Knowledge Management And Collaboration

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Abstract

We report on a study of the relationship between collaboration and knowledge management. Successful knowledge management projects encourage and enhance collaboration between employees. The presence of 'collaborative' technologies might help that process but does not automatically increase collaboration. Empirical evidence is taken from a broad range of organisations: Anglian Water plc, BG Technology, BP Amoco plc, Ernst and Young and the European Bank for Reconstruction and Development (EBRD). Four of these organisations focus their knowledge management policy on the development of their corporate intranet. The empirical evidence shows that knowledge management is a collaborative activity, which depends on the creation of 'shared context' between the participants. This is more likely to occur with a combination of face-to-face meetings and machine-mediated communications.

1 Introduction

UK companies appear to need little convincing that they must develop knowledge management policies. They are purchasing knowledge management software and services at a prodigious rate. Ovum, for example, predicts that the market for knowledge management software will grow from $515 million in 1999 to $3.5 billion in 2004. In the same period, it estimates that the knowledge management services market will grow from $2.6 billion to just over $8.8 billion [Ovu99]. But it is clear from survey evidence that most companies have only just begun the process of developing successful knowledge management policies.

Cranfield Information Systems Research Centre carried out a postal survey of knowledge management in European businesses during 1998. It received 260 responses. Using this information Murray concludes that it is 'early days' for knowledge management in industry [Mur99]. Interestingly 70% chose to define knowledge management as "the collection of processes that govern the creation, dissemination, and utilisation of knowledge to fulfil organisational objectives." This definition does not refer to technologies or tools.

At about the same time, the American Management Association conducted a survey by fax in November 1998 [AMA98]. It received 1,051 responses. Respondents were asked if they had a knowledge management programme in place. 21% replied "yes, an effective one"; 16% "yes, but in name only – no real knowledge management is taking place". 15% expected to implement a programme in the near future and 41% had no plans to introduce one. As with the European Survey, companies were asked "which of these statements best reflects your company's definition of knowledge management?" (Respondents were asked to tick all that applied but it is unclear whether the responses came from all the respondents or whether the statistics exclude those who said they had no plans to introduce a knowledge management policy.) 29% replied, "Managing tangible intellectual capital – copyrights, patents, licenses, royalties, etc."; 62% "Gathering, organizing, and sharing the organization's information and knowledge assets"; 61% "Creating work environments for the sharing and transfer of knowledge among workers."

Others such as Rajan, as reported in the *Financial Times* are dismissive; in a survey of 14,000 companies involved with knowledge management, of 6000 usable responses, only 140 were worth discussing. "The rest were misusing the phrase knowledge management" [Mai99]. This is unfair, given that the field is developing. Even early adopters, like Buckman Labs in the USA, report an iterative process. Buckman points out that their knowledge management programme began in 1988 with the introduction of e-mail, and has gone through three technology driven enhancements [Buc00].

For the purpose of this study, knowledge management is defined as the "three main knowledge activities: generation, codification, and transfer." [Rug97]

Knowledge management as currently practised by UK organisations appears to be interlocked with the development of corporate intranets. In some quarters, this information technology is thought of as a 'knowledge tool' or 'knowledge network'. A plethora of proprietary knowledge management applications are appearing. Some products work as middleware, providing search and retrieval tools within an intranet environment. Others are communication tools, providing synchronous and asynchronous one-to-one and many-to-many communication by displaying words and symbols, voice, pictures or video clips.

1.1 Issues

The key focus of this paper is the relationship between collaboration and knowledge management. It tests this relationship via a series of high level interviews and study of unpublished and published sources on corporate knowledge management practices. Empirical evidence is sought from a broad range of organisations: Anglian Water plc, BG Technology, BP Amoco plc, Ernst and Young and the European Bank for Reconstruction and Development (EBRD). It is assumed that the success of knowledge management depends on collaborative practices. This raises four areas of investigation:

1. To what extent do organisations recognise that knowledge management depends on collaboration, and to what extent are they trying to encourage collaboration?

2. If organisations recognise the importance of collaboration, to what extent are communication and collaboration supported and managed, and what role does information technology play?

3. Can the availability of collaborative information technology (such as an intranet) of itself stimulate collaboration between employees? If it can, to what extent is this due to the creation of shared context? Can the machine-mediated workspace take on characteristics which assist in the creation of new tacit knowledge?

4. Does knowledge management require face-to-face communication or will machine-mediated communication suffice?

1.2 The Machine-mediated Workspace

The incremental incursion of computers throughout organisations has seen a development from isolated use for batch applications, such as accounts and payroll, to ubiquitous use for word processing, databases, spreadsheets, *etc*. Now each application is potentially available to all employees if an intranet is used. This delivers an on-screen 'desktop', providing a powerful, multi-faceted and multi-channel means of communication between employees, between the organisation and its employees and between those employees and the outside world.

Information technology alters the contours of reality making work more abstract, and allowing intelligence to be programmed and organizational memory and visibility to be increased [Zub88]. Intranets have, in many organisations, produced a virtual space into which the more tangible environment of work merges. Preparing reports and presentations, receiving and transmitting information, analysing data, logging timesheets, maintaining financial records, allocating and processing work tasks, even seeking authority for actions, can now take place automatically or semi-automatically via the desktop computer connected to an intranet. This is the machine-mediated workspace. It provides organisations with effective tools for operating in a more unified way at geographically dispersed locations, and can facilitate the creation, in part or whole, of virtual organisations. As the machine-mediated workspace has become more prevalent, knowledge has taken on a new significance both as a goal in itself and as a means of achieving organisational objectives.

2 What is Knowledge Management?

At this point, it will be useful to revisit the definition of knowledge management. On the face of it, definition might be regarded as self evident, since the component words are both in common usage. Alternatively it can be viewed as an oxymoron. (How can an intangible such as knowledge be managed?). Neither view is correct. Business interest in knowledge management is specific, and the definition is conditioned by that interest. It is that set of corporate policies which "explicitly enable and enhance the productivity" of activities which involve "the movement of knowledge from one location to another and its subsequent absorption" to yield the value of that knowledge for the group as well as the individual [Rug97].

It is common ground that knowledge may be classified as either explicit or tacit. Explicit knowledge is codified in

corporate procedures, policies, manuals, computer programmes, dialogue scripts for call centre operators and so on. Tacit knowledge is not codified. On the contrary it is 'fuzzy' and is found inside the heads of employees, in accepted but un-codified practices adopted by employees, and in an unorganised way within computers in files or large data sets.

Knowledge is created by human interaction with information [DP97] [DP98] [Hon95]. This interaction can bring about different interpretations or even different knowledge depending on the previous experience of the person interacting with the information, their access to existing information, their ability to process and understand the information, their specific purpose and their ability to communicate it effectively to those around them.

2.1 Why Knowledge Management?

During the past five years many organisations have seen knowledge as the key to the competitive advantage they need to prosper or even survive. The growth in business interest in knowledge management is largely due to its potential to contribute to a range of key business objectives, most specifically that it can improve profitability. Global organisations are focusing on knowledge management to drive innovation, refine products or customer service, refresh and re-value intellectual property and improve organisational best practice to respond faster to the market.

It is recognised that knowledge is an intangible asset, but some see it as equally important as the physical assets of organisations. The argument goes that, given the right circumstances, tacit knowledge can be converted into better practice, new products or services. In other words, creativity can convert knowledge into innovation, the lifeblood of a viable enterprise [Eco95] [Eco96].

Academic interest in 'knowledge management' has developed over the past fifteen years. Initially it was associated with artificial intelligence and expert systems [BM86] [Mac94]. Some suggest it is linked with data mining, the extraction of value and the search for patterns in huge stores of data, say, on customer transactions. Later it became associated with electronic document management systems and workflow. There is now growing interest in 'customer relations management' as a sub-set of knowledge management [Qui92].

Corporate interest in knowledge management intensified with the publication of two books, *Wellsprings of Knowledge* [Leo95] and *The Knowledge Creating Company* [NT95]. These books came at a time when US corporations were beginning to question the 'slash and burn' techniques which had become associated with Business Process Re-engineering [HC93]. It did matter if experienced employees left as a consequence of re-

engineering. The knowledge that they take with them is permanently lost to the organisation and often cannot be duplicated by the employees who remain. More alarmingly, disenchanted employees may take their knowledge to competitors, or set up in business themselves to challenge their 're-engineered' former employers.

2.2 The Role of Collaboration

The role of collaboration, such as knowledge sharing, and the creation of shared context, are neglected factors in the literature on knowledge management. More emphasis is placed on communication rather than collaboration. Communication may imply collaboration between sender and recipient, but this supposition must be tested against empirical evidence.

A study of thirty-one knowledge management projects in twenty-four companies, recognise the importance of knowledge sharing [DLB98]. The American Productivity and Quality Centre carried out a survey of the cultural barriers to knowledge transfer [OG98] [Szu94]. This found that a knowledge transfer required a supportive, collaborative culture and elimination of traditional rivalries. It assumes a basic level of organisational skills such as teamwork.

The creation of shared context is crucial to knowledge management; shared context is defined as "a shared understanding of an organisation's external and internal worlds and how these worlds are connected." [FP98]

This deserves more detailed explanation. The supposition is that shared context is developed by something more than communication, casual acquaintance or an awareness of a group of people who share interest in a topic or topics. It requires some bonding activity to take place, perhaps a face-to-face meeting, an exchange of views, the establishment of a common vocabulary, and perhaps a correlation of beliefs, attitudes and opinions about the participants. It may involve subjective factors such as whether the participants 'like' each other. It may also involve knowing that the people in the group are liked by others outside the group, whose opinion is valued by members of the group. In a business environment, shared context may be a common understanding about business direction (future vision), objectives, methods of working and spheres of influence and activity.

Groupware is built on the premise that it co-ordinates activities across time and space, and for many users this presents a radically different understanding of technology compared to previous experience [Orl93]. Groupware in the workplace increases the opportunities for collaboration, insight, knowledge production and value generation and "accelerates the conflation of learning and working"; but it is not a "dream come true", as these opportunities are seldom realised [Zub96]. Intranets offer the potential for

capturing and sharing knowledge, but in addition, it is necessary to understand team dynamics to understand how to implement groupware [Hil97]. If an organisation's culture is collaborative the technology will support that culture, but it cannot create a collaborative culture where one does not exist [Orl93].

3 Empirical Evidence

Evidence about the existence of collaborative knowledge management practices is sought by means of case studies, based on a structured interview lasting between half an hour and three hours, with follow up contacts, plus examination of published and unpublished documents including material on the internet. Data from interviews were verified and supplemented using corporate documents and externally published material.

3.1 Case studies

Case studies were carried out at Anglian Water plc, BG Technology, BP Amoco plc, Ernst and Young, and the European Bank for Reconstruction and Development (EBRD).

The organisations vary in size from 600 employees at BG Technology (within an organisation of 16,500) to over 100,000 in the case of BP Amoco. They are in different economic sectors, facing different demands for innovation of product or process. All operate at diverse locations and all have an international dimension. Three see themselves as 'global', by which they mean they operate in a global marketplace and have global competitors. One, by definition, is international, though it does not see itself as global. (It is an international organisation formed by Treaty, so it does not have competitors in the strictly commercial sense but is expected to meet normal commercial criteria in its transactions.)

All five have an intranet. In three cases this is based on Lotus Notes (which would have formerly been referred to as 'groupware'). Windows NT is used in at least one case. Most appear to have introduced an intranet when their existing groupware application upgraded to intranet technology.

In four cases there is an explicit link between the concept or term 'knowledge' and the intranet, in two cases by the use of the word 'knowledge' as part of the corporate name for their intranet.

Knowledge management is at different stages in each case. Earlier adopters of intranets, for example, BP Amoco and Ernst and Young appear to be furthest ahead with their knowledge management initiatives. However, Anglian Water's goal is to be a 'learning organisation', which they see as distinct from the concept of knowledge management. This policy is in place and fully operational.

Their intranet, despite being called "HAWK" – Harnessing Anglian Water's Knowledge – appears to play a secondary role in their knowledge management policy.

The knowledge management policy is driven by culture in one organisation, content in another, whilst at the remaining three culture and technology go 'hand in hand'. At some the initiative is a joint effort between the Human Resources and IT departments. In one, Information Scientists are in the lead. In another, the IT department is in the lead. Leadership of the project has a direct bearing on whether technology, culture or content is to the fore.

Three organisations have specific 'knowledge management tools' on their intranet platform. One is trying to use a tool which is accessible via the intranet, but is not supported. This causes difficulties in maintaining the availability of the knowledge management application. Most are search and retrieval tools. However one application produces a map of the knowledge arriving from external sources. Presented as an island with contours, this is used to demonstrate the proximity of issues and is especially useful in detecting joint initiatives between competitors.

Teams exist within all the organisations, nested within a hierarchical framework. However, some hierarchies are flatter than others. No probing took place on the definitions used by the respective organisations of the term 'team'. However, BP Amoco, BG Technology and Ernst and Young recognise the special significance of the term and have policies which provide support to teams.

3.2 Collaboration

Increased collaboration is an explicit objective of the knowledge management policy in four of the five examples. Indeed BP Amoco and Ernst and Young have active methodologies in place to develop collaboration. In one case this is explicitly to create 'Virtual Teams' and in another 'Dynamic Knowledge Networks'. Ernst and Young's policy is particularly interesting. They allow 'Communities of Interest Networks' to develop naturally. They intervene to resource the activity if it meets the organisation's criteria for business benefit in relation to overall corporate strategy. The ultimate goal is to create a "Dynamic Knowledge Network".

BG Technology recognise that communities and teams have different characteristics and need different levels of support, and both are encouraged as fora for collaboration.

Anglian Water use an aggressive socialisation programme, known within the organisation as 'The Journey' to help develop a collaborative culture. This has improved collaborative work in teams, which are an established part of the organisational hierarchy. However, networks and communities have also developed as additional means of collaboration.

The evidence shows that new collaborative corporate structures are present. They are described as 'networks' or 'communities', and only in one case as 'teams'. 'Teams', where present, appear to be a construct firmly within the power of the organisation. But 'networks' and 'communities' are allowed to develop more freely and cut across organisational and professional boundaries. All recognise that they cannot be imposed, though some encourage their development. However, a team can only be created by the organisation, and its full life cycle can be observed in the organisations under study. Teams are typically nested within hierarchical structures. There were no cases where the teams, networks or communities have replaced, or are likely to replace, the traditional hierarchies.

Increased collaboration appears to be stimulated by the increased opportunity for communication provided by information technology. This is irrespective of whether the corporate knowledge management initiative is content, technology or culture led.

3.2.1 Remarks on Collaboration

The empirical evidence demonstrates the clear value given by organisations to collaboration as an underpinning of their knowledge management policies. New internal organisational forms, called by some 'networks' and others 'communities', are prevalent as vehicles for collaboration. These compare to 'clans' and 'fiefs' which form in most organisations [Boi95] [Boi98]. Futurologists who extol virtual organisations point to the proliferation of networks as an expression of this new, more fluid, organisational form [Bar97] [DM92] [HW97].

In all cases, where these new structures are allowed to develop, they appear to make little impact on corporate policy on 'teams', except that it is recognised that teams are now better supported as a result of knowledge management. In two cases corporate delayering is one of the drivers of the knowledge management. In one case this gives emphasis to teams.

3.3 IT Support for Communication and Collaboration

The evidence demonstrates a close link between knowledge management and information technology in four of the five cases. In these cases knowledge management would not have happened without an intranet. At BP Amoco and Ernst and Young well established methodologies for developing meetings and brainstorming are in place. Information technology is integral to the development of Virtual Teams at BP Amoco and Dynamic Knowledge Networks at Ernst and Young. It supports channels of communication and collaboration and MIS (Management Information System) information for the management and development of the teams or networks.

Interestingly Ernst and Young depend upon word of mouth, rather than MIS information, to learn about the creation and early operation of 'Communities of Interest Networks', as they are allowed to develop naturally.

In four of the five cases the information technology is being developed in a way which supports the existing culture, be that culture 'person to person' or 'person to paper'. However, in one case knowledge management is being promoted as a means of making a competitive organisational culture more collaborative. This is interesting because usually collaboration is seen as the means to achieving better knowledge management rather than the end in itself.

At BG Technology the importance of using information technology to support teams and communities is recognised, but each receives a different level of support. Face-to-face meetings between team members are still regarded as important. Anglian Water relies almost exclusively on a face-to-face approach. BP Amoco and Ernst and Young are operating larger and global organisations, and take steps to reduce unnecessary face-to-face meetings (to reduce cost and maximise the effectiveness of employees' time). However, both recognise the vital importance of face-to-face meetings as a basis for developing collaboration, which can then be carried forward via technology. BP Amoco recognise that electronic media must transmit meta-data and personal information if it is to facilitate successful communication. This role underpins the support information technology gives to their model of Virtual Team-work. Consequently they are using video or web-cam technology to develop one-to-one and many-to-many contacts.

At Anglian Water a more open and collaborative culture was created by 'The Journey'. Later an intranet was built, and is increasingly being used, but it is not seen as the principal vehicle for communication or collaboration.

The case of the EBRD is interesting because it appears that the mere existence of the technology is stimulating new patterns of collaboration despite the corporate culture.

3.3.1 Remarks on IT Support for Communication and Collaboration

The evidence suggests that knowledge management in its post-1995 guise would not have evolved without the development of sophisticated communication and collaboration information technologies. In at least one of the case studies, cultural and corporate developments are mapped closely to the developing capabilities of information technology, each new technology being exploited as soon as practical. In three cases, technology is the servant, perhaps shaping the situation, but being adapted according to the specific cultural requirements of the organisation. In one case the development is cultural

and information technology plays little or no role.

3.4 IT as a Stimulus of Collaboration Between Employees

Information technology is creating the opportunity to collaborate, and in four of the five cases that opportunity is being seized. In two of the five cases, participants are steered towards collaboration by the inclusion of a collaborative metric within corporate performance assessment schemes. However, in one of these cases, it is admitted that they are yet to obtain total compliance with the scheme. The other offered no evidence to suggest that the policy has teeth. Some might suspect that cynical employees will do whatever is necessary to make the assessment metric work, which may have little to do with collaboration, but no evidence of this was found.

In the case of the EBRD, collaboration is clearly being stimulated solely by the opportunity provided by the intranet. There is some evidence to suggest that this is causing cultural waves, not all positive, because it cuts across professional boundaries.

Clearly some individuals respond positively to the opportunity to collaborate and some do not. For the former, the machine may add to, if not create, shared context. In three of the five cases, private 'team rooms' are being used for collaboration. There is corporate awareness of the importance of respecting this privacy, but Ernst and Young makes subtle and successful attempts to yield corporate benefit from it.

3.4.1 Remarks on IT as a Stimulus of Collaboration Between Employees

Machine-mediated collaboration is occurring, some of which is stimulated by corporate assessment and reward schemes, and some by peer group pressure. However, some appears to be stimulated by IT alone.

The existence of pockets of privacy within the virtual spaces provided by an intranet may be part of the attraction of collaboration. It allows individuals the opportunity to brainstorm in unorthodox ways , to be credited and recognised for their ideas and other contributions, and considerations like status may be set aside, perhaps promoting a healthy disrespect for established corporate policy. In all circumstances, collaboration via the machine-mediated workspace appears to be occurring because it brings rewards to the individuals involved.

Of course, this may only be a modern expression of the age-old informal webs of communication which exist within organisations. Though the evidence obtained on this issue is crude, it sheds light on the frequently made suggestion that successful knowledge management cannot be technology led. These findings suggest that technology-led knowledge management can provide organisations with increased opportunities for collaboration. But unless organisations are aware of the complexity and the subtlety of the human forces in play and understand how to work with them, they are unlikely to gain real benefit.

3.5 Communication

A great deal of evidence is provided on communication or the transfer of information. In all cases information technology is being used to increase the channels of communication, both between the organisation and employees, and between employees. Information technology has improved the efficiency of transferring information. Improved communication is the foundation for all the knowledge management initiatives examined in the case studies.

Standard corporate information is now being made available in original form to all employees with access to the intranet. This has the advantage of ensuring no delay in the diffusion of information and no alterations, for example, by errors in re-broadcasting it. But it does not guarantee the absorption of the information. Simultaneous diffusion is seen as important where employees have to operate standard procedures in diverse locations. Global organisations valued this improvement, finding information technology more reliable and faster than previous forms of communication, especially with asynchronous working. Indeed, some are taking advantage of the benefits of asynchronous communication which information technology facilitates.

Information technology now allowed graphics, pictures and video clips to be used to supplement written communication. Video conferencing facilities are being developed in one case as a prelude to collaboration.

Common intranet content included specific information about individuals within the organisation and their skills, known commonly as 'Yellow Pages directories'. These provide modified CVs with pictures and telephone numbers for follow-up contact. Some organisations mediate this content by making it subject to standard corporate assessment interviews. Elsewhere, established informal procedures are allowed to take their course; employees are no less likely to claim expertise in areas where they have none than they were in a non computer-mediated workspace. Indeed, there are reasons for believing that such claims will be less likely since the broadcast capacity of the intranet enhances the chance of false claims being discovered.

Establishing such a register of skills is an important 'codification' exercise in four of the five organisations studied. However, none have achieved 100% participation by employees; most are aware of the extent of take-up as a metric for judging success.

The case studies point to a huge increase in the codification of explicit knowledge made available by search and retrieval software. There is evidence that its wide availability stimulates more meaningful contact, for example when establishing project teams or solving specific problems. BG Technology, BP Amoco and Ernst and Young see this as an important contribution to corporate effectiveness.

In three cases incoming electronic data feeds such as Reuters Business Briefing are being used. Search and retrieval push technologies are found useful in filtering these feeds. Here the communication is one way – the objective is to provide high-grade information tailored to individual employees requirements. 'Information overload' is being experienced at one of the organisations.

The distinction between 'person to person' culture and 'person to document' culture [HNT99] is meaningful to those questioned in each of the case studies. Some, but not all, are conscious of this distinction when designing their knowledge management initiative and its IT support.

3.5.1 Remarks on Communication

Knowledge management as practised by in the case study organisations is focused on increasing machine-mediated communication, though not necessarily on increasing face-to-face communication.

It is possible to understand the corporate rationale for starting knowledge management by improving the means of internal communication. It is a positive first step which leaves undisturbed the more sensitive issue of the cognitive processes of knowledge generation. These issues are sensitive because they are embedded both in the individual's self-perception and the corporate culture.

Hierarchical patterns of communication and control, supplemented by informal patterns of communication, are the norm within organisations. It is clear, however, that IT supplements and augments those channels, and makes possible other internal corporate structures. In particular, the ability to compress time and space adds new communication capabilities. These are being exploited by global organisations such as BP Amoco, BG Technology and Ernst and Young. It is interesting to note that these opportunities are played down at Anglian, despite their potential to improve communication over such a large operating area. It is said that only face-to-face communication offers an equal chance to communicate to all employees.

4 Discussion: Collaboration and Knowledge Management

The evidence above suggests that there is recognition of the link between successful knowledge management and collaboration. In other words, knowledge management can be successfully developed by corporate policy (such as the decision to establish a corporate intranet) so long as this technological development is accompanied by the adoption of collaborative strategies (such as the encouragement of networks or communities of practice).

Shared context has to be created to facilitate collaboration. It may be created by an intranet, but it seems unlikely that this alone can create shared context. It is more likely to be created by a combination of face-to-face meetings and machine-mediated communications.

Networks and communities were revealed as more important structures for stimulating collaboration than teams. There is some evidence to suggest that shared context, a key ingredient for collaboration, is present in networks and communities. More detailed work is necessary on these emerging corporate forms to document their lifecycle and map the development of the collaboration they stimulate. It would be interesting to establish where they rank compared to 'groups' and 'teams' [JJ94] [SW95].

The operation of networks or communities in practice requires study to determine the extent to which they contribute to the cognitive processes of individual learning. At a higher level, do companies see knowledge management interlocking with their corporate learning and training policies? Networks and communities should be assessed to determine if they are delivering the expected rewards to the company. Other strategies for encouraging collaboration within the machine-mediated workspace must be evaluated. This has important implications for the development of business-to-business and business-to-customer e-commerce, and for IT mediated distance learning policies.

The case studies offer evidence that in four of the five cases, knowledge management delivers rewards to the organisation. However, organisations appear to be a long way from directly tapping the tacit knowledge they so value, but are gaining from its generation and transfer. This is a result of having created the right circumstances in which the generation and transfer of explicit knowledge can occur, with and without machine mediation. Employees perceive that a knowledge management policy offers them recognition, valuing their skills and knowledge, irrespective of their position within the organisation. This may play a role in encouraging employees to make full use of the corporate intranet.

More work is needed on the motivations to collaborate [Axe90] [Lun97]. Is there the wholehearted collaboration that one would expect to take place between willing and equal partners? How far does such collaboration go in the machine-mediated work-space? What is the impact of

ideals such as equality and justice?

Further work is necessary to discover why some employees collaborate via the machine-mediated workspace and why others do not. Is this a function of individual technical ability or does the presence of an intranet merely stimulate those who are already more likely to collaborate? For example, those who are altruistic, or egalitarian, in nature?

It is assumed that collaboration has to be voluntary. Yet employees enter into a contract with their organisation which implies that they must collaborate both with the organisation and with others to fulfil that contract. Collaboration which is not voluntary may not be optimal, but since organisations must make all the gains they can, it is wrong to assume that only optimal behaviour will suffice.

The creation of a machine-mediated workspace alters the culture of the organisation. The role of peer group pressure must be considered in these circumstances. It is strong in all the situations studied, where peer group pressure is judged by facility with the tools of the machine-mediated workspace.

At the outset it was assumed that machine-mediated communication alone cannot create shared context. The evidence challenges this assumption. Such shared context seems to be developing for some people, under some circumstances. Those people and circumstances are of interest to future work on the development of shared context in the machine-mediated workspace.

There is a "dynamic interdependence" between technology, group processes and performance. Group technology can both aid and hinder group dynamics, communication, participation and work patterns [HM95]. If these relationships can be mapped on to patterns of ideal or optimal interactions, it may be fruitful to use game theory to compare ideal with actual interactions using MIS data [deH99].

5 Conclusion

Organisations generally have to do those things that are pragmatically right. Time pressures dictate the adoption of the best available solution rather than awaiting the arrival of the 'ideal' solution. This is satisficing rather than optimising behaviour. The evolution of information technology clearly demonstrates that users' horizons can be lifted by the installation of a partial solution. This then allows users to define their requirements more precisely.

The technological opportunities to improve communication and increase collaboration are expanding rapidly. They will be seized by many organisations, whether or not they amount to 'knowledge management' according to an ideal definition. Knowledge management provides a rationale

for managing corporate intranets, which are burgeoning. Organisations which do not deploy that rationale may more quickly experience information overload and other detrimental effects from intranets. However, organisations which pursue knowledge management policies are more likely to succeed if they complement technological developments with the development of collaborative strategies. The encouragement of employee-run networks or communities of practice seems to be one successful strategy, providing both employees and the company with rewards from knowledge management within the machine-mediated workspace.

6 References

[AMA99] A.M.A. *Knowledge Management AMA Survey by Fax.* At www.amanet.org/research/reports.htm 1999

[Axe90] R. Axelrod. *The Evolution of Co-operation* Penguin, Harmsworth, 1990.

[Bar97] C. Barnatt. *Changing Reality. In Search of the Future Organisation* John Wiley, Chichester, 1997.

[BM86] M.L. Brodie and J. Mylopoulos (eds.). *On Knowledge Based Management Systems Integrating Artificial Intelligence and Data Base Technologies* Springer-Verlag, New York, 1986.

[Boi95] M.H. Boisot. *Information Space. A Framework for Learning in Organisations, Institutions and Cultures* Routledge, London, 1995.

[Boi98] M.H. Boisot. *Knowledge Assets. Securing Competitive Advantage in the Information Economy* OUP, Oxford, 1998.

[Buc00] B. Buckman. *Knowledge management at Buckman Labs* Lecture, City University, London, 23 May 2000.

[deH99] R. de Hoog, G. van Heijst, R. van der Spek, J.S.Edwards, R. Mallis, B. van der Meij and R.M. Taylor, "Investigating a theoretical framework for knowledge management: a gaming approach," in J. Liebowitz (ed.), *Knowledge management Handbook* CRC Press, Boca Raton, 1999, Chapter 10.

[DLB95] T.H. Davenport., D.W. de Long, and M.C. Beers. "Successful Knowledge Management Projects," *Sloan Management Review* (39:2), Winter 1998, pp. 43-57.

[DM92] W.H. Davidow and M.S Malone. *The Virtual Corporation. Structuring and Revitalising the Corporation for the 21st Century* Harper Collins, New York, 1992.

[DP97] T.H. Davenport and L. Prusak. *Information Ecology. Mastering the Information and Knowledge Environment* OUP, New York, 1997

[DP98] T.H. Davenport and L. Prusak. *Working Knowledge. How Organisations Manage What they Know* Harvard Business School Press, Boston, MA., 1998.

[Eco95] Economist, "The Knowledge," *Economist* 11 November 1995, p107.

[Eco96] Economist, "The Hitchhiker's Guide to Cybernomics," *The Economist Survey of the World Economy*, 28 September 1996.

[FP98] L. Fahey and L. Prusak. "The Eleven Deadliest Sins of Knowledge Management," *California Management Review* (40: 3), 1998, pp. 264-276.

[HC93] M. Hammer and J. Champy. *Reengineering the Corporation* Nicholas Brealey, London, 1993.

[Hil97] M. Hills. *Intranets as Groupware* McGraw Hill, New York, 1997.

[HM95] A.B. Hollingshead and J.E. McGrath. "The Whole is Less than the Sum of its Parts. A Critical Review of Research on Computer-assisted Groups," in *Team Effectiveness and Decision Making in Organisations* R.A. Guzzo and E. Salas (eds.). Jossey-Bass, San Francisco, 1995, pp. 46-78.

[HNT99] M.T. Hansen, N. Nohria and T. Tierney. "What's your Strategy for Managing Knowledge?," *Harvard Business Review* (77), March/April 1999, pp. 106-116.

[Hon95] T. Honderich (ed.). *Oxford Companion to Philosophy* OUP, Oxford, 1995.

[HW97] R. Hale and R. Whitlam. *Towards Virtual Organisations* McGraw-Hill, London, 1997.

[JJ94] D. Johnson. and F. Johnson. *Joining Together. Group Theory and Group Skills* Fifth edition, Prentice Hall, Englewood Cliffs, NJ., 1994.

[Leo95] D. Leonard-Barton. *Wellsprings of Knowledge. Building and Sustaining the Sources of Innovation* Harvard Business School Press, Boston, MA., 1995.

[Lun97] T.M. Lunati. *Ethical Issues in Economics, from Altruism to Cooperation to Equity* Macmillan, Basingstoke, 1997.

[Mac94] A. Macintosh. *Corporate Knowledge Management, State of the Art Survey* Artificial Intelligence Applications Institute, University of Edinburgh, 1994.

[Mai93] A. Maitland. In search of useful inside information *Financial Times* 14 July 1999 p13

[Mur99] P. Murray. *Emerging patterns in knowledge management in European Business* 27-35 in UNICOM, *Making knowledge management work for you* Seminar papers. London 13-14 July 1999.

[NT95] I. Nonaka. and I. Takeuchi. *The Knowledge Creating Company. How Japanese Companies Create the Dynamics of Innovation* New York, OUP, 1995.

[OG98] C. O'dell and C.J. Grayson. *If Only We Knew What We Know. The Transfer of Internal Knowledge and Best Practice* Free Press, New York, 1998.

[Orl93] W.J. Orlikowski. "Learning from Notes. Organisational Issues in Groupware Implementation," *The Information Society* (9:3), 1993, pp. 237-250.

[Ovu99] Ovum Knowledge Management Building the Collaborative Enterprise. Ovum, London. 1999.

[Qui92] J.B. Quinn. *Intelligent Enterprise* Free Press, New York, 1992.

[Rug97] R.L. Ruggles (ed.). *Knowledge Management Tools* Butterworth Heinemann Boston, MA., 1997.

[SW95] K. Stott, K. and A. Walker. *Teams, Teamworking and Teambuilding. The Manager's Complete Guide to Teams in Organisations* Prentice Hall, Englewood Cliffs, NJ., 1995.

[Szu94] G. Szulanski. *Intra-firm Transfer of Best Practices Project* American Productivity and Quality Centre, Houston, Texas, 1994.

[WS00] E.C. Wenger and W.M. Snyder. "Communities of Practice: the organizational frontier" *Harvard Business Review* (78), January /February 2000, pp. 139-145.

[Zub88] S. Zuboff. *In the Age of the Smart Machine. The Future of Work and Power* Basic Books, New York, 1988.

[Zub96] S. Zuboff "Foreword" in *Groupware and Teamwork. Invisible Aid or Technical Hindrance?* C.U. Ciborra (ed.). John Wiley, Chichester, 1996, pp. ix-xi.