



Management Focus

Learning in Online Forums

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Information and communication technologies afford different levels and types of support for learning networks. We draw on our studies of video-conferenced classrooms, group discussion spaces, and online communities to suggest a framework for understanding how learning networks can benefit from various e-learning venues. We show how the design of computer-mediated environments influence the kinds of learning processes that are likely to unfold as business professionals interact with one another across time and space barriers. The extent to which participants experience these types of learning depends upon how the electronic environments are structured and, more importantly, on how participants manage their interaction processes. Though all venues provide access to distributed social resources, some settings are more effective than others in addressing the specific learning needs of knowledge workers.

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In ancient times, learning networks occurred within one's immediate family, community, and tribe. Today our learning networks are more tentative and diffuse. We join schools, places of work, and extended families that are diverse, distributed, and without the strong, longstanding ties characteristic of traditional learning networks. Often the groups we join interact via technology; participants may be mere acquaintances, or even strangers. In matters as vital as learning one's profession, upgrading new skills, or making sense of information in everyday life, we find ourselves a part of many networks that are, in essence, new organizational forms — not the tried and true settings of yesteryear.

Learning networks provide opportunities for seeking and providing information, for forming relationships

among participants, and for creating shared mind-sets. As learning networks span the globe, become culturally diverse, and operate across traditional time and space boundaries, many questions arise regarding their feasibility and effectiveness. Can people share information, form strong working relationships, and develop insight and understanding when their interaction occurs primarily via electronic media? Can e-based learning networks be built to last, or are they destined to be short-lived and based on loose ties? Do different e-based venues spawn different forms of learning, or is the propensity for group learning similar across various electronic forums?¹

This paper has two goals: first, to suggest a framework for understanding how e-based venues influence the learning process for participants; and, second, to consider how participants, in turn, successfully interact in these venues to form effective learning networks. Each technology venue affords somewhat different possibilities for learning; and different kinds of learning networks emerge depending on how participants interact with one another within the venue.

Technology-mediated Venues for Learning

Relative to traditional venues for group learning, technology-mediated forums offer potential advantages and disadvantages. For example, on the upside, we know that e-based venues afford the participation of a larger and more diverse set of people than traditional non-technology venues. People from multiple time zones and organizations can join distributed classrooms, group discussion spaces, and online communities. Increases in the size and diversity of

the learning network afford a larger and more diverse set of information resources, and enhanced opportunity for information sharing and idea generation. These, in turn, should improve learning effectiveness and promote a more robust network (Guzzo and Dickson, 1996; Hiltz, 1994). On the downside, however, computer-mediated communication can reduce overall communication within a social network (Hollingshead and McGrath, 1995; Sarbaugh-Thompson and Feldman, 1998; Straus, 1997), which may hamper network survival and growth. If participants lack dissimilar backgrounds, common attributes, and a history of interaction, knowledge transfer may become more difficult (Marshall and Novick, 1995; Ko *et al.*, 2003). The interruptions and lags associated with asynchronous communication can disrupt conversational routines and potentially hinder tacit learning, which relies on deep and subtle information exchange. Finally, lack of face-to-face contact among participants can reduce group identity and make relational ties more fragile (Shapiro *et al.*, 2002).

Given both positive and negative impacts, how can we anticipate the effects of e-mediated venues on group learning? As a start, we can compare venues in light of their relative *affordances* for learning (Gaver, 1993; Gibson, 1977, 1979).

Technology Affordances: Three e-Based Venues

Figure 1 identifies important dimensions that can be used to compare e-based learning venues, along with their corresponding implications for group communication and learning. We consider only three venues, but our general analytic approach can be

applied to other learning venues, or to different implementations of these three venues. Our approach is built on media richness theory (Daft and Lengel, 1986), which stresses the importance of high information-carrying capacity in media for tasks with high equivocality (i.e., uncertainty in the meaning of the message); social presence theory (Short *et al.*, 1976), which emphasizes the need for high salience of others’ presence in tasks that are highly interpersonally involving; and language game theory (Wittgenstein, 1974), which emphasizes the cognitive process of building shared mental models through dynamic, patterned discourse with others. E-venues can be compared based on their likelihood to promote open (public) versus closed (private) participation, their likelihood of creating a sense of co-presence (immediate versus diffused), and their likelihood of promoting conversation with meaningful structural routine such that members can share a cognitive mindset with others when they join and interact from afar.

1. *Video-conferenced Classrooms* extend the place-dependent face-to-face classroom so that two or more otherwise unconnected social networks can be joined together. The technology provides a bridge for linking face-to-face groups, and there is the hope that the disparate locales can think and act as one. (We assume here that participants are in physical classrooms, such as at a college or university, and not in a virtual setting, such as where participants attend from home.) The technology includes audio connections, video connections, and computerized connections (e.g., shared whiteboards and projection systems). If these operate during times of informal interaction, not just dur-

Technology Affordances	Impacts on Group Communication	Learning	
		Type	Dynamics in online venues
<p><i>Participation:</i> Open (public – anyone can join the venue) versus closed (private – participation in the venue is limited)</p>	<p><i>Open</i> communication enables a larger and more diverse learning network; the presence of many strangers promotes weak ties. The individual feels more anonymous and less in the limelight of public scrutiny. <i>Closed</i> communication enables a smaller and more homogeneous learning network; participants are more likely to become acquaintances or friends, rather than strangers, promoting stronger network ties. The individual feels more a part of the group and also more scrutinized for his or her actions.</p>	<p><i>Declarative & procedural information exchange</i></p>	<p>Opportunities to exchange declarative and procedural knowledge expand as the learning network becomes more open. Alternatively, as the network becomes more limited, opportunities to meet the unique information needs of participants decline. The more open the forum, the more likely information exchange is to remain transactional, with a focus on explicit knowledge, rather than deep with a focus on tacit knowledge.</p>
<p><i>Co-presence:</i> Immediate versus diffused</p>	<p>Synchronous communication creates a sense of <i>immediacy</i> in the social occasion. The gathering has defined boundaries (start and finish). There is high awareness of others and one’s impact on others. Asynchronous communication, especially across many time zones, <i>diffuses</i> the social occasion. The boundaries of the gathering are not well defined; one’s impact on others is less acute.</p>	<p><i>Transactive learning</i></p>	<p>The greater the sense of co-presence in the venue, the more likely participants are to form mutual identity and trust. When co-presence is more immediate, participants attend to the person with whom they are communicating and their place in the overall group—not only to the information being exchanged. Alternatively, as co-presence declines, participants attend less to creating a sense of “us,” and transactive learning becomes more difficult.</p>
<p><i>Conversational structuring:</i> Structured versus free flowing</p>	<p>If the topics and flow of conversation are <i>structured</i> (e.g., via a human facilitator or computer-based devices that encourage focused discussion, challenge, analysis, reflection, etc.), then sense making is more likely. If communication is <i>free flowing</i>, then penetrating analyses and challenge are less likely to occur, unless the group is an already-established community of practice.</p>	<p><i>Sense making</i></p>	<p>Shared mental models emerge through rich dialogue that includes interpretation, evaluation, challenge, reflection, and story telling. Subtle meanings and ways of thinking convey tacit knowledge. Venues that support narration, cognition, and processes for building shared understanding are more likely to promote sense making. Richer media and conversational aids should be superior to leaner media or venues with no facilitation of the group dialogue.</p>

Figure 1 Technology Affordances and their Implications for Learning in e-Venues

ing designated meetings, the effect is to create a common 'media space' for group interaction (Bly *et al.*, 1993). Relative to the other venues, video-conferenced classrooms offer privacy (one has to be invited into the room and cannot 'drop in' without an invitation) and a high sense of co-presence (the gathering has defined boundaries, and participants can see and hear one another in 'live' mode). An instructor or other leader encourages a structured dialogue among parties across the multiple venues so that there is turn-taking, attention to speakers, and a discussion chain that is sufficiently organized and meaningful such that people can contribute and learn.

2. *Group Discussion Spaces* offer a venue for a working group, such as a project team, consulting team, or student learning team. The discussion space may include places to store group documents and track team progress; often the group can customize the design of the space to meet their particular needs or preferences. A key feature of group discussion spaces is their use by pre-established groups, so access is private (not public). In our experience, these venues are used to supplement other learning venues for the group, such as face-to-face meetings and e-mail, and they are better suited for reinforcing existing social networks than for establishing new ones. The venues can be used for synchronous chats but are more frequently used for asynchronous interaction, especially if group members are highly mobile or living in distant locations. The diffused learning environment results in what Goffman (1963) calls a 'multi-focused gathering' (as opposed to the fully-focused gathering found in traditional meetings or classrooms). Group members are likely to spend much of their communication signaling one other, seeking feedback, and checking for the reactions of others. Issues of social identity and trust come to the fore, and learning is heavily relational, as opposed to cognitive.
3. *Online Communities* are open, Internet-based forums that anyone can join to discuss topics of mutual interest. Not all online communities are dedicated to learning; for example, some exist for entertainment and others to produce software products (e.g., Linux). Our concern is with learning-oriented communities, such as those that discuss business topics, political interests, or medical matters. These online communities are akin to voluntary associations that provide a common venue for interaction among professionals from a wide set of organizations (Aldrich, 1999). Successful communities are longstanding; people visit repeatedly, and participants form a sense of mutual identity. Whereas video-conferencing bridges learning networks, and group discussion spaces supplement pre-existing networks, online communities are used to create entirely new social networks. Communication is via lean, text-based media. The

environment is virtual in the sense that communication boundaries are diffused over time and space, participants are strangers who rarely meet face-to-face (if at all), and the forum can be readily created and destroyed (deleted). The group structure in online communities is fluid and fragile.

Implications for Learning

The three e-based venues progressively decrease in their media richness and sense of co-presence, as they become more public, diffused, and less structured. So, we would expect learning to become more challenging as one moves from venue (1) to (3). The venues differ in their affordances for three general types of group learning: declarative and procedural information exchange, transactive learning, and sense-making.² These are learning processes, embedded in communication, as opposed to specific accomplishments or goals. They reflect increasingly sophisticated forms of interaction as a function of the kinds of knowledge the group is sharing.

Declarative and Procedural Information Exchange occurs when people seek and provide relatively objective or factual knowledge with one another. Declarative knowledge is a discussion of fact (what); and procedural knowledge is a discussion of method (how). The two often occur together as a process of knowledge swapping. The exchange is equity governed such that people provide knowledge to others in return for receiving knowledge. For example, a participant might ask, 'Where can I find a good reference for statistical modeling?' or 'What companies offer data mining tools suitable for use by multi-language operators?' or 'I'd like to do a Balanced Scorecard assessment for my company. Any suggestions on how to get started?' Respondents might offer references, lists, guidelines, opinions, and so on. The specifics of the information being discussed may be complex, but the discussion is not because it lacks challenge, interpretation, debate, or other forms of complex conversation. Declarative and procedural information exchange is a relatively rudimentary process of knowledge sharing that is well suited to e-based venues. The exchange can be between two parties in the group or hundreds. Large volumes of knowledge exchange are possible, and transactions can occur rapidly. In fact, the larger and more open or public the venue, the greater the possibilities for participants to find the information they need in the resource pool of participants, and the wider the range or frequency of questions people are likely to ask. The focus tends to be more on the knowledge itself than on the relationship between the parties who are seeking or providing the knowledge.

Transactive Learning is the process of sharing information about the capabilities and boundaries of knowledge that exist among members of a group (Wegner, 1986). Transactive learning is an investment

in the 'groupness' of the collective as members identify their expertise (e.g., 'Shawn has worked for a software firm and can probably help you out with that problem'), recount their successes and failures ('I worked all night to develop an implementation plan, but I am really stuck at this point'), acknowledge each other's abilities (e.g., 'Jacques can sift through 100 balance sheets and quickly find the ones with errors'), etc. Through queries and replies about 'who knows' or 'where to find,' group members discover the frontiers and limits of their learning network (Moreland *et al.*, 1998). Some transactive knowledge is shared in the process of declarative and procedural information exchange. But, whereas learning in the former case tends to be equity governed, transactive knowledge is decidedly relational and incorporates information about the persons who are interacting not just the information itself. In this way, transactive learning is more challenging. A sense of co-presence, or immediacy in the social occasion, should facilitate transactive learning. If the gathering has defined boundaries, such as a definable start and finish and/or a fixed set of group members, exchange of transactive knowledge is easier than if the social gathering is diffused.

Sense-making is the process of developing shared mental models that enable a group to coordinate its efforts, respond to novel events, absorb information, and detect and reduce errors (Weick, 1995). Sense-making occurs through dense dialogue that includes information interpretation, providing of opinion, trying out new ideas, and reflecting on results of individual and group actions. It also may include story telling or narratives that convey nuances in the meaning of knowledge. Whereas the other types of learning focus more on explicit knowledge, sense-making emphasizes tacit knowledge. When a group engages in sense-making, a common view of the world is interactively produced, challenged, and reproduced over time. The group is able to absorb new knowledge, to change, and avoid becoming insular (Goodwin and Heritage, 1990). Sense-making contributes to the formation of a community of practice (Wenger, 1998). Sense-making is difficult to experience in any venue, but it is especially difficult when dialogue is scattered or disjointed. E-based venues that emulate face-to-face meetings, such as video-conferenced classrooms, are more likely to foster sense-making than asynchronous or text-based venues, since, in the former, dialogue can be rich and rapid, and non-verbal cues are available. Group discussion leaders can facilitate sense-making via conversational structuring or use of technological devices, such as topic organizers, voting tools, or brainstorming modules that organize the discourse. As venues become more open, diffused, and free-flowing, conversation management becomes more difficult.

Figure 2 presents a comparison of the three e-based venues for their relative potential to promote collab-

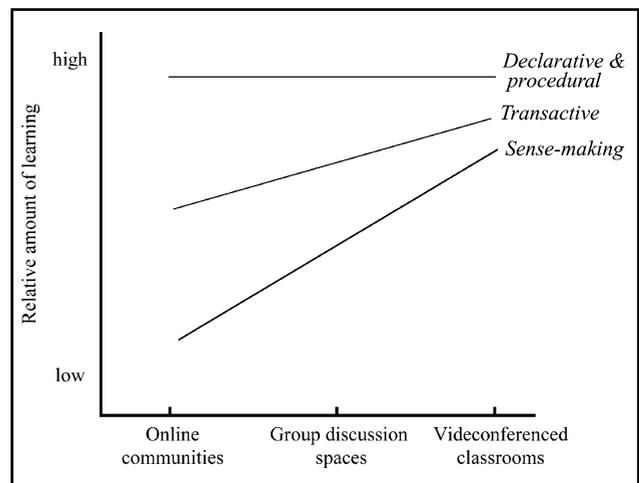


Figure 2 Anticipated Levels of Learning in Three e-Mediated Venues

orative learning. Venues that offer open participation are most likely to foster information exchange. Those that offer the greatest co-presence are most likely to support transactive learning, and those that offer effective conversational structuring are most likely to promote sense-making. The three kinds of learning are cumulative, so we would expect sense-making to be most readily achieved in video-conferenced classrooms venues and most difficult to achieve in online communities. Video-conferenced classrooms, group discussion spaces and online communities are progressively more challenging venues for promoting group learning.

Research Findings

As noted earlier, technology affordances do not fully determine communication patterns. Learning is emergent, and groups can produce complex communication even in lean media environments (Abel, 1990; Lea and Spears, 1991; Markus, 1994; Carlson and Zmud, 1999). In our research, we have attempted to document group struggles and successes in realizing the learning benefits of various e-based venues. Our case studies illustrate how groups can successfully leverage the technological affordances of e-based venues to yield rich learning experiences. The results provide lessons in how the downsides of e-based venues can be overcome by groups to yield learning that spans the three levels shown in Figures 1 and 2.

Video-conferenced Classrooms

We studied video-conferenced classrooms linking students enrolled in courses at INSEAD campuses located in Fontainebleau, France and Singapore. The two facilities were designed to operate as a common media space (Bly *et al.*, 1993) such that when students

stepped into the room in their local facility there was the sense of being in a shared facility with the other campus. Participants could see, hear, and interactively read and write with people in the other venue. The shared venue was relatively small (15–25 students across the two sites), team-based, and heavily interactive. Students in the courses were full-time MBA students with 5–6 years of prior work experience and differing cultural and language backgrounds. Prior to participating in the video-conferenced courses, some of the students had met each other face-to-face, but most had not. Further, many of the participants had never been to the other geographic location, so they had no prior sense of a common social network other than the fact that they were all a part of the INSEAD organization. The learning network challenge was to build relationships within and between the two locations. In addition, there was the hope that the video-based learning experience would contribute to the larger institutional goal of developing a common community across two campuses.

Figure 3 summarizes key observations from this research. The observations are based on analyses of video-recordings of class sessions (including informal time before and after class sessions and during breaks), interviews with participants, and live participant observation. (More detailed reporting of the results is provided in Fayard, 2002).

Case Example Participation in the video-conferenced course was voluntary; the course was elective (rather than required). The course was heavily project-oriented and aimed to achieve experiential learning. Students worked in teams with members drawn from the two campuses. For the case described here, there was one faculty at each site, 10 students in Singapore and 14 in Fountainebleau. There were eight class sessions of three hours, each with a 15-minute break in the middle, over a period of two months. In addition

to classes, group work sessions of 1–1.5 hours also were held in the video-conferencing facility and recorded. Each video-conferencing facility included an electronic white board, visible at both sites, video cameras, and a TV monitor. Tables at each site were connected at their ends via the video, resulting in one long virtual table.

A key challenge in video-conferenced meetings, as in any e-venue, is establishing a sufficient physical and linguistic co-presence so that participants can begin to experience a shared social context — a sense of ‘us’ rather than ‘you’ versus ‘me,’ and a sense of all of us being ‘here’ rather than some ‘here’ and others ‘there.’ A common social context helps groups to make inferences about one another’s knowledge and engage in learning (Cook and Brown, 1999). Further, there is the matter of using the course experience to develop a common context for the institution as a whole. Several approaches proved important to promoting a common social context in this video-conferenced course.

First, one student at each site was appointed as ‘host’ to help involve participants in the discussion; the host was asked to organize the technology for the session, guarantee that nobody talked off camera, monitor the picture, etc. The host was considered a crucial role because instructors were not able to manage the technical details while leading the class discussion. However, we found that the appointed hosts soon gave way to emergent facilitators who were much more effective in mediating the group interaction than the appointed hosts. Our emergent student facilitators understood the technology better than the others, were more aware of the constraints and limits introduced by it, and endeavored to enhance interaction by modifying the setting and supporting others’ behaviors. They also felt at ease among the particular set of people in the class and were respected by them. These facilitators, along with the

Learning discourse	<ul style="list-style-type: none"> • Declarative & procedural – communication of declarative knowledge during class lectures, with contributions by both the instructors and the students; much procedural knowledge concerned operation of technology in each venue and how to ease management of visual and audio communication across the two sites. • Transactive – much higher than anticipated; heavy investment of time in people getting to know one another, both within each (co-located) site and across the two (distributed) sites. Knowing one’s fellow students and the instructors seemed more important than in the usual (non e-based) classroom setting. • Sense-making – increased as the course progressed, after a comfort-level of communication had been established.
Challenges	<ul style="list-style-type: none"> • Although a common learning network was established, there were “two sides” to the network, i.e., there were stronger ties within each site than between the two sites. • Difficult to establish a sense of shared context across the two venues. The goal was for the entire class to be “here”, but “here” versus “there” was hard to overcome. • Difficult to manage turn taking and ensure a fluid conversation; especially difficult for participants to smoothly enter the conversation across sites. This improved with experience.
Successful strategies	<ul style="list-style-type: none"> • Both instructors spent some time at both sites. • Produced an informal video at each site that showed the facility, the surroundings, and an informal introduction of each class participant; this video was shown to participants at the opposing site. • Organized local events (e.g., dinners) to help establish the learning network. • Informal student facilitators emerged at each site who served as “translators” between the technology and the group; they served as effective hosts to assure a smooth meeting process, especially coordination of camera operation and conversation. • Used group discussion spaces (bulletin boards) to supplement video venue for teamwork meetings

Figure 3 Learning Experiences in Video-conferenced Classrooms

faculty leadership, provided governance of the distributed classroom.

Second, various social practices emerged that proved crucial to conversation management. For example, students designed a practice to encourage fair turn taking. It was hard to interrupt when persons at the other site were talking, and waving hands for attention was not effective for gaining airtime. Thus, when someone in Singapore wanted to comment on what someone in Fontainebleau was saying, the person in charge of the remote control — who was able to notice the subtle non-verbal behavior because they were co-located — focused the camera on the person who desired to speak. Over time, this became a convention for assuring that both 'sides' were involved in the conversation. These sorts of emergent social practices were critical to maintaining the viability of the e-based venue over time.

Third, a common social context was developed through informal conversation, joking, playing with the camera, and visual display of the environment across the two sites. A friendly and informal atmosphere developed with teasing exchanged across the two locales. The weather was a frequent topic of conversation, and students occasionally pointed the camera out of the window so that participants on the other continent could view their weather. Experimentation was also important. For example, during the second class session, one student in Singapore took a paper board into the classroom and placed it the screen. He drew the tables in Fontainebleau and wrote down the names of students he knew. A second student entered the room and did the same, followed by another who did the same. Students also tried out different locations for the camera for various meeting topics and purposes. Group members took on mutual responsibility for developing an effective classroom environment over time.

Declarative learning exchange largely gave way to procedural learning in this course; there was extensive discussion — especially early on — about processes for managing the equipment, conversation, and teamwork. Declarative learning exchange occurred largely during lectures, but procedural learning occurred on a more routine basis within and across the two sites. Even more dominant was transactive learning, which proved difficult and extremely time consuming for students as they invested in learning about each other's capabilities and ongoing progress in their projects. Investment in transactive learning was critical and difficult. Each team had to continually assess who knew what and determine their mutual capabilities. Most teams invested considerable time in developing and maintaining trust, deciding upon roles, monitoring progress, and making adjustments as needed. Teams that invested time in getting to know one another tended to develop more productive working relationships and were more satisfied with the course experience, in contrast

to teams that spent little time on transactive learning activities. As the course progressed, and especially in the project work, there were many occurrences of sense-making. Students extensively discussed the definition of the project — how they interpreted the problem, their goals and understanding about the final output, etc. Discussions were lively, with debates within and across the sites. Planned brainstorming sessions in which group members generated ideas without criticism seemed to facilitate movement toward sense-making. Idea generation was followed with idea interpretation, challenge, and gradual building of shared ideas for executing the project.

Group Discussion Spaces

We studied small group discussion spaces used by executive MBA student teams at Duke University. As part of a global MBA program, executives meet face-to-face at the start of each term, after which they return to their jobs — in Europe, Asia, and the Americas — and use Internet-based tools for five months of distance learning. The executives work in groups of four-to-six people and use the group discussion spaces for analysis of cases, drafting of reports, working on technical problems, and general coordination of team work activities. The MBA program emphasizes team-based learning, and executives are given many assignments to complete as a team. Further, team members are encouraged to rely on one another for individual learning, that is, to seek and provide help to one another as they progress through the coursework.

We studied 18 teams across two academic terms, for a total of 10 months of activity. During these 10 months the teams met face-to-face (for traditional classroom learning) for three weeks at the start of the MBA program and, again, for two weeks at the start of their second academic term (approximately half-way through the 10-month period). The teams had access to asynchronous group discussion spaces, synchronous chat, and audioconferencing tools, as well as email and file sharing. We report here on our analysis of learning-oriented discourse in the group discussion venue, which supports threaded conversations in a bulletin-board format. Due to time zone differences and travel schedules, most of the teams relied on this asynchronous group discussion space as their primary venue for interacting at a distance.

The learning network challenge for these teams as they used the group discussion space was to deepen relationships they initiated while face-to-face so that they could move past 'getting to know you' to the more challenging work of sense-making. Their work tasks were complex and required deep levels of learning, not just surface-level exchange of information. The teams had to be able to work effectively as a group, to maintain mutual identity and trust,

to engage in dense dialogue, to discuss competing interpretations of information, to generate creative ideas, and to identify and resolve conflicts. Further, their work schedules and family lives put immense pressure on participants to be able to work efficiently and to meet deadlines with a minimal number of set-backs.

We sampled six weeks of discourse (two weeks in each of the five-month terms) and coded all passages (i.e., meaningful statements) within the messages posted to the group discussion space. In all, 8076 passages were coded.³ As shown in Figure 4, declarative and procedural exchange were the dominant form of learning in the teams, followed by transactive learning and sense-making. This concurs with our expectations (Figure 2), in that declarative and procedural knowledge are the simplest forms of exchange that groups can undertake, followed by transactive learning. It is notable that there was nearly as much transactive learning as information exchange and, in turn, nearly as much sense-making as transactive learning. Perhaps more noteworthy are the differences across teams and the fact that variation across teams was lowest for transactive learning. (See the standard deviation values in Figure 4.) When we split the sample into the relatively-high versus relatively-low performing teams, we observed an interesting trend. (See Figure 5.) Compared to the lower-performing teams, the higher-performing teams engaged in slightly less declarative and procedural knowledge exchange, slightly more transactive knowledge exchange, and significantly more sense-making.⁴

Case Example Here we describe Team 62, one of the higher-performing executive MBA teams. The amount of declarative and procedural knowledge exchange in this team was slightly below average (15%); transactive knowledge exchange was average (16%), and sense-making was above average (18%). Four men and one woman composed the team; two lived in the United States, and the others lived in Brazil, Japan, and Indonesia. Their backgrounds included finance, accounting, and engineering; and

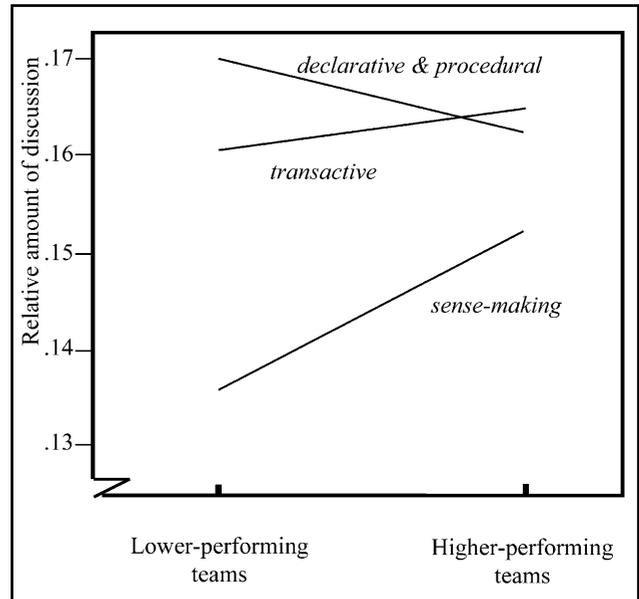


Figure 5 Three Types of Knowledge Exchange in a Group Discussion Space for Higher-versus-lower Performing Executive Student Teams

they were employed in the auto industry, telecommunications, engineering, consulting, and education. This degree of team diversity is typical in the global MBA program. Likewise typical, the members did not know one another prior to their enrollment in the MBA program.

The team started to use the group discussion space during the initial three-week period of their program in which they were co-located for classroom learning. They used the discussion space to post notes about team responsibilities, project progress, deadlines, and pointers to where specific files or other team information could be located. They also used the board to plan dinners (while co-located) and other team meetings. From the start, the message postings by this team tended to be brief (200 words or less) and presented in the form of itemized lists. Even in the case of detailed analysis of technical problems (such as discussion of how to do a sensitivity analysis for a

Discussion devoted to Learning ¹	Mean per team	St.Deviation	Total Passages	Percent of all Passages
Declarative & Procedural	79.4	48.3	1429	17.7%
Transactive	73.1	34.7	1315	16.3%
Sense-making	68.1	42.5	1226	15.2%

¹Analyses are based on a sample of six weeks (across 10 months) of message postings by 18 teams. In all, there were 2383 postings, yielding a total of 8076 passages for coding.

Figure 4 Summary of Learning Discourse in a Sample of Executive Student Teams

specific case), the messages were presented in cogent, step-by-step fashion. Communication was frequent, and members notified one another of their whereabouts, schedules, and progress on tasks. Their approach to using the group discussion space created a sense of co-presence; even members who were not actively working on a specific team task 'checked in' and made themselves visible and available to others. Two members who were coordinating on a sub-task used the bulletin board to post messages to one another so that others could monitor their progress and offer thoughts if interested. The tone of messages was uniformly positive and often closed with an invitation for others to disagree or post alternative/opposing ideas. As an example:

One Team suggestion: my understanding from the Support Group in Durham is we can really clog up our Board with attachments. I don't have a feeling when this is, but as Leader of the last project, I want to make sure we can still have an effective Board dialog....I would like to suggest any file over 50K be put on the FTP. Any comments or other ideas? Great work Team, as usual.

Although messages were polite and positive, members also were willing to challenge one another, admit failure, and actively promote continual improvement. For example:

Geez Kai! You get a virtual smack on the head for this one! :) I can't believe you threw out two weeks worth of work and re-did the whole thing! It is very nice though, BRAVO. I was working with Georgio yesterday (he was in NYC) and we were talking about time series in general and I went back and ran my data with the time series approach and then realized I had to break out the data like you did. However, I could never have gotten as far as you did. I do have a much better understanding now, but still need to make the leap into prediction. I got the playing with the data thing down....

Conversations were dense and often became very technical as the team struggled with analyzing problems and interpreting results:

When you deseasonalize or reseasonalize by dividing or multiplying by the seasonal factor, this means you're treating the seasonal relationship as multiplicative. For instance, reseasonalizing with a seasonal factor of 1.5 changes 100 to 150 and 200 to 300. The change is 50 in the first case and 100 in the second case. If you use the seasonal factor as an independent variable, this treats the relationship as additive in the sense that it will add or subtract a fixed amount from each forecast for a given season.

At the same time, the group did not get bogged down in a task. They consistently pushed to complete work and move on. They developed both routines of conversation (e.g., posting messages and replies at least five times per week...letting team members know if they would be unavailable and for how long, etc) and routines for managing their work tasks (e.g., setting deadlines, posting progress, conducting audio-conferenced meetings with planned agendas set in the group discussion space). They gave directions to

one another and accepted direction from one another. A high degree of mutual respect emerged on this team.

Overall, Team 62's success can be attributed to their regular use of the group discussion space, their development of organized and efficient routines for interaction, a tone of mutual respect and challenge in their discourse, and a willingness to modify routines over time. A structure emerged in their interaction. They used the group discussion space to manage the present, monitor progress, take time for sense-making, and plan for the future. Three members were more active than others in posting messages to the group discussion space, but everyone on the team was involved in the conversation on a regular basis. This group used the technology to build an effective learning network.

Online Communities

The online communities we studied differed from the other venues in that these were created by individuals or organizations as open spaces for discussion. In many cases the forums were hosted by Internet service providers, such as Yahoo.com. The participants generally were not members of the same school or other organization; they did not share a common work task or goal. They came together as strangers to discuss topics of mutual interest. The learning network challenge in such a venue is to form a meaningful learning network out of the scattered set of individuals who join the discussion. Our research interest was in identifying the attributes of the more enduring learning communities, to observe their dynamics, and to understand how they grew and learned.

We report here on our research on open online communities devoted to the topic of knowledge management. Contributors to these e-based venues include technical professionals, general managers, consultants, students, and researchers. The forums are readily suited to declarative and procedural information exchange, where people can seek and provide information without forming ongoing relationships. We expected these venues to include relatively simple question-and-answer discussions about software, systems design, and use of knowledge management systems. But we were curious as to whether, and how, some of these communities emerged to form more enduring learning networks that engaged in transactive learning and sense-making.

Our research included two phases. First, we compared 40 online communities using readily observable indicators. We discovered three dominant types of communities, which we summarize in Figure 6. Next, we examined discussions within these communities and tracked their development. Our field notes from one of the communities serves as the basis

		Type 1 ¹ (information kiosks)	Type 2 ¹ (associations)	Type 3 ¹ (communities of practice)
Structural attributes	Age ²	11.50	8.79	26.78
	Number of unique contributors ²	7.40	10.53	17.29
	Contributor retention ^{2,3}	.998	2.90	5.06
	Overlap with other communities ^{2,4}	.434	2.66	.925
	Size of core group ⁵	1.70	5.07	21.22
	Discussion moderator? ⁶	11%	58%	75%
	Affiliated with a real-world association or organization? ⁶	0%	50%	0%
	Geographical affiliation? ⁶	22%	8%	25%
Communication behaviors	Message production per contributor ²	1.36	2.34	2.54
	Word count per message ⁶	129.52	159.78	226.92
	Discussions per contributor ²	.63	1.03	1.03
	Replies per contributor ²	.73	1.31	1.50
	Discussion density ^{2,7}	0.03	0.06	0.11

¹Values shown are averages for the set of communities within each type. ²Based on average values per 30-day period. ³The number of contributors who posted to the community and then returned to post in the following period. ⁴The number of contributors in the community who also posted to other communities. ⁵The number of contributors who return to the community (over the life of the community) AND whose tenure (# of active periods) equals or exceeds the average contributor tenure in that community. ⁶Based on coding of a sample of messages early in the life of the community. ⁷For each discussion thread: Density = $(1 - (\# \text{ unique contributors} / \text{total messages})) * 100$. Density increases as contributors return to contribute to a given discussion.

Figure 6 Three Types of Online Communities

for our case example. We do not have direct measures of learning for these communities, but we can make inferences based on the general indicators and discussion field notes.

Type 1 communities have been in existence an average of 11.5 months. They have notably fewer unique contributors per month than other communities, a lower retention rate, and a small degree of overlap with other communities. A relatively small core group of people stays with the community throughout its life. Discussions in these communities generally are not moderated or organized by a leader. Fewer new discussion topics and replies are introduced by contributors each month in these communities, in comparison to the other two types of communities. However, as in the other communities, contributors are more likely to reply than start discussion, suggesting a willingness to provide answers or comments to message postings. Willingness to reply to queries suggests at least some minimal interactive learning-type of activity in the forum. Message production and word count are relatively low, and the discussion density tends to be low; people are not having extended conversations with one another so much as they are seeking and providing information. We call these Type 1 online communities 'information kiosks' because they appear to provide question-and-answer forums. The learning network in these kiosks is smaller, more isolated, and less productive than in the other types of communities. Nonetheless, the network holds together over time and has a small core group of people who regularly return to contribute to the discussion. Information kiosks would seem ideal for people who want to

drop in and out of a learning network in search of relatively efficient declarative and procedural knowledge exchange.

Type 2 communities, which we call 'associations,' are notably younger than the others and nearly half are affiliated with a (non-virtual) professional society, such as the International KM Institute or the Global Knowledge Economics Council. We speculate that the societies create online discussion forums as extensions of their real-world counterparts in order to create awareness and attract new members. In some cases contributors appear to know one another, or at least to know of one another, often via their presence in other KM communities. Contributor retention is higher than in the information kiosks, and the discussions are deeper and more productive (in terms of word count, density, and the number of replies relatively to discussions). Also, contributors tend to join other online communities (especially associations), in search of additional contacts and information sources. Type 2 learning networks — while vibrant — are more overlapping with other networks as participants seek out additional forums in which to gain knowledge. We speculate that participants in these types of online communities are especially interested in exchanging transactive knowledge as part of the process of building a professional social network.

Type 3 communities are the closest of the three types to what Wenger (1998) and others have termed, 'communities of practice.' Such communities are characterized by frequent, patterned social interaction. They produce high volumes of knowledge generated by

large numbers of participants in the network. Dense interactions help them build coherence and homogeneity and promote shared understandings and practices associated with sense-making. A core group of participants sustains the network, but the community is also able to absorb newcomers and grow over time. Communities of practice are not insular or isolated from other networks; there is some degree of overlap with other networks. Together, these attributes and behaviors result in learning networks that are able to sustain production of knowledge over time, share it efficiently, and facilitate innovation (Brown and Duguid, 1991; Lave and Wenger, 1991). Our case example is of one of these communities of practice.

Case Example We studied the KMF⁵ community between the period December 1999 (its founding date) and April 2001. The community was started with a clear and detailed welcome message in which the founder articulated the purpose, goals, and intended environment for this online forum:

The [KMF] is a learning community dedicated to building knowledge about public sector knowledge management. We aim to provide an environment where members can create and share knowledge about public sector knowledge management issues... Over the next twelve months the Chapter will pursue three themes: understanding how to implement knowledge solutions in a public sector environment; gaining a better understanding of the people aspects of knowledge management; raising the profile of knowledge management among senior public sector managers through education... Our ultimate aim is to be the pre-eminent source of public sector knowledge management knowledge.

The discussion then started with a series of postings of article titles and contents on the KM topic. Early on, a newcomer, Tim, proceeded to post excerpts of articles from books and other sources related to KM. At first, few people replied; then one participant engaged Tim in conversation about the content of one of his postings. Soon thereafter, Tim encouraged those visiting the site to introduce themselves and join the conversation: 'If we want to make this site as successful as it can be, then I am of the view that it would be reasonable if we shared some personal information: who am I, what do I do, what do I know, what can I be helpful with?' From thereon, the community grew rapidly, as people began to introduce themselves, provide comment on Tim's postings of article content, and pose queries and topics for discussion. The founder was not a high contributor to the forum, though he appeared on a regular basis to welcome newcomers, announce events, provide reference information, and to encourage the group in their discussion. The founder seemed to serve as a moderator/facilitator of the forum.

Early on, the conversations in this forum were not deep, but there was extensive knowledge seeking

and providing as people posted information about themselves, articles, events, and so on. People requested and provided opinions, but the threads of conversation were relatively short and lacked penetrating exploration or debate. This general pattern of declarative and procedural information exchange became a standard routine. Over time, however, the conversation grew beyond this form of learning to include deeper dialogue. By October of 2000, contributors were providing personalized responses that included detailed reflections and ideas. Most of the discussion concerned KM definitions, nuances, general issues and debates. At times the discussions were very general, almost philosophical, as contributors raised questions about the meaning of KM terms or how KM should be managed. At other times the discussions were highly focused, centering on document management, for example, or protection of intellectual property. Individuals described their own organizational experiences with KM, including triumphs and challenges. The conversations were not particularly technical (i.e., about computers or software). They were jargon-rich, but jargon was not the center of the discussion. In all, 130 people contributed to the discussion over the period we studied. Of these, 20 constituted a core group in the sense that they repeatedly contributed to the discussion and their tenure in the community was average or above.

Reviewing the contents of the KMF forum as a whole, we see that knowledge exchange occurred at all three levels: declarative and procedural, transactive, and sense-making. The online community venue lends itself to declarative and procedural knowledge exchange, so it is no surprise that the learning started at this level. But the KMF community was able to move into sense-making over time. Our review of the forum contents suggests that this success was facilitated by their investment in transactive learning about one another (as encouraged by Tim and reinforced by their founder over time). The group was able to develop a meaningful organization out of what was otherwise a formless e-venue. KMF started with a clear purpose; it was effective in absorbing newcomers; there were roles (e.g., moderator) and routines (e.g., conversational habits). Perhaps most important, the KMF community developed a sense of identity and organizational culture. As one contributor noted, 'we are a diverse group but with a very definite culture of knowledge exchange in a supportive environment...' Throughout the forum, the tone was friendly, professional, and personalized. Contributors signed their messages, almost always with their first name and often with their complete name, position, organization, and location information. The forum developed a helping and welcoming atmosphere that nurtured debate, challenge, and idea generation — hallmarks of a community of practice, i.e., a sustainable learning network.

Conclusion: Guidelines for Learning Networks

Strong learning networks are difficult to form in any venue, and the challenges are especially great when interaction occurs primarily through the conduit of e-media. Given a set of e-based options from which to choose, managers can evaluate the options based on the ways in which participation, co-presence, and conversational structuring are likely to be experienced by group members. Evaluation can proceed in a systematic fashion, first assessing the technological affordances of available venues and, from there, anticipating communication and collaborative learning processes. Once an e-venue is selected, groups can work to produce declarative and procedural information exchange, transactive learning, and sense-making, realizing that these types of learning are progressively more difficult to experience in online settings.

We offer the following general guidelines for groups as they endeavor to experience collaborative learning inside e-based venues:

- ❖ Aim for *frequent interaction*. Frequent communication facilitates formation of the network and helps to sustain it over time. E-venues that are vibrant with ongoing communication are more likely to experience declarative and procedural information exchange, transactive learning, and sense-making. Regular contribution to the conversation, even if just 'checking in,' signals a group member's presence in the group and will improve the retention rate in the network.
 - ❖ Foster a mindset of viewing the technology not so much as a conduit that links distributed people or sites but as a platform for group discourse — a *media space* for interaction. In this way, the venue exists not so much to link nodes into a network but to provide a shared context in which group learning evolves.
 - ❖ Over time, aim for *deep discussion*, that is, for discussion that includes not only information seeking and providing but also discussion of group members' capabilities and changing needs, and discussion that includes challenge, reflection, and debate. These latter types of discussion are dense and will move the group toward transactive learning and sense-making. Note that deep discussion takes time to develop. Even in rich, video-linked media spaces, dense discussion rarely happens early on but rather after the network is established.
 - ❖ Emphasize the importance of *speech that is positive and respectful* in tone. Learning is more likely to be nourished if the conversational atmosphere is tolerant and people feel a comfortable degree of co-presence. Even when conversations include criticism and debate, communication can be positive. Mutual respect is critical to development of a healthy learning network, and more sense-making
- will occur in groups that exhibit a consistently respectful tone in their online conversation.
- ❖ Recognize the importance of *facilitators*, especially emergent facilitators. Some facilitators serve as technology 'translators' who are willing to help with adaptation of new technology to collaborative work (Mackay, 1990; Nardi and O'Day, 1999; Orlikowski *et al.*, 1995). They buffer group members from difficulties in operation of the technology and encourage learning-oriented communication within the group. Other facilitators act as leaders or moderators of the online conversation. Both types of facilitators contribute to the success of the learning network.
 - ❖ Work to develop a relatively large *core group* of participants who provide stability in the network and foster growth. Avoid insularity or a core group that is too small in size to foster learning.
 - ❖ Recognize the importance of *routines* for interaction (e.g., regular online contribution, turn-taking, productive debate or challenging one another). Conversational routines provide structure that facilitates participation and aids interpretation of knowledge as it is shared inside the group. Specific routines can be advocated (e.g., asking people to say something about their work backgrounds in advance of commenting on an issue), but most routines cannot be fully defined in advance. Soft (pliable) routines are more conducive to learning than rigid conversational routines. Routines should evolve over time as a function of group needs and preferences.
 - ❖ Encourage groups to *experiment* with the technology and the conversations they conduct within it. Through experimentation groups can discover social practices that meet their unique needs and interests.

To conclude, this paper has described some ways to think about online venues of today and their use for group learning. Future research will examine successes and failures not only within e-venues but across venues, as group work increasingly spans multiple e-venue settings, and the concept of media space expands to include entire sets of mediated learning environments. Learning networks will evolve to intertwine many groups, communities, and institutions, and the challenges for managers will magnify. No doubt, the study of learning in online forums will remain a vibrant area of research for many years to come.

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Notes

1. In this paper we use the term 'learning network' to refer to the *group of people* (the social network) who interact for

- learning purposes. We use the term e-based learning 'venue' or 'forum' to refer to the *technology-mediated setting* in which the people interact with one another.
2. Although a more refined analysis of social learning certainly is possible, these three categories capture the major learning activities that occur as people interact with one another in a group setting. For more detailed typologies of group knowledge exchange, readers are referred to Alavi and Leidner (2001), Choo (1998), and Edmondson *et al.* (2001).
 3. We thank Ms Karen Rivers for assistance in coding the data for this analysis.
 4. Note that we are reporting general trends and not tests of statistical significance.
 5. The community name and its contributors are disguised in this paper in order to protect their privacy.

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