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Collaborative Knowledge Creation in Electronic Mail

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Abstract

With organisational work increasingly performed by the collaboration of distributed groups, an improved understanding is needed of the co-creation of knowledge in emerging virtual structures. We explore the potential of the ubiquitous organisational tool, electronic mail (e-mail), for supporting collaborative knowledge creation in such settings. This research draws on a case study of knowledge creation occurring in e-mail conversations in a large Australian university and adopts a discourse analysis research approach. We describe a model of collaborative knowledge creation derived from the study and identify a preliminary set of key factors for organisational knowledge tools and their use by groups to support collaborative knowledge creation. The paper also provides insights into the role of e-mail in collaborative knowledge creation, not only in facilitating this process, but in shaping a participatory, multi-perspective, team-based approach to knowledge building. Organisational implications arising from this type of knowledge creation are also discussed in the paper.

Key words: electronic mail, knowledge management, collaborative knowledge creation

1. Introduction

Ongoing knowledge creation is a new business imperative for securing and sustaining a competitive advantage in contemporary globalised firms (Sharkie, 2004). While there has been some theoretical exploration of the process of knowledge creation (cf Nonaka & Takeuchi, 1995; Spender, 1996), it remains a vastly under-researched area. Thus the enabling organisational conditions for knowledge creation remain poorly understood (Alavi & Leidner, 2001; Easterby-Smith & Lyles, 2003). Recent research suggests that collaborative virtual structures offer important advantages for knowledge creation as synergies and learning are available from conjoining knowledge in diverse specialisations, resolving conflicting perspectives and modifying team structures to access missing knowledge (Bonifacio & Molani, 2003; Qureshi et al., 2000; Ratcheva, 2004; Townsend et al., 1998; Vick & Johnson, 2005).

At the same time, collaborative structures are increasingly underpinning modern modes of organisational work. The traditional command-and-control structure of companies is being replaced by organic networking structures based on more equitable employee participation and the support of work groups rather than individuals (Ing & Simmonds, 2000). Such groups are often geographically and temporally dispersed, and engaged in collaborative intra- or inter-
organisational distributed work, facilitated by emerging virtual structures such as transient virtual teams and virtual communities of practice (Iivari & Linger, 1999; Schaffers et al., 2003; Townsend et al., 1998).

A key virtual group activity is the development of plans, decisions, innovations and competencies (e.g. Qureshi et al., 2002; Vick & Johnson, 2005), suggesting that a study of such activities may reveal fresh understandings about organisational and technical conditions favouring knowledge creation in virtual settings. Given our interest in exploring knowledge creation in a distributed collaborative context where knowledge tools are involved, we elected to explore knowledge creation enabled by a ubiquitous organisational communication and collaboration tool – electronic mail (e-mail).

We selected conversations enabled by e-mail for a number of reasons. First, e-mail continues to evolve as a highly popular, versatile organisational tool, with recent enhancements such as workspaces and task management highlighting its emerging role as a collaborative technology (Gwizdka, 2002; Whittaker et al., 2005). Second, a recent report revealed that 90-95 per cent of virtual collaborative work is performed by e-mail (IDC, 2003). Third, studies have found considerable knowledge work and value in e-mail discourse (CIO, 2001; Bontis et al., 2003; Kock, 2000; Lucas, 1998). Fourth, e-mail has the potential to support knowledge creation (Alavi & Leidner, 2001). In e-mail discourse, personal ideas are regularly combined with existing knowledge to create new knowledge. Finally, as e-mail is now integral to everyday work (Doubleclick, 2005; Ducheneaut & Bellotti, 2001, 2003), we believed e-mail may have greater value than is generally recognised, and thus selected it as a focus for our study.

This paper aims to provide an understanding of how organisational knowledge can be created collaboratively in e-mail and the impact of this phenomenon on technological and organisational practices. Following this introduction, we review contemporary perspectives on knowledge creation and key concepts suggesting e-mail as a valuable organisational tool for knowledge management. After discussing the research methodology chosen, a conceptual model of collaborative knowledge creation in e-mail is described, based on the empirical findings. We discuss issues relating to this method of knowledge creation in organisations and provide a preliminary set of factors for knowledge tools and their use by groups to support collaborative knowledge creation in organisations. Finally, we summarise the paper’s main contributions and propose a way forward for e-mail and other systems and technologies that aim to support collaborative knowledge creation in virtual organisational settings.

2. Background
In this section we provide a theoretical background for the empirical study by first reviewing contemporary perspectives on knowledge creation with a focus on the advantages of collaboration and second, discussing the advantages of e-mail for supporting knowledge management.

2.1 Knowledge creation
Knowledge creation is part of a program of organisational knowledge management – the support of the creation, transfer and application of organisational knowledge (Alavi & Leidner, 2001). A popular inclusive perspective of knowledge conceptualises it as a holistic system of organisational information, processes, practices, norms, values and beliefs (Davenport & Prusak, 1998).

Knowledge in an organisation can be categorised as organisational, collective or individual, with tacit and explicit dimensions (McElroy, 2000; Nonaka & Takeuchi, 1995). Tacit organisational knowledge is embedded in an organisation’s culture, procedures and norms, whereas explicit organisational knowledge has been officially sanctioned by an organisation and is represented by documented policy, procedures, frameworks and technological representations. Tacit collective knowledge is shared understanding, mutually held in the minds of a group, while explicit collective knowledge is a shared representation of that knowledge.
knowledge resides in the mind of an individual. Nonaka and Takeuchi (1995) suggest that “tacit knowledge is highly personal and hard to formalise, making it difficult to communicate or share with others. Subjective insights, intuitions and hunches fall into this category of knowledge” (p. 8). Explicit individual knowledge is simply a representation of that knowledge, with an example being a spoken message.

The creation of organisational knowledge involves developing or replacing some of an organisation’s knowledge (Pentland, 1995). Organisational knowledge is dynamic and can be created from the interplay and transformations between various knowledge types – individual or collective; tacit or explicit – as illustrated by Nonaka’s famous knowledge spiral (Nonaka, 1994). According to this well-known theory, four basic transformations occur in knowledge creation: socialisation (the conversion of tacit knowledge to tacit knowledge); combination (the conversion of explicit knowledge to explicit knowledge); externalisation (the conversion of tacit to explicit knowledge); and internalisation (the conversion of explicit to tacit knowledge). While other experts have also developed knowledge classification schema, what is worth noting is that the well known models of Nonaka (1994) and seminal others such as those of Spender (1996) and Blackler (1995) all demonstrate the expansion of a knowledge base through collective human activity.

While individual and collective knowledge are generated through the basic conversion processes of Nonaka, new organisational knowledge per se may not eventuate (Alavi & Leidner, 2001). However, new organisational knowledge can be created when new insights and intuitions are shared and combined (Sharkie, 2004) or gleaned during internalisation (Alavi & Leidner, 2001). Another valuable source of new organisational knowledge is the external environment. By regular sampling of external data, new organisational knowledge may be advanced into an organisation and outdated knowledge may be updated (Hall et al., 2003; Sharkie, 2004). Malhotra (2000) points out that in rapidly changing environments, storing previous knowledge as rules or best practice is a simplistic assumption of continuing knowledge validity. He recommends the building of competencies, networks and knowledge sharing in order to tap into current external knowledge.

2.2 Collaborative knowledge creation and decision-making

Some experts suggest that the real value of knowledge is measured by its application in group-based organisational practices such as collaborative decision-making, problem-solving and learning (Alavi & Tiwana, 2002; Evangelou et al., 2005; Malhotra, 2000; Stahl, 2000, 2002). Collaborative knowledge creation plays a key role in each of these activities. Alavi and Tiwana, for example, suggest that group-based pooling and recombining of tacit knowledge is part of group decision-making, while Stahl theorises that an individual learns through the internalisation of social knowledge that has been built during collaborative discourse.

Knowledge creation is important to decision-making in that decision-makers need to have access to timely relevant knowledge and new ideas (Qureshi & Hlupic, 2001). Rittel and Webber (1973) point to new types of ‘wicked’ decision problems that include a lack of problem articulation; stakeholder value-based decision-making; an unbounded solution set; the absence of decision-finalisation criteria; and uniqueness. According to Courtney’s (2001) paradigm for managing these types of problems, the power of multiple discordant perspectives may be employed to resolve them. Such perspectives can be applied to a developing problem, producing insights and updating the mental models of stakeholders who can consider the perspectives as they relate to the problem. New tacit knowledge is also developed in this process, in the form of individual insights and revised mental models, as well as shared (collective) understandings. Decisions are then based on this new knowledge.

An emerging theme in collaborative decision-making is the technological support of discourse-structured templates that inform and are evolved by participants (e.g. Evangelou et al., 2005; Raghu et al., 2001; Turoff et al., 1999). However, such collaborative tools rely
substantially on pre-specified discourse requirements and involve significant automated shaping of discourse. The problems, goals and decision-making criteria must be established at the outset. ‘Wicked’ decision problems are not well supported by such heavily structured tools. Moreover, Ing and Simmonds (2000, p.9) caution that in collaborative decision-making, “management of the social dynamics of interaction requires a greater emphasis than the technological support for dialogues”. Notably, attention to the social aspects has not been evident in current implementations of collaborative decision support tools.

Similarly, group support systems in their current form are experiencing a raft of difficulties stemming from their neglect of the social dynamics involved (de Vreede et al., 2003). Participant concerns include inadequate consideration of all proposed alternatives and the inability to use participant credentials as a supporting means of validating different alternatives proposed, because of current participant anonymity in such systems. A significant proportion of participants reported unsatisfactory decision outcomes as a result of such difficulties.

2.3 From collaborative knowledge creation to wisdom

Weick (2001) theorises wisdom as a balanced attitude of doubt and knowing. He suggests that the synthesis of existing individual knowledge in dialogue adds to overly cautious participants’ knowledge while removing some existing doubt, thereby increasing wisdom - and adds doubt in the form of new information to overly confident participant attitudes, thereby increasing wisdom.

We have argued (see Lichtenstein et al., 2005) that in today’s organisations, where specialisation is the normal method of structuring knowledge among workers, there tends to be greater doubt than confidence in domains which lie outside one’s area of specialisation. In such settings, gathering knowledge from others offsets excess doubt when it is added to existing personal knowledge through the internalisation process. Such confidence is also increased when organisational knowledge creation is situated in practice and so the new knowledge is highly relevant. Further, if this knowledge is collaboratively created, it can later be defended by those who constructed it, providing greater confidence in the validity of the knowledge within the organisational context.

An alternative view of wisdom is that it comprises a systemic view of knowledge underscored by an understanding of the principles and interactions which comprise the knowledge ‘system’ (cf Barabba et al., 2002, Bellinger et al., 2004). In collaborative knowledge creation, each participant has the opportunity to develop an understanding of the processes which have led to the new knowledge, and have an improved understanding of how groups think. Moreover, participants have an enhanced understanding of the negotiations that are feasible in the group and perhaps even the wider organisational community. These understandings may prove useful in making wise decisions in future work situations.

In the next section we summarise the key advantages of e-mail for knowledge management.

2.4 Advantages of e-mail for knowledge management

E-mail is an increasingly integrated and essential organisational communication and collaboration tool (Doubleclick, 2005) and continues to expand by moving into new application areas such as mobile wireless e-mail (Datamonitor, 2005) while reinventing itself for effective collaboration (Ducheneaut & Watts, 2005; Whittaker et al., 2005). Ing and Simmonds (2000) in their design for a new virtual information infrastructure suggest a focus on unstructured work and ad hoc processes such as are commonly found in e-mail, as such processes focus on useful knowledge outcomes and are therefore likely to be immediately valuable. Lucas (1998) and Bontis and colleagues (2003) studied the informal knowledge flows represented in e-mail and discovered their high value in creating knowledge networks. A study by Kock (2000) revealed more valuable contributions in e-mail than in face-to-face conversation, a finding also of CIO.com (2001) which reported that three quarters of a company’s best insight is contained in its
e-mail. We argue that a significant factor in e-mail’s popularity is the valuable knowledge work enabled by its medium. In Lichtenstein and Swatman (2003) we explored the advantages of e-mail for organisational knowledge management in depth, and provide a summary of them in Table 1.

Table 1: Advantages of e-mail for organisational knowledge management

<table>
<thead>
<tr>
<th>Advantage</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support for communication and collaboration</td>
<td>E-mail provides a ubiquitous communication and collaboration infrastructure with access to a social network or “community of minds” whose members know one another and speak the same social language (Courtney et al., 2000).</td>
</tr>
<tr>
<td>Support for fluid virtual teams</td>
<td>E-mail supports the activities of virtual teams working across time zones and geographical boundaries (Townsend et al., 1998), and facilitates team fluidity because people can rotate in (and out) quite easily (Alavi &amp; Tiwana, 2002; Townsend et al., 1998).</td>
</tr>
<tr>
<td>Motivation</td>
<td>E-mail motivates employee participation in knowledge work by attracting scarce attention, integrating knowledge work with everyday work and providing excellent sense-making context.</td>
</tr>
<tr>
<td>Message attention attraction</td>
<td>E-mail has attention-attracting characteristics such as a push technology, personalisation, easy-to-digest, and ‘captive environment’ (Davenport &amp; Beck, 2001).</td>
</tr>
<tr>
<td>Integration with everyday work practices</td>
<td>E-mail is part of everyday work practices because it can be used for such activities as meeting scheduling, file transfer and decision-making (Ducheneaut &amp; Bellotti, 2001; 2003; Gwizdka, 2002).</td>
</tr>
<tr>
<td>Sense-making through contextualization and personalization</td>
<td>Context needed for sense-making is provided through discourse, referencing of work objects (such as digital documents) and the historicity provided by quoted messages. Also, a personalised message is likely to be more appealing and meaningful, as well as more easily understood.</td>
</tr>
<tr>
<td>Accessibility, commitment and accountability for knowledge workers</td>
<td>E-mail can access people in many different places and time zones at their convenience, while careful use of the cc (copy) facility enables employee activity to be observed by key persons during message exchanges, thereby increasing accountability. E-mail allows the negotiation of commitment in a way that is documented.</td>
</tr>
<tr>
<td>Individual, collective and organisational memory</td>
<td>E-mail facilitates individual memory through individual storage of messages and personal message understanding, and collective memory through quoted knowledge trails and shared understanding. The collection of employee e-mails contributes to organisational memory, but this is limited unless it is accessible to others.</td>
</tr>
<tr>
<td>Knowledge creation</td>
<td>E-mail enables access to a variety of knowledge needed for knowledge creation. Discourse enables knowledge sharing required for knowledge creation.</td>
</tr>
</tbody>
</table>
Our study focuses on the last-named advantage of e-mail – knowledge creation. Before presenting the empirical findings, we describe the research design employed for the study.

3. Methodology

An exploratory case study of the popular e-mail client Eudora was conducted in a community of practice centred on the activities of an academic unit in a large Australian university. Three hundred complete e-mail conversations that took place over a two year period were collected from the e-mail archive of an academic member of the community, with purposive sampling consisting of collecting conversations containing more than ten messages and featuring the creation of new organisational knowledge.

Ancient Greeks discovered that “by entering ideas, even incomplete ideas, into the public record, they could later be improved and refined” (Donald, 1991: 342). According to this original view of science, knowledge building is seen in terms of collaboration facilitated by external memory, social process and technological mediation (Stahl, 2002). Stahl proposed that researchers investigate sequences of refinement of ‘statements of knowledge claims or questions’ (utterances) in conjunction with an examination of the effects of technological affordances that support the knowledge work involved. Bakhtin (1986) suggested that an utterance is meaningful in terms of its referrals to preceding and subsequent utterances, and concluded that sequences of utterances are interpretable by a relevant linguistic community. Therefore, in order to understand how knowledge is created collaboratively in e-mail, we turned to discourse analysis.

As e-mail has a socio-organisational character (Ducheneaut & Watts, 2005), we used grounded discourse analysis to analyse the e-mail conversations. The knowledge patterns found therein could thus be drawn from the structures of the messages and their organisational and social context, rather than from previously identified communication discourse structures such as those described by Turoff et al. (1999) which were designed for Delphi exercise, debates and other common collaboration methods. Further, we sought patterns relating to collaborative knowledge creation and, to the best of our knowledge, there were no well-accepted theories of structure in collaborative knowledge creation in existence at the time of study.

According to Fairclough (1992), a fragment of discourse can be viewed as “being simultaneously a piece of text, an instance of discursive practice, and an instance of social practice” (p.3). Text was analysed using qualitative content analysis techniques (Mayring, 2000) with iterative hermeneutic circles of meaning discovery. Discursive practice was investigated in order to comprehend how texts were produced and understood. Social practices such as surrounding organisational circumstances were studied with respect to their impact on the discourse; and finally, the broader organisational context was taken into account. Using Deetz’ (1996) dialogic (cf critical) analysis, we searched for unintended negative effects of knowledge creation occurring in this way. Feature analysis (Kitchenham & Jones, 1997) was used to identify key features of e-mail from the specifications and descriptions available in literature.

Stahl (2002) thought that researchers of collaborative learning/knowledge building through the study of dialogue should possess an innate understanding of the culture under study. Therefore, for data we mined an e-mail archive owned by one of the authors, thus facilitating our understanding of context (Fairclough 1992, Klein & Myers, 1999). Furthermore, the remaining author is a member of the same organisational department, participating in similar e-mail activities within the same organisational setting and culture. This approach enabled the cross-checking of context and culture between the researchers (Stahl, 2002). Participant observation was employed to the extent of direct participation and introspection upon that participation (Denzin, 1970), enhancing our ability to interpret conversations, while introducing an element of bias. We attempted to control any bias influence by random independent analyses and cross-validation of results, and reflective observation in that the e-mail conversations and associated organisational context studied had already occurred prior to commencement of the study. The unit of analysis was a complete e-mail conversation. Coded categories for conversations were
inductively developed, evolving to conclusive states over iterative readings. We thus arrived at themes, patterns and trends.

In the following section we present our findings, commencing with a description of a model of collaborative knowledge creation discovered in e-mail conversations. For reasons of space, we have employed only one conversation to illustrate our analysis and findings. In the descriptions and discussions that follow, we also review relevant literature in order to highlight current scholarly support for the model elements.

4. Model of collaborative knowledge creation in e-mail

We identified a pattern of collaborative knowledge development and creation in the conversations studied, described in depth in Lichtenstein (2004) and conceptualised by the model shown in Figure 1. There are five underlying processes - initiation, crystallisation, sharing, qualification and combination - culminating in the creation of new organisational knowledge. This lifecycle is illustrated by the e-mail conversation in Figure 2.

To summarise, virtual teams, operating more like micro-communities, are summoned by an initial message inspired by a need perceived to be of mutual interest to others in the group. This message becomes part of a knowledge trail consisting of successive related e-mails in one or more threads emanating from the first knowledge seed e-mail. In the conversations, selected because knowledge development took place, knowledge is crystallised along the knowledge trail by processes of knowledge qualification and combination, with reference to knowledge resources including authorities, documents, and contributions of insights, ideas, suggestions and context by participants.

New participants are co-opted as needed for their decision-making power, interest or additional knowledge. From time to time, participants are omitted from the circulation list. By the end of the knowledge trails, the tacit knowledge of participants has been shared and combined in useful ways, and new organisational knowledge has been created in the form of organized plans and innovation, decisions and actions. As a result of the continuous organisational learning occurring concurrently, new social and intellectual capital has also been created at individual and collective levels. This constitutes a form of knowledge integration in which specific knowledge held by individual participants has been combined, imbued with collective meaning and integrated into the group members’ tacit knowledge in a potentially valuable way.

![Figure 1. Model of collaborative knowledge creation (Lichtenstein, 2004)](image-url)
Ray (*initiation*): “I am planning to teach Subject A next year on week nights, instead of weekends. In order to do that, I need a free week night when there are no other classes for students. Bob, can you swap times with me for Subject B, and teach on weekends?”

Bob (*crystallisation, sharing, combination*): “I wish I could help, Ray, but I can’t do weekends, either. I’ve been thinking though of changing the teaching for Subject B. I’ve noticed students don’t get much out of Tutorials in Subject B, so I might omit those and have a two hour seminar which I can put on at 4pm. You can then teach three hours of Subject A afterward at 6pm, Ray. What do you all think?”

Sue (*crystallisation, sharing, qualification*): “As I recall, Marcia says all postgraduate subjects need three hours of class contact.”

Marcia (*crystallisation, sharing, qualification*): “Colleagues, yes, the students like three hours of class contact a week, to provide the understanding they need in the subject.”

Ray (*crystallisation, sharing*): “Maybe it is time to look at alternative ways that provide even better value?”

Marcia (*crystallisation, sharing, qualification*): “Well, perhaps Bob can find an innovative way of doing that? Bob, I will leave it to you to come up with something.”

Bob (*crystallisation, sharing, combination*): “After some discussions with others about this, I suggest we have a two hour workshop each week at 4pm, and a two day workshop during the mid-semester break.”

Marcia (*crystallisation, sharing, qualification*): “Sounds good to me. What do you think, Sue and Ray?”

Sue (*crystallisation, sharing, qualification*): “Good idea!”

Ray (*crystallisation, sharing, qualification*): “Yup. Thanks, Bob.”

Figure 2: Sample of knowledge creation processes in e-mail conversation

5. Issues in collaborative knowledge creation in e-mail

In this section we discuss key issues associated with the way that knowledge creation was facilitated by the e-mail conversations. In general, we found that e-mail facilitated spontaneous ‘just in time’ organisational knowledge creation on a community-needs basis, with new knowledge created from a collaborative ‘meeting of the minds’. This involved the resolution of multiple discordant perspectives, with decision-making shaped by participant support or dissent, expressed through the qualification process. Fluid, dynamic virtual teams shaped knowledge-under-construction into a final outcome to suit emerging participant needs, rather than attempting to satisfy predetermined decision criteria, of which there were none. This finding accords with the constructionist view of organisations in which order is created by enactment (Weick, 2001), with alternative solutions proposed and qualified in order to ideate possible realities representing participant perspectives and needs. External variables were often unknown or incomplete. However, participants continued working towards resolution despite this missing knowledge.
This suggests the notion of improvisation (Weick, 2001), an emerging organisational solution to the difficulties involved in finding all the knowledge needed from an increasingly vast global repository of potentially relevant knowledge.

It was also found that the decision-making style used was not pre-determined, but rather was shaped by the evolving conversation as we now discuss.

5.1 Decision-making

While in general, repeated qualification of different perspectives eventually brought about conversation and decision closure, we observed examples where additional external activity was required for this purpose. There were occasional challenges to the existing organisational knowledge base, assumptions made, or other problems that proved difficult to resolve. In one instance, an impasse where no decision could be made because a consensual outcome was sought necessitated moving the discussion off-line. In other cases, an authority figure was brought into a conversation to guarantee its resolution, or this person simply observed the conversation until the ‘dust settled’ and then pronounced an outcome and provided a rationale based on her assessment of the conversation. We also observed that usually when employees qualified knowledge-under-construction, they provided accompanying rationale. This finding contrasts with the findings of Majchrzak et al. (2000) that virtual teams are reluctant to document decision rationale for new product design when using relatively public collaborative knowledge tools compared with e-mail.

Importantly, in e-mail, compared with face-to-face meetings and various synchronous collaborative tools, we discovered a strong sense of participatory and democratic involvement in decision-making. All participants were given ample opportunity to reflect, formulate and contribute individual opinions. They were able to consider other perspectives at leisure and formulate and contribute thoughtful responses. Furthermore, the fact that key decision-makers were accessible and accountable loaned credibility and weight to the decision-making processes – in particular, the qualification processes – as well as to the final knowledge outcome.

One concern – especially with Eudora, which was the e-mail client used by participants – was that the decision-making/knowledge creation threads were non-linear. Sometimes, after an initiator sent an initial message, several people responded at different times, possibly without reading the most current response. This often resulted in quite fragmented discussions and may have reduced the effectiveness of e-mail-based decision-making and knowledge creation. On the other hand, this may also have encouraged more diverse views as the protocol of turn-taking is not feasible with e-mail.

5.2 Value: From knowledge to wisdom

Clearly, an assessment of the value of knowledge created using e-mail is important. We suggest that the main value of the collective knowledge generated by such e-mail conversations is found in the resolution of multiple perspectives. This resolution is mainly achieved by the qualification process which refines knowledge for usefulness, and also by the combination process which pools participant specialised knowledge. According to Weick’s (2001) view of wisdom discussed earlier, it is by such combinations that wisdom is gradually developed. Doubt of knowledge is added in order to achieve a healthy balance of doubt and confidence in individual knowledge. However, we were unable to measure whether this rebalancing of doubt and confidence had occurred. We also did not measure the understanding of decision-making or problem solving to ascertain whether wisdom was gained according to the wisdom-as-system model of Bellinger et al. (2004), also discussed earlier. Elsewhere, we have further explored the development of wisdom in e-mail conversations (Lichtenstein et al., 2005).

Another contribution to the value of knowledge created in e-mail conversations is the ability to consult knowledgeable people by the copy or forward facilities, when seeking access to newly-
needed knowledge. Bonifacio and Molani (2003) suggest there is value in establishing cooperative, decentralised knowledge networks (such as the individual virtual groups operating in e-mail) with access to one another’s knowledge as well as to external knowledge, via a peer-to-peer distributed knowledge management infrastructure. Indeed, a key finding of this study accords with several of Bonifacio and Molani’s (2003) identified benefits of distributed versus centralised knowledge management – particularly the allowance of a plurality of opinions and a lack of oppressiveness by the freedom of small collectives of workers to go about their business independently of other groups and undue managerial interference.

5.3 Knowledge resources

Access to key knowledge resources is required during decision-making (Joshi, 2001). In the conversations studied, access was provided to high quality tacit and explicit knowledge resources. When documents were requested by participants, hyperlinks were posted or documents were e-mailed as attachments. Some documents had been prepared over the course of the e-mail conversation in response to a perceived need. Participant knowledge was available by e-mail conversation – that is, as far as participants were prepared to share, and able to articulate, such knowledge. The tacit knowledge of experts and decision-makers who were not initially included in the conversation was accessed by including such people in the conversation as needed. Other affected knowledge stakeholders could be accessed when needed for their opinions or authorisation.

An interesting finding was that the feasibility of the knowledge-under-construction was important tacit knowledge that was able to be tapped by the e-mail conversations – that is, was the current knowledge-under-construction feasible in light of the current or anticipated organisational context?

Participants employed the quote function to generate a knowledge trail which provided a record of the way by which the issues and knowledge had developed over a conversation. This trail acted as a reminder of the state of play, compensating for the lack of continuity inherent in communicating by an asynchronous medium. Some confusion was experienced whenever participants responded without including the knowledge trail.

5.4 Teams, roles and power

Knowledge creation was team-based. Participants cooperated and collaborated in their efforts to build knowledge for a collective purpose. The composition of teams was fluid and dynamic where people were co-opted into a team when needed for their expertise, authoritative powers or because of a perceived special interest in the knowledge being developed.

Interestingly, role ambiguity was apparent (as was also found in a study of new product design by a virtual team using collaborative technology by Majchrzak et al., 2000). It was often unclear who would be deciding the final outcome. At times, the authorised decision-maker did not seem to participate in the final decision. Her silence throughout a conversation may, or may not, have implied consent for the knowledge-under-construction or even the final knowledge created, yet interestingly, such silence was consistently taken to imply consent. Leadership also vacillated between participants and appeared to depend only on who had the greatest motivation to continue driving the knowledge creation process forward to a successful conclusion. Nevertheless, there was generalised team-spirit and determination to find a solution.

An interesting power-based influence existed where the conversation initiator selected receivers for the first message, thus strongly influencing the knowledge that was created. However, other participants were then able to copy in others who had been included in the original e-mail, thereby enabling a more equitable final result. In face-to-face situations, however,
the initiator could simply hold a meeting of the people whom she wished to contribute to the solution, without the opportunity for those present to suddenly enlist key people with an important stake in the knowledge being created. Clearly, such a face-to-face process would be likely to produce a quite different outcome.

5.5 Participant involvement

With e-mail, there is an increased ability to create knowledge with participants across geographical boundaries. The knowledge creation process obtains greater participant responsiveness in a distributed environment using e-mail, because this process can be initiated at any time and with any people whom the initiator might think could contribute value. This is more difficult not just with face-to-face communication, but also telephone conferencing and other communication techniques where more preparation is required.

An important finding from the discourse analysis was that the medium encouraged contributions only from participants who believed they had something genuine to say or those who read their e-mail in a timely manner. Other participants were effectively excluded from the process by choosing to remain passive. This situation has both advantages and disadvantages. For instance, in a face-to-face meeting participants must invest their time, and therefore may feel compelled to contribute to discussions even if they lack related valuable knowledge. With e-mail, people will only contribute if and when they choose to do so. The disadvantage, however, is that the decision-making process may ignore the valuable knowledge of those participants who do not read their e-mail regularly. It is difficult to compel individuals to participate in a knowledge creation process by e-mail. Another concern is that people had to be reading their e-mail in a timely manner if they wished to contribute to knowledge creation where the final outcome may affect them. This had led to increased e-mail reading frequency in some cases. The use of e-mail for making decisions about new organisational knowledge had also resulted in an increase in e-mail volume which was already straining employee workloads.

5.6 Conflict resolution

At times, participants engaged in one-to-one background e-mail conversations in parallel with the main community conversation in order to resolve developing conflict or express their wishes privately. This behind-the-scenes activity enabled conflict resolution in a timely fashion and led to more productive outcomes and a more pleasant and positive atmosphere. However, some people may have tried to influence the decision-maker(s) privately without providing an opportunity for their perspectives to be questioned by the larger group.

5.7 Complex knowledge domain

We observed significant disorder in the patterns of knowledge processes occurring, with chaotically (rather than linearly) ordered employee contributions to knowledge development. Indeed, it is impossible in e-mail as it presently exists to ensure linear development of a threaded discussion. Yet despite this obstacle, most conversations resulted in successful outcomes. In search of an explanation, we recognised that the knowledge work in our e-mail sample resembled the domain of complexity defined by Snowden (2002) in his discussion of complex adaptive systems knowledge flow – with informal communities clustering naturally, and where participants “recognize, disrupt, reinforce and seed the emergence of patterns. (and)... allow the interaction of identities to create coherence and meaning”. This pattern was observed in many of the conversations studied. Snowden distinguishes complex domains from chaotic domains in which “no such patterns are possible unless we intervene to impose them; they will not emerge through the interaction of agents”.

Snowden suggests that complex domains are managed and led by the early identification of pattern formation, followed by disruption of undesirable patterns and stabilisation of desirable patterns. We observed signs of this type of management and leadership in the discourse interactions, although there appeared to be no planned strategy in this respect. The leadership emerging appeared to be based mainly on natural authority of a patriarchal or matriarchal nature, and was exercised by knowledge qualification. However, at times an act of power was clearly linked to an actor with formal authority (Lichtenstein, 2004). The ramifications and exploration of the shaping of knowledge – which appeared at times to be politically-constructed – is an interesting avenue to investigate in future research.

5.8 Factors that support collaborative knowledge creation

The findings from this study suggest a set of key factors for knowledge tools and their use that support collaborative knowledge creation (Table 2). When considering the small data sample, we recognise that the set of factors is not immediately generalisable and may have limited application to other knowledge tools and organisational environments. However, the set of factors provides a foundation upon which to build in future research.

Table 2: Key factors for knowledge tools and their use to support collaborative knowledge creation (adapted from Lichtenstein, 2004)

| 1. Accessibility and accountability of key stakeholders (involved peers, decision-makers, domain experts) |
| 2. Collaborative knowledge creation lifecycle – initiation, crystallisation, sharing, qualification and combination processes |
| 3. Sense-making through communication, contextualization and personalization |
| 4. Reflective asynchronized knowledge work |
| 5. Emergent participatory problem-solving/decision-making |
| 6. Cooperative and collaborative fluid teams |
| 7. Emerging participant needs shape outcomes |
| 8. Resolution of multiple perspectives |
| 9. Access to rich information/work objects |
| 10. Just-in-time, situated knowledge creation |

6. Conclusion

This paper has explored the collaborative creation of knowledge in organisations in a virtual setting by studying e-mail conversations. As a theoretical contribution, the findings have provided important new understandings and insights into the nature of collaborative knowledge creation in organisations where knowledge work is carried out in virtual environments. The findings suggest that in e-mail conversations, employees may intuitively build new knowledge, crystallising the knowledge-under-construction by submitting it iteratively to a range of key stakeholders for comment and new input until a decision is reached that settles the outcome. This process has been represented as a preliminary model for collaborative knowledge creation (figure 1) and the model should be explored in future research. The paper has also provided a preliminary set of factors for knowledge tools and their use to support collaborative knowledge creation (Table 2). The factors may suggest new design elements for collaborative knowledge tools.

Questions about the potential value of e-mail in collaborative knowledge creation arise from this research. What additional collaborative functionality is needed in e-mail to make up for the
shortfalls with respect to knowledge creation, such as the lack of a shared space for effectively maintaining the knowledge trail? Is new knowledge developed by e-mail superior or inferior to new knowledge developed through more traditional avenues such as face-to-face meetings or more sophisticated collaborative tools such as electronic workspaces? What as-yet-unidentified negative impacts of knowledge creation by e-mail exist? For example, are some employees’ needs not being met because they do not wish to, or are unable to, access their e-mail accounts as frequently as needed to participate in knowledge creation in a timely manner? How are employees responding to the creation in e-mail of new organisational knowledge which does not meet their needs? Is e-mail being used as a platform for the achievement of personal agendas in new organisational knowledge? Such questions clearly merit research attention.

Turoff et al. (1999) point out that discourse structures may be useful for measuring progress toward collaborative objectives. Thus the pattern identified by the model presented here could be used to develop a metric for measuring the effectiveness of e-mail conversations with respect to knowledge creation.

We observe that in the participatory organisation of today, employees may be aware of their greater responsibilities in organisational knowledge creation which have clearly empowered them to propose knowledge contributions as well as qualify others’ contributions—actions traditionally viewed as managerial in traditional hierarchical organisations. By offering specialised knowledge in a collaborative manner to solve mutual problems, participants collaborate to pool and integrate existing valuable individual knowledge and thus potentially develop new value for the organisation.

From a competency development perspective, businesses should recognise the important role that e-mail may play in developing employee knowledge, skills and attitudes by collaborative knowledge creation. Effectively using e-mail in this way may provide an important contribution to strategic objectives of accelerated speed-to-innovation and sustainable competitive advantage. Building on e-mail’s knowledge creation capabilities by extending its collaborative functionality would be worthwhile, and there have been recent theoretical and practical developments in this direction (Whittaker et al., 2005). The design of managerial interventions to improve knowledge creation outcomes may also prove fruitful. Examining how more sophisticated collaborative technologies can provide similar or greater value for supporting knowledge creation is another possible research avenue. Finally, the findings from this study may also be useful in the design of virtual teams for teleworking, workplace design in network and virtual organisations, and design of inter-organisational networks.

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References


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