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Abstract

Many knowledge management (KM) systems have proven unsustainable to date, exhibiting low quantities and quality of knowledge, with systems falling into disuse. In this paper, we provide and explore a model for sustainable KM systems, focusing on the advantages to be gained from integrating knowledge work with everyday work practices, and enabling sense-making through personalisation and contextualisation. We employ a discourse analysis of email as an exemplar of a sustainable KM system, thereby identifying a number of key characteristics for sustainable KM systems. Our model for sustainable KM systems adds to existing KM theory and, more immediately, assists companies by providing an understanding of the kinds of characteristics likely to make KM systems more effective, and sustainable in the long term.

Keywords

Knowledge Management, Email

1. Introduction and Background

Organisational knowledge management (KM) – the support of the creation, transfer and application of organisational knowledge (Alavi and Leidner 2001) – offers considerable promise to businesses of all sizes. Once defined by Nonaka and Takeuchi (1995) as justified true belief, knowledge is modernly viewed as an holistic system of information, processes, practices, norms, values and beliefs (Davenport & Prusak 1997).

While the goal of KM has been the improvement of organisational efficiencies, effectiveness and competitiveness through knowledge, only moderate successes have been experienced to date, with recent reports suggesting the full benefits have yet to be realised (KPMG 1999, Schultze & Leidner

2002). Not surprisingly, significant concerns are founded in the social, organisational, business and human issues, rather than the technology. The sparse population of many knowledge repositories is popularly attributed to employees hoarding knowledge, or lacking the time or attention to contribute – with a common solution being the rewarding of contributions (Davenport & Beck 2001, Hahn & Subramani 2000, KPMG 1999). A second, well-remarked concern is the low value of much of the knowledge found in knowledge repositories, commonly attributed to difficulties in capturing, articulating and converting employees' strategic tacit knowledge into explicit knowledge, for storage and reuse (KPMG 1999, Romaldi 2002).

These and other important KM concerns have recently been linked to the ***separation of KM systems from everyday organisational work practices and business processes***. Davenport and other experts now advocate the integration of KM with normal work practices in which knowledge development, organisation, planning, sharing and application naturally occur – thereby minimising the separate attention a worker must give to knowledge work, as well as reducing the need to separately motivate employees for knowledge work (Markus, Majchrzak & Gasser 2002, KPMG 1999, Lelic 2002).

A second emergent theme derives from calls for ***personalised, contextualised, interpreted approaches to KM*** (Alavi & Leidner 1999, Tsui 2002). Because existing knowledge repositories typically omit context and personal intent, they may lack meaning, and genuine value. To remedy this, Thomas, Kellogg and Erickson (2001) suggest the human and social story behind knowledge must be understood, before knowledge can be accurately represented. This interpretive perspective of knowledge has similarly been mooted for knowledge transfer, application and reuse. Malhotra (2002), for example, perceives knowledge in uncertain, rapidly changing environments as "a dynamic process of ongoing reinterpretation of data, information and assumptions while proactively sensing how decision-making process should adjust to future possibilities", while Galliers and Newell (2000) caution that only personally contestable knowledge can lead to the creativity and innovation greatly desired as strategic benefits from KM.

We propose a third strand, linking and extending these two themes – ***sustainable KM*** – that is, KM which persists independently of direct management or other attempts to control it. The benefits of sustainable KM include reduced dependencies on knowledge champions and employee reward systems, and reduced monitoring and redevelopment (Snowden 1999). Objectives for sustainable KM incorporate Snowden's (2002) notion of:

> *"a sense-making model that utilises self-organising capabilities of the informal communities and identifies a natural flow model of knowledge creation, disruption and utilization."*

To date, there has been only limited research into sustainable KM systems. We observed the persistence of the ubiquitous organisational communication and collaboration tool email, as well as its popularity in its adapted role as a KM tool, suggesting email as an obvious example of a sustainable KM system (Ducheneaut and Bellotti 2002). We recognised that email seamlessly integrates work practice with knowledge work, and that its content, management and operation are highly personalised and contextualised. This led us to conjecture that the integration, personalisation and contextualisation of KM systems might well constitute some of the foundational elements for sustainable KM systems. Although there were many frameworks already in existence for KM (for example, Nonaka 1994, Alavi & Leidner 2001), we felt that a study of the connections between integration, interpretation and sustainability in KM could yield new and potentially useful results.

In this paper, we develop underlying theory for sustainable KM, founded on the integration of KM with daily organisational work practices, and the personalisation and contextualisation of KM. Our study provides a deeper understanding of how and why such integration, personalisation and contextualisation facilitate the development and application of knowledge within the complexities of a large organisational environment. Importantly, this research develops and explores a model of characteristics – a number of which have not as yet been investigated by researchers – which enhance the sustainability of KM systems. This model is potentially of use to organisations considering developing sustainability in existing and future KM systems.

Following, we overview our research design, then justify our choice of email as a case appropriate for exploring the topic. A preliminary model for sustainable KM is then provided and explored through an analysis of the facilities and uses of email. Finally, we discuss our findings, draw conclusions and suggest future research directions.

2. Research Methodology

We conducted an exploratory case study of the popular email client Eudora, as an exemplar of sustainable KM. We collected and analysed *five hundred* consecutive email messages, as well as *fifty* email conversation fragments, taken from the email archive of an academic at a large Australian university. Our method of analysis was discourse analysis. According to Fairclough (1992), a fragment of discourse can be viewed as "simultaneously a piece of text, an instance of discursive practice, and an instance of social practice" (p.3). The textual dimension can be analysed via content analysis, thereby identifying recurring patterns and themes; the discursive practice dimension can be explored by examining how texts are produced and understood; the social practices dimension examines how social issues, such as the organisational circumstances of the conversation, affect the discursive practice. A fourth dimension is suggested by Klein and Truex (1995), who advise accounting for the wider context of a particular discourse. We analysed our data qualitatively according to all four dimensions, in order to identify patterns, themes and trends.

For data, we selected an email archive owned by one of the paper's authors, in order to improve our understanding of context and establish a meaningful frame of reference (Fairclough 1992, Klein & Myers 1999). In this way, our study was able to benefit from participatory observation – enhancing our ability to interpret the conversations, although introducing an element of bias. We have employed *one only* of the fifty conversational fragments (Appendix A) for the purpose of illustrating our research in this paper, however we invite interested readers to contact us in order to obtain the complete set. In the next section, we justify our choice of email as an exemplar for our study.

3. Knowledge Management in Email

Email is regarded as the most ubiquitous organisational and inter-organisational communication and collaboration tool in use today (Jackson, Dawson and Wilson 2001). Despite its history of flaws, misuses and abuses – including spam, flame, viruses and information overload – email continues to flourish as an essential communication and collaboration channel in many organisations, and fulfils a key role in a company's KM tool kit, having been identified as the second most common organisational KM tool after intranets, in 1997 (Alavi & Leidner 1999, Ducheneaut & Bellotti 2001).

Organisational usage of email has been far greater than predicted by media richness theories (Adams, Todd & Nelson 1992, Ducheneaut & Bellotti 2002), a success often attributed to email's great versatility in performing organisational tasks (Ducheneaut & Bellotti 2001) – although we suggest it is also due, in no small measure, to email's use for initiating, crystallising, sharing, organising and actioning knowledge. Indeed, it has been reported that three quarters of a company's best insights are contained in its email messages (CIO.com 2001). Evidence of the KM capability of email is growing, with Ducheneaut and Bellotti (2002) observing the phenomenon of selected, protracted email conversations transforming themselves into new knowledge artifacts such as organisational policies, and suggesting,

> *"Email, far from being a poor, technically-limited substitute for face-to-face communication, has some unique and compelling properties that make it ideally suited for talking about things."*

Finally, we note the failure of other, newer KM tools to achieve such ubiquity and large scale, diffuse user bases, and argue that email is a salient example of a sustainable KM system – well-integrated with organisational tasks, and personalised and contextualised (although we are by no means claiming it is the ideal KM tool for these purposes). We have therefore selected email as an exemplar for the purpose of exploring our paper's topic.

4. Model for a Sustainable Knowledge Management System

In this section, we describe and explore a model for a sustainable KM system (Figure 1), which suggests that a KM system must first win an employee's attention from amongst competing sources. The employee naturally engages with the system during normal work practices – that is, the system, tool and technology are integrated with existing work practices. The system is personalised in order to attract employee attention, as well as providing essential motivation, understanding, desired autonomy, and personal information management capability. Ready access to relevant context further facilitates individual sense-making of knowledge. The employee participates in a knowledge development lifecycle within which knowledge is initiated, crystallised, shared, and applied – leading to useful outcomes, such as decisions, ideas, plans and innovations.

Below, we discuss the model's components, and explore how email provides them.

4.1 Attention – the crucial first step to sustainable KM

Davenport and Beck (2001) identified attention as the scarcest resource in the age of information overload, while Markus, Majchrzak and Gasser (2002) recognised the importance of "customer engagement" in their design theory for emergent knowledge processes, citing how in one KM application, textual representations of knowledge such as lessons learned and best practice were ignored, with engagement obtained via more entertaining representations, based on computer games. This suggests that the first imperative of a sustainable KM system is to attract employee attention through possession of significant, attention-attracting characteristics. Davenport and Beck reported a study identifying the four most important characteristics for a message to command scarce attention, as: *personalised*; *emotionally evocative*; *trustworthy*; and *easy-to-digest*.

Below, we examine how email provides these types of attention, possibly accounting to an extent for its persistence in organisations.
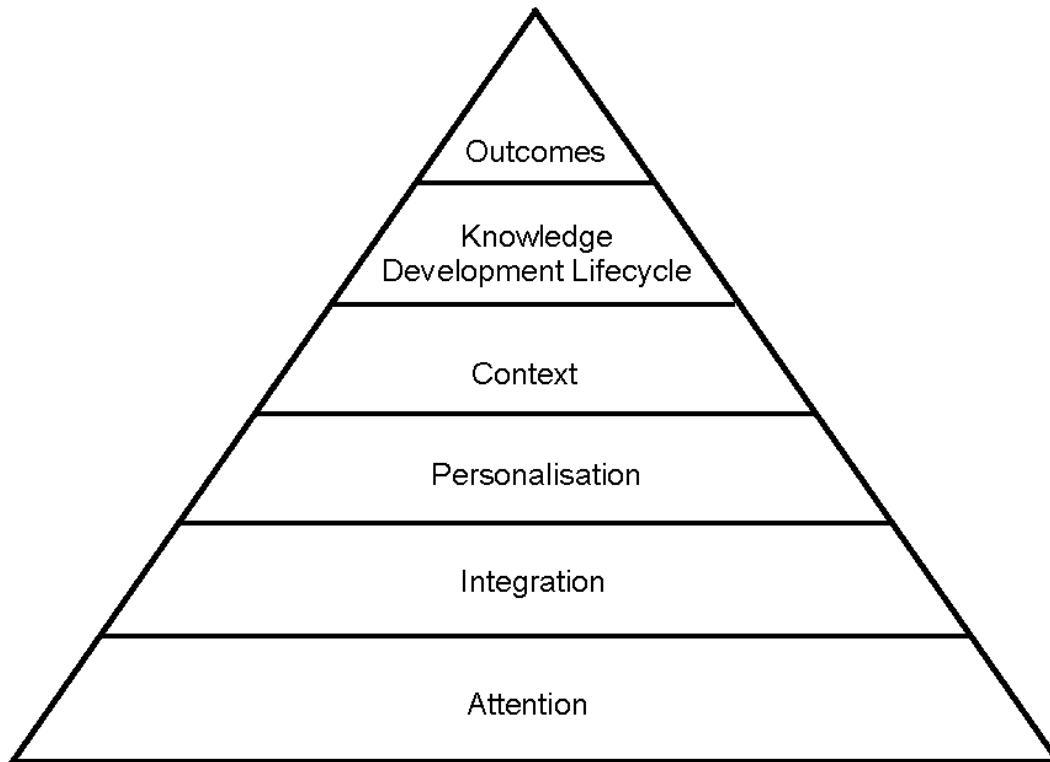

Figure 1. Sustainable Knowledge Management

Personalised

People have become increasingly narcissistic, responding quickly to personal attention, noted Davenport and Beck. Email provides highly personalised attention, with its self-managed content, high levels of autonomy, and significant proportion of exclusive content. We address personalisation later in the paper as a separate component of the model.

Emotionally evocative

Much of email evokes strong, positive or negative emotions in the recipient. The prevalence of "flaming" in email messages, in response to often quite minor provocation, indicates both what an evocative medium email can be, and what an accessible path it provides to the recipient. Interestingly, Davenport and Beck found "slightly aversive" information to be highly attractive to recipients. As much of organisational email implicitly attributes accountability to the receiver (according to organisational norms), email effectively solicits slightly aversive attention – that is, attention given because receiver inattention, lack of response, unawareness, or an inappropriate, untimely, inaccurate or tardy response, "may" lead to negative consequences for the receiver.

Notification of opportunities and invitations to pleasant events, both popular uses of email, are examples of how organisational email provides Davenport and Beck's "attractive attention" (enjoyment is experienced as reward for paying attention).

Trustworthy

With email, there is opportunity for the email recipient to "consider the source" of the knowledge therein, through sender identification and other indicators. This enables the recipient to personally evaluate the reliability, credibility, completeness, comprehensiveness, accuracy and overall value of the knowledge, using her subjective judgement of the source.

Easy-to-digest

The nature of email is brevity and simplicity, making it easy for a reader to digest. This promotes a high level of comprehension and, according to Davenport and Beck, attracts attention. Correspondingly, Hansen and Haas (2001) found that a steady flow of small amounts of knowledge possesses high attention attraction qualities. Other strong attention attraction features of email, according to Davenport and Beck's attention attraction criteria, are found in its tendency to form a captive environment or habitat for the employee, its social nature, the use of push technology, and the provision of immediate benefit.

4.2 Integration of KM with everyday work practices

"Email has … become a powerful way to organize one's work and rapidly access work

(Ducheneaut & Bellotti 2002, p.2)

Email naturally integrates KM with normal work practices and business processes, as we summarise below (compiled from Bellotti, Ducheneaut, Howard, Neuwirth & Smith 2002, Ducheneaut & Bellotti 2001; 2002, Gwizdka 2002). We also observed almost all the following facilities in email studied.

Email is utilised for activity recording, organising, meeting scheduling, file transfer, referencing of digital work objects, assigning responsibilities and decision-making – with time and task management, evolving functions. Quoting previous, related messages is a popular feature, the quoted messages being appended to the end of a new post in order to facilitate understanding through the disclosed history of a conversation. Email record-keeping as evidence for accountability and legal reasons is becoming increasingly important. Knowledge development occurs within some conversations, as we discuss later in this paper. Finally, email provides a complete personal knowledge archive, including personal knowledge trails. The email fragment shown in Appendix A is an example of a knowledge trail.

4.3 Personalisation – or "what's in it for me?"

Tsui (2002) and others have suggested the need for personal, rather than enterprise, KM tools. We have already discussed the role of personalisation in attracting employee attention, and focus here upon its other advantages.

An email recipient can readily identify whether the message has been sent to her alone, or to a group. A message sent to only one person is likely to be expressed in personal, contextualised language which the recipient can readily understand, or clarify via an exchange of emails. This type of personalisation is well-demonstrated by the sample conversation in Appendix A. In addition, email is almost entirely owner-managed – including its retention, reading, despatch, filtering, organisation, confidentiality, integrity, privacy and disclosure (via forwarding, printing, dissemination and quoting). This high degree of knowledge work autonomy is particularly attractive to employees, placing control of knowledge overload, and personal KM in general, in the hands of the employee.

4.4 Context

Collison and Parcell (2001) discuss the need for knowledge workers to "know what, who, where, when and why", about knowledge – in other words, to have access to the knowledge context, for sense-making purposes. Such context is well provided for by email, through the process of discourse, reference to work objects (for example, digital documents), and the historicity of appended, quoted emails in an email conversation. Conversation participants can provide important context about the organisation or group culture, norms and beliefs, business strategy and objectives, political and power structures, authority, relevance, pressures and sense of urgency. These types of elements are typically unavailable within knowledge stored in existing organisational KM systems (Wickramasinghe 2002). Participants can easily request any missing context by return email.

In the example in Appendix A, participants communicated contextual aspects such as the norms and constraints of the university's teaching methods, the willingness of participants to seek a solution, and the pressing need for that solution.

4.5 Knowledge development lifecycle

Wickramasinghe (2002) identified the absence of "knowledge creation through sense-making" in three large consulting firms' KM systems. Email enables such creation, according to Ducheneaut and Bellotti (2002, p.2), who wrote:

> "*email users draw on the persistence of the medium to make sense of the objects being talked about, and sometimes even transform the conversation itself into an object of conversation*"

– such as organisational policy. We also observed this pattern in the email fragments studied (refer example in Appendix A, which shows the development of a new teaching method for a particular subject).

There are many knowledge lifecycles already in existence, an early example being Nonaka's (1994) seminal SECI model and, more recently, Birkinshaw and Sheehan's (2002) model of four stages: creation, mobilisation, diffusion and commoditisation. It is not our intention to define yet another model, but rather to suggest that email naturally facilitates such a lifecycle, by describing how knowledge development takes place in email.

Cope (2000) highlights the importance of the individual in initiating knowledge development. The email fragments studied included the following categories of knowledge initiation, *inter alia*: challenge, instruction, link to stored knowledge reference, plan, accusation, question, responsibility assignment, assertion, statement of intent, and statement of emotion. Our description of the

knowledge development lifecycle follows, featuring four underlying knowledge processes: *initiation*, *crystallisation*, *sharing* and *application*. The lifecycle is illustrated by the email fragment in Appendix A.

Initiation

Email knowledge micro-communities form around an initial knowledge seed, spawned by an individual or organisational need. An initial message is posted as the knowledge seed email – for example, asserting a fact, asking a question, assigning a responsibility, or sharing knowledge. This is the first email in a knowledge trail consisting of successive, related emails (within one or more related threads, all stemming from the first knowledge seed email).

Crystallisation and sharing

The initial email and its recipients form the first circle knowledge micro-community, a circle which later expands or shrinks according to the needs of the micro-community. Each successive micro-community with whom the next email in that thread is shared, is either informed with the complete knowledge trail by virtue of having been in the circle from the beginning, or receives only those segments passed on to it by earlier circles. However, along the knowledge trail, the knowledge grows and is crystallised by the micro-community and by reference to authorities, documents and other knowledge sources. Insights, ideas, suggestions, and contextual information are provided along the way. Eventually the knowledge trail concludes when, for example, the needs of the various micro-communities are satisfied, or they simply change priorities, or there is another reason for termination. Aspects of the knowledge trail are now "known and understood", according to individual sense-making, by at least some of the people in the micro-communities involved. At that point, some people who had access to and followed and understood the entire trail, are in possession of all the knowledge represented by that trail. Therefore, knowledge sharing has taken place during and as a byproduct of the development of the knowledge itself.

Application

The application of any knowledge developed or shared in the lifecycle is discussed below.

Outcomes

By the conclusion of a knowledge development lifecycle, there should be one or more outcomes which apply the knowledge gained. Most of the email conversations we studied appeared to result in new knowledge for one or more participants (as described above), as well as actions, decisions, plans and storage of selected, newly formed knowledge. In the email fragment in Appendix A, the outcomes include a plan for a new teaching method, for one of the subjects discussed.

5. Findings and Conclusions

In this paper, we explored key elements for a sustainable KM system, using a case study of the email client, Eudora – and provided a preliminary model for sustainable KM systems (Figure 1). Although our results are limited to a sample of fifty conversational email fragments and a set of five hundred consecutive emails from an individual archive – and of course we cannot generalise from

this small sample of data – our results are yet indicative of the important roles of attracting attention, integration with everyday work tasks, personalisation, accessibility of context, a knowledge development lifecycle, and outcomes arising from knowledge development, for achieving sustainable KM systems. We suggest a number of applications of our research results.

Our model can be employed by companies to develop sustainability in an existing KM system, by applying the different layers of the model to the current system, evaluating how well the existing system provides each characteristic. Questions to be asked would include, *inter alia*: How strongly does the system attract employee attention? Which recognized attention-attracting features does it already possess, and which does it lack? How can it be made more attention-attractive to employees? Is the existing KM system integrated with existing work practices? If not, how can it be so-integrated? Is the existing KM system sufficiently personalised? Does it provide personal autonomy and personal interpretation for individual employees? How can it be made more personalised? How can more context be provided to facilitate understanding? Does the opportunity for a knowledge development lifecycle exist, in an intuitive form? If not, how can such a lifecycle be facilitated? Are valuable knowledge outcomes enabled? If not, how can the potential for such outcomes be increased? Where the existing system is deficient with respect to particular characteristics, and changes are considered in order to provide those characteristics, the feasibility and impact of the proposed changes should first be assessed, then the selected changes designed and implemented.

The model may also prove useful to companies developing new KM applications, with the layers of the model being incorporated into designs at an early stage. From a completely different perspective, KM applications which draw on the knowledge work value in email could be developed, although clearly there are ethical issues to be considered, for example email privacy.

We believe that we are the first researchers to highlight *the importance of attracting attention,* for KM systems. Without such attention, a KM system simply will not be used sufficiently, in this era of information and knowledge overload where there is only limited attention available from employees. A KM system must therefore command high levels of employee attention in order to be sustainable, and we have discussed in this paper various ways in which attention-attraction capability can be attained. Our research results also suggest yet another way to attract employee attention – by integrating KM with everyday work practices, as well as providing all the other features of the model: personalisation, contextualisation, an intuitive knowledge development lifecycle and a high likelihood of a useful outcome.

To conclude, we anticipate that the understanding we have provided in this paper will enhance the sustainability of new KM systems, as well as adding to existing theory in this area – theory of which there is little to date. Although our model is preliminary, we believe we have provided a solid foundation upon which to build, in future research.

In an era where information and knowledge overload continue to exhaust the human capacity for attention, understanding and reuse, and KM systems fall by the wayside accordingly, it would behoove companies to look toward developing sustainable KM systems – those which build on natural employee tendencies, practices and needs, rather than managers' and technologists' proclivities.

6. References

Adams, D, Todd, P and Nelson, R (1993), 'A Comparative Evaluation of Electronic and Voice Mail on Organizational Communication', *Information and Management*, vol. 24, no. 1, pp. 9-21.

Alavi, M & Leidner, DE (2001), 'Review: Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues', *Management Information Systems Quarterly*, vol. 25, no. 1, pp. 107-136.

Alavi, M & Leidner, DE (1999), 'Knowledge Management Systems: Issues, Challenges and *Communications of the Association of Information Systems*, vol. 1, no. 7, February.

Bellotti, V, Ducheneaut, N, Howard, M, Neuwirth, CM & Smith, I (2002), 'Email-centric Task Management and its Relationship with Overload', PARC Working Paper, Xerox Palo Alto Research Center, Palo Alto, CA.

Birkinshaw, J & Sheehan, T (2002), 'Managing the Knowledge Lifecycle', Working Paper 14, Strategic and International Management Group, London Business School, UK.

CIO.com (2001), 'From Data to Information to Knowledge—to Results', White Paper Library, CIO.com, viewed 6 February 2003, <http://www.cio.com/sponsors/061501_data.html>

Collison, C & Parcell, G (2001), *Learning to Fly, Practical Lessons From One of the World's Leading Knowledge Companies*, Capstone, US.

Cope, M (2000), *Know Your Value?*, Financial Times Prentice Hall.

Davenport, TH & Beck, JC (2001), *The Attention Economy: Understanding the New Currency of Business*, Harvard Business School Press, US.

Davenport, TH & Prusak, L (1997), *Working Knowledge- How Organizations Manage What They Know*, Harvard Business School Press, Boston, MA.

Ducheneaut, N and Bellotti, V (2002), 'Ceci n'est pas un objet? Talking about objects in email', PARC Working Paper, Xerox Palo Alto Research Center, Palo Alto, CA.

Ducheneaut, N & Bellotti, V (2001), 'Email as a habitat: An exploration of embedded personal *Interactions*, vol. 8, no. 5, pp. 30-35.

Fairclough, N (1992), *Discourse and Social Change*, Cambridge, Polity Press.

Galliers, RD & Newell, S (2000), 'Back to the Future: From Knowledge Management to Data Management', Working Paper No. 92, Department of Information Systems, London School of Economics and Political Science, UK.

Gwizdka, J (2002), 'Future Time in Email – Design and Evaluation of a Task-Based Email *Proceedings of Center for Advanced Studies Conference (CASCON 2002)*, IBM, Markham, CA.

Hahn, J & Subramani, MR (2000), 'A Framework of Knowledge Management Systems: Issues and Challenges for Theory and Practice' in *Proceedings of Twenty-First International Conference of Information Systems* (Orlikowski, WJ, Weill, P, Ang, S and Krcmar, HC, eds.), Brisbane, Australia.

Hansen, MT & Haas, MR (2001), 'Competing for Attention in Knowledge Markets: the Case of Electronic Document Dissemination in a Management Consulting Company', *Administrative Science Quarterly*, vol. 46, pp. 1-28.

Jackson, T, Dawson, R & Wilson, D (2001), 'The Cost of Email Interruption', *Journal of Systems and Information Technology*, vol. 5, no. 1.

Klein, HK & Myers, MD (1999), 'A Set of Principles for Conducting and Evaluating Interpretive Field Studies in Information Systems', *Management Information Systems Quarterly*, vol. 23, no. 1.

Klein, HK & Truex, DP (1995), 'Discourse Analysis: a Semiotic Approach to the Investigation of *The Semiotics of the Workplace* (Anderson, PB & Holmquist, B, eds).

KPMG (1999), Knowledge Management Research Report, KPMG, UK.

Lelic, S (2002), 'Interview with Tom H. Davenport', Preconference publicity for KM Europe 2002, Ark Group Ltd, viewed 16 November 2002, <http://www.kmeurope.com>

Malhotra, Y (2002), 'Why Business Management Systems Fail' in *Handbook on Knowledge Management* (Holsapple, CW, ed.), Springer-Verlag, Heidelberg.

Markus, ML, Majchrzak, A & Gasser, L (2002), 'A Design Theory for Systems That Support *Management Information Systems Quarterly*, vol. 26, no. 3, pp. 179-212.

Nonaka, I & Takeuchi, H (1995), *The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation*, New York:NY:Oxford University Press.

Nonaka, I (1994), 'A Dynamic Theory of Organizational Knowledge Creation', *Organizational Science*, vol. 5, no. 1.

Romaldi, V (2002), 'Collaborative Technologies for Knowledge Management: Making the Tacit *Joint Proceedings Informing Science & IT Education and InSITE—Where Parallels Intersect*, Computer Science Department, University College, Cork, Ireland.

Schultze, U & Leidner, DE (2002), 'Studying Knowledge Management in Information Systems Research: Discourses and Theoretical Assumptions', *Management Information Systems Quarterly*, vol. 26, no. 3, pp. 213-242.

Snowden, D (2002), 'Complex Acts of Knowing. Knowledge Management Portal', Standards Australia, viewed 10 February 2003, http://www.knowledge.standards.com.au/KM/INFO/SNOWDEN/SNOWDEN.HTM

Snowden, D (1999), 'A framework for creating a sustainable knowledge management program' in *The Knowledge Management Yearbook 1999-2000* (Cortada, JW & Woods, JA, eds), pp. 52-65, Boston: Butterworth/Heinemann.

Thomas, J, Kellogg, WA & Erickson, T (2001), 'The Knowledge Management Puzzle: Human and Social Factors in Knowledge Management', *The IBM Systems Journal*, vol. 40, no. 4.

Tsui, E (2002), 'Technologies for Personal and Peer-to-Peer Knowledge Management: an Overview of Server-less KM Tools/Systems at Individual and Group Levels' in *Proceedings of the 4th Asia Pacific Knowledge Management Conference*, Hong Kong.

Wickramasinghe, N (2002), 'Practising What We Preach: Are Knowledge Management

Systems in Practice Really Knowledge Management Systems?' in *Proceedings of the 35th Hawaii International Conference on System Sciences*, Hawaii, IEEE.

Appendix A: Sample Email Fragment

Ray: "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: "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 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?"

Author: "As I recall, Marcia says all postgraduate subjects need three hours of class contact."

Marcia: "Colleagues, yes, the students like three hours of class contact a week, to provide the understanding they need in the subject."

Ray: "Maybe it is time to look at alternative ways that provide even better value?"

Marcia: "Well, perhaps Bob can find an innovative way of doing that? Bob, I will leave it to you to

Bob: "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: "Sounds good to me. What do you think, Author and Ray?"