/MISQ/2017/41.2.1).
6. Dennis, A. 1996. "Information Exchange and Use in Group Decision Making: You Can Lead a Group to Information, but You Can't Make It Think," *MIS Quarterly* (20:4), pp. 433- 457 (doi: 10.2307/249563).
 7. Dennis, A. R., and Garfield, M. J. 2003. "The Adoption and Use of GSS in Project Teams: Toward More Participative Processes and Outcomes," *MIS Quarterly* (27:2), pp. 289–323 (doi: 10.2307/30036532).
 8. Dennis, A. R., Fuller, R. M., and Valacich, J. S. 2008. "Media, Tasks, and Communication Processes: A Theory of Media Synchronicity," *MIS Quarterly* (32:3), pp.575-600 (doi: 10.2307/25148857).
 9. Dennis, A. R., Wixom, B.H., and Vandenberg, R. J. 2001. "Understanding Fit and Appropriation Effects in Group Support Systems via Meta-Analysis," *MIS Quarterly* (25:2), pp. 167-197 (doi: 10.2307/3250928).
 10. Dennis, A., George, J, Jessup, L. M., Nunamaker, Jr., J. F., and Vogel, D. R. 1988. "Information Technology to Support Electronic Meetings," *MIS Quarterly* (12:4), pp. 591-624 (doi: 10.2307/249135).
 11. Dennis, A.R., Aronson, J.E., Heninger, W.G., and Walker II, E. 1999. "Structuring Time and Task in Electronic Brainstorming," *MIS Quarterly* (23:1), pp. 95-108 (doi: 10.2307/249411).
 12. Dickson, G., Partridge, J. E., and Robinson, L. 1993. "Exploring Modes of Facilitative Support for GDSS Technology," *MIS Quarterly* (17: 2), pp. 173-194 (doi: 10.2307/249800).
 13. Gallupe, R. B., DeSanctis, G., & Dickson, G. W. 1988. "Computer-based support for group problem-finding: An experimental investigation," *MIS quarterly* (12:2), pp. 277-296 (doi.org/10.2307/248853).
 14. Griffith, T. L., Sawyer, J. E., and Neale, M. A. 2003. "Virtualness and Knowledge in Teams: Managing the Love Triangle of Organizations, Individuals, and Information Technology," *MIS Quarterly* (27:2), pp. 265–287 (doi: 10.2307/30036531).
 15. Grohowski, R. , McGoff, C., Vogel, D., Martz, B., and Nunamaker, J. 1990. "Implementing Electronic Meeting Systems at IBM: Lessons Learned and Success Factors," *MIS Quarterly* (14:4), pp. 369-383 (doi: 10.2307/249785).
 16. Iversen, J. H., Mathiassen, L., and Nielsen, P. A. 2004. "Managing Risk in Software Process Improvement: An Action Research Approach," *MIS Quarterly* (28:3), pp. 395–433 (doi: 10.2307/25148645).
 17. Jarvenpaa, S., Rao, V., and Huber, G. 1988. "Computer Support for Meetings of Groups Working on Unstructured Problems: A Field Experiment," *MIS Quarterly* (12:4), pp. 645-666 (doi: 10.2307/249137).

18. Jessup, L., Connolly, T., and Galegher, J. 1990. "The Effects of Anonymity on GDSS Group Process with an Idea-Generating Task," *MIS Quarterly* (14:3), pp. 313-321 (doi: 10.2307/248893).
19. Kanawattanachai, P. and Yoo, Y. 2007. "Impact of Knowledge Coordination on Virtual Team Performance Over Time," *MIS Quarterly* (31:4), pp. 783-808 (doi: 10.2307/25148820).
20. Levina, N., and Vaast, E. 2008. "Innovating or Doing as Told? Status Differences and Overlapping Boundaries in Offshore Collaboration," *MIS Quarterly* (32:2), pp.307-332 (doi: 10.2307/25148842).
21. Liang, T. P. 1988. "Model Management for Group Decision Support," *MIS Quarterly* (12:4), pp. 667-680 (doi: 10.2307/249138).
22. Majchrzak, A., Beath, C. M., Lim, R., and Chin, W. W. 2005. "Managing Client Dialogues during Information Systems Design to Facilitate Client Learning," *MIS Quarterly* (29:4), pp. 653-2672 (doi: 10.2307/25148704).
23. Majchrzak, A., Rice, R. E., Malhotra, A., King, N., and Ba, S. 2000. "Technology Adaptation: The Case of a Computer-Supported Inter-Organizational Virtual Team," *MIS Quarterly* (24:4), pp. 569-600 (doi: 10.2307/3250948).
24. Malhotra, A., Majchrzak, A., Carman, R., and Lott, V. 2001. "Radical Innovation without Collocation: A Case Study at Boeing-Rocketdyne," *MIS Quarterly* (25:2), pp. 229-249 (doi: 10.2307/3250930).
25. Neiderman, F., Beise, C., and Beranek, P. 1996. "Issues and Concerns About Computer-Supported Meetings: The Facilitator's Perspective," *MIS Quarterly* (20:1), pp. 1-22 (doi: 10.2307/249540).
26. O'Leary, M. B., and Cummings, J. N. 2007. "The Spatial, Temporal, and Configurational Characteristics of Geographic Dispersion in Teams," *MIS Quarterly* (31:3), pp. 433-452 (doi: 10.2307/25148802).
27. Piccoli, G., and Ives, B. 2003. "Trust and the Unintended Effects of Behavior Control in Virtual Teams," *MIS Quarterly* (27:3), pp. 365-395 (doi: 10.2307/30036538).
28. Ramasubbu, N., Mithas, S., and Kemerer, C. F. 2008. "Work Dispersion, Process-Based Learning, and Offshore Software Development Performance," *MIS Quarterly* (32:2), pp.437-458 (doi: 10.2307/25148847).
29. Saunders, C., Rutkowski, A. F., van Genuchten, M., Vogel, D. R., and Orrego, J. M. 2011. "Virtual Space and Place: Theory and Test," *MIS Quarterly* (35:4), pp.1079-1098 (doi: 10.2307/41409974)
30. Sengupta, K., and Te'eni, D. 1993. "Cognitive Feedback in GDSS: Improving Control and Convergence," *MIS Quarterly* (17:1), pp. 87-113 (doi: 10.2307/249511).

31. Srivastava, S. C., and Chandra, S. 2018. "Social Presence in Virtual World Collaboration: An Uncertainty Reduction Perspective Using a Mixed Methods Approach," *MIS Quarterly* (42:3), pp.779-803 (doi: 10.25300/MISQ/2018/11914).
32. Thomas, D., and Bostrom, R. P. 2010. "Vital Signs for Virtual Teams: An Empirically Developed Trigger Model for Technology Adaptation Interventions," *MIS Quarterly* (34:1), pp.115-142 (doi: 10.2307/20721417).
33. Turoff, M., Hiltz, S. R., Bahgat, A. N. F., and Rana, A. R. 1993. "Distributed Group Support Systems," *MIS Quarterly* (17:4), pp. 399-417 (doi: 10.2307/249585).
34. Tyran, C., Dennis, A., Vogel, D., and Nunamaker, J. 1992. "The Application of Electronic Meeting Technology to Support Strategic Management," *MIS Quarterly* (16:3), pp. 313-334 (doi: 10.2307/249531).
35. Vlaar, P. W. L., van Fenema, P. C., and Tiwari, V. 2008. "Cocreating Understanding and Value in Distributed Work: How Members of Onsite and Offshore Vendor Teams Give, Make, Demand, and Break Sense," *MIS Quarterly* (32:2), pp.227-255 (doi: 10.2307/25148839).
36. Watson-Manheim, M. B. and Bélanger, F. 2007. "Communication Media Repertoires: Dealing with the Multiplicity of Media Choices," *MIS Quarterly* (31:2), pp. 267-293 (doi: 10.2307/25148791).
37. Ziggers, I., and Kozar, K. 1994. "An Exploratory Study of Roles in Computer-Supported Groups," *MIS Quarterly* (18:3), pp. 277-297 (doi: 10.2307/249619).
38. Ziggers, I.; Poole, M., and DeSanctis, G. 1988. "A Study of Influence in Computer-Mediated Group Decision Making," *MIS Quarterly* (12:4), pp. 625-644 (doi: 10.2307/249136).