

Towards Purposeful Collaboration in E-Business: A Case of Industry and Academia

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Abstract. Information and Communication Technology (ICT) helps to remove barriers and improve mechanisms that support collaboration in e-business. This paper proposes a model of purposeful collaboration analysis that helps identify the extent to which ICT supports collaboration. It is argued that the ICT components of e-business are necessary to support collaboration but in themselves are often insufficient as enablers of collaboration. The model encourages the examination of issues left unsupported by ICT and allows more focused consideration of further initiatives that might be applied to improve purposefulness of the collaboration task. The case of a retail manufacturer in a long term e-business collaborative exercise with an academic institution is used to illustrate the model. Concepts from the social practice literature are identified that might contribute to a hybrid approach to addressing the gap resulting between generic technology and situated business applications.

1 Introduction

The literature on e-business emphasises the role of ICT as an enabler and facilitator of collaboration [15] and is rarely challenged. However, there are few attempts to evaluate the extent to which collaboration is achieved through ICT. A discussion of the meaning of collaboration within a specifically e-business context depends upon the theoretical model of collaboration chosen. This paper describes a process that encourages the iterative examination of the value added to collaborative practice by ICT. This process adopts the model of collaboration proposed by theoreticians and practical analysts of social practice theory. The foundation to this school of thought is that the concept of organisational culture is most clearly expressed through the recurrent activities and work practice that evolve and emerge from individuals and groups striving to achieve expertise within a working community [18]; [11]. According to this theoretical model, specific examples of task activity within individual working environments is the appropriate domain in which to study collaborative practice. This orientation allows a process to be proposed that juxtaposes the purpose of individual collaborative tasks with the appropriate ICT tools to facilitate this task. Once task and facilitating ICT are identified, a qualitative evaluation is possible of the extent to which ICT adds value to the collaboration.

Limitations in ICT facilitation are then exposed and consideration is given to the potential of complementary socially oriented approaches. The paper concludes by proposing a general, practice-centric approach to evaluating the role of ICT in purposeful collaboration.

2 Definition of Collaboration

The notion of collaboration is a broad one. Webster's dictionary definition gives two meanings: 'to work together, especially in a joint intellectual effort' and 'to cooperate treasonably, as with an enemy occupation force in one's country' (www.websters-online-dictionary.org). The first indicates that the meaning of the term is historically and socially situated. It implies that the partners' 'joint-ness' is equal and that they share common goals, enjoy equal benefits and wield equal power. These initial assumptions about the nature of collaboration appear to be contested by much literature on observed practice in collaborative work situations [17]; [5]. The second suggests that collaboration has not always occupied high moral ground. Collaboration frequently appears to contain a strong competitive element. The notion that collaboration can go too far and become tantamount to 'fraternisation with the enemy' is another common feature of reports on collaborative practice [12]. The term 'collaborate' is often used interchangeably with 'cooperate'. The same dictionary defines this as 'to work or act together toward a common end or purpose', 'to form an association for common, usually economic, benefit' and 'to acquiesce willingly; be compliant'. The first two definitions compare closely with the 'working together' definition of collaboration, but the third definition reveals the principal difference between the terms. The implication of deference due and subsidiary status within 'cooperation' identifies the essential merit of the alternative term, 'collaboration' to those who reject any overt element of subservience in their role. This paper proposes an approach to identify the information requirements of such socio-technical systems, exploring the relationship between ICT tools and collaborative practice.

3 Collaboration in E-Business

E-business systems are now an integral component of modern business (including the business of education). The purpose of e-business is to handle trading of goods and services without the need for physical contact between trading partners or agents. It involves teams of practitioners dispersed geographically, organisationally and culturally that need to operate as a community in order to enable the technical infrastructure to work effectively. The traditional face-to-face approach to developing mutual trust and a shared understanding of the dynamics of the trading system is rarely available. Instead they develop practice within a technical system overlaid with socio-cultural rules and driven by the interpretation of corporate and departmental policy. This is what is referred to here as a collaborative system. Because e-business systems are becoming so vital, the building and operation of collaborative systems that support commercial and social purposes is critical.

Communities using these systems are highly dependent upon sharing knowledge that helps their members achieve the purpose of becoming accepted as effective practitioners by the rest of their community. In Blackler's terms they are about embodied, embedded and encultured knowledge that is located not within individuals, but distributed amongst a community of practitioners [4]. This reciprocal dependency between practice and knowledge maintains the criticality of communication, co-ordination and co-operation [2] in collaborative systems that perform satisfactorily. Sharing of knowledge is highly dependant upon the establishment of trust within practitioner communities and allows the community knowledge to be accessed and contributed to by its members.

A four year action research programme examined the development of collaborative systems within the UK retail sector. Major supermarkets all established electronic trading networks and their suppliers were effectively compelled to change their systems of trading to comply with the technical and operational requirements of these systems [14]. The structure of the collaborative systems that resulted imposed considerable differences in the amount of power that the collaborating partners could bring to bear on other partners [13], however, suppliers willingly assented to become part of the collaborative trading system as they considered that their position in the supply chain produced by the collaboration increased their chances of survival within the market as a whole [14], [6] identified the following critical actions that need to be addressed before engaging in collaborative systems:

- ~ *Agree mutually beneficial outcomes from collaboration at the start of the collaboration:* The results of this programme reflect reports of an imbalance of power and benefits in collaborative partnerships in the USA [3]. Risks are associated with both being included in and excluded from collaborative relationships.
- ~ *Control the proliferation of collaborative links:* As retailers developed their collaborative systems, the overhead for trading partners became unmanageable.
- ~ *Establish consensual understanding of data:* As collaboration relies on written communication, an agreed understanding of terminology used is essential. It is often difficult for data definitions to be agreed within an organisation and these problems are compounded across organisations.
- ~ *Address the change in skill profiles demanded by changes to working practices:* As staff profiles change, with more reliance on negotiation in written communication, training issues need to be identified.
- ~ *Revise business processes to support e-business:* Improving one part of a business process can only be successful if the other processes can support the improvement. Collaboration may improve the efficiency of order receipt but needs to be matched by improvements in order processing and distribution to avoid bottlenecks.

4 Collaboration in Academia

Academic-industrial collaboration can be interpreted as potentially beneficial from one of a number of standpoints. Firstly, from the viewpoint of national policy, it appears to provide a cost-effective means of embedding government policy into the

Higher Education sector. Secondly, from the viewpoint of those sponsoring research for the purpose of increasing national wealth and academic prestige, it provides a framework for developing research partnerships. UK government policy is to encourage the structural embedding of collaboration between industry and the Universities. However, at the level of academic and industrial practice there appear to be some generic problems. Short-term common goals that are valued by both academic and industrial partners are difficult to identify [10]. Government research funding programmes frequently address this with explicit performance measurement requirements. However, the implicit interpersonal relationships that provide the more tacit components of collaboration, such as mutual trust, are not so frequently assessed in such frameworks.

Overall, academic-industrial collaboration appears to have lacked the drive from survival or competitive pressures that typically lead industry to collaborate. In general, and with the possible exception of some practitioner-led research programmes [16], there has been an absence of bottom-up initiatives for academic-industrial collaboration. Government policy requirements have insisted that such collaboration will take place and this has led to enforced top-down collaboration in Universities when they bid for major research projects. But top-down pressure for collaboration tends not to be effective [16]. Such top-down collaborative initiatives tend to result in situations where the weaker partner drives the initiation of the partnership in contrast to industry-industry partnerships where the stronger partner provides the lead. This appears to result from a need for lower profile institutions to find a place for themselves in serving the more elite, preferred institutions in order to gain revenue and reputation.

This reflection on the impact of policy on how e-business practitioners interact in collaborative systems has been examined at a strategic level. This is useful for identifying macro influences on e-business systems but is remote from the operational practice that enabling e-business systems are intended to operate. In order to identify information requirements it is necessary to resolve specific activities where practice exists. This emphasis upon recurrent practice as the foundation upon which organisational culture sits is the subject of the next part of this paper.

5 A Practice-Based Model of Collaboration

A variety of tasks are called collaboration. Collaboration comprises many different practices and policy will impact upon them in different ways. The taxonomy proposed here will provide a means of refocusing on this interaction. The notion of collaborative practice is distributed over all shades and varieties of practice. Smith (2001) identifies categories specifically for the research area of higher education, and this has a usefully simple, if not fully explanatory function for collaborative practice in general. His categories comprise: corporate partnerships, team collaboration and inter-personal collaboration. This maps to the notion of practice at the: macro level (national/organisational), meso level (local community of practice) and micro level (individual and small group). The macro level addresses the areas of strategic consideration of overall policy within the operation of educational schemes. The

micro level addresses the activity of individual tactical educational practice. Finally, the meso level bridges the gap between these two points of the practice continuum by considering the activities of closely co-operating groups, or communities of practice that interact dynamically with other communities. This provides a means to structure discussion on how these categories of collaborative practice act and interact.

A simple model of tasks involved in collaborative practice uses examples taken from a four year action research project in a soft drinks manufacturing organisation. Interviews were conducted with an academic partner and an industrial partner to a joint project [7]. This data was triangulated with data taken from observation of collaboration between academic and industrial institutions. This provides a complementary way of integrating parts of these three models in order to look at specific examples of what is meant by collaborative practice. The model is built upon a scale where one end is occupied by practice that is predominantly controlled or influenced by academic institutions (for example, teaching and learning practice) and the other end by industrial influence (for instance, applied research and development projects). The model shows groupings of tasks observed occurring as an outcome of ongoing collaborative projects. Mapped to these task categories are examples of ICT tools and processes that were used in these areas of practice to contribute to collaborative task execution. Alongside these mappings are 'gaps' that appeared in the extent to which the technology were considered by the interviewees to have facilitated achievement of the tasks

This simple categorisation provides a rudimentary taxonomy of this example of collaborative practice observed between an academic and an industrial institution, its groups and its individuals. The development from initial types of collaborative practices to more mature forms is characterised by the taxonomy proposed in figure 1. Increasingly intensive forms of collaboration, such as that from A1 to A3, or B7 to B9, involve more developed levels of collaborative ability, motivation and cultural affinity to collaborative action. Development of the collaborative practice in this way is accompanied by a concurrent development of a number of attributes of the developed collaborative system. These include time invested in the collaborative arrangement, by a higher level of trust amongst the participating practitioners, by an ability to identify benefits accruing from the partnership, by holding some goals in common and by having begun to institutionalise, or 'tempered' the relationship in a way in which interpersonal tensions are released sufficiently to enable participants to be able to perform in the joint practice that emerges from the collaborative work system [7]

Figure 1 Taxonomy of Collaborative Practice in an Academic-Industrial Project

	Educationally oriented Purposeful Collaboration Categories	ICT Contribution	Gap for Purposeful Participation	Industrially oriented Purposeful Collaboration Categories
Micro Level	A1 Industrial practitioners - guest lectures of categorical information	e-lectures, virtual learning environment	Aligning information to other contexts of use	B1 Academics as trainers / advisors in categorical information
	A2 Industrial practitioners relate case studies for problem solving	e-lectures, virtual learning environment	Consensus of important problem	B2 Academics relating case studies for problem solving to industry
	A3 Industrial practitioners as members of academic workshops	Visualisation, modelling software	Ability to function as a team member	B3 Academics as members of industrial project team
Meso Level	A4 Groups of industrial practitioners giving access and information to academics	Email, groupware, electronic message boards	Developing common ontology of information	B4 Groups of academics giving access and information to industrial staff
	A5 Groups of practitioners give access to research to academics	Grid technology, distributed databases	Develop ways to work with communities	B5 Groups of academics provide access to research to industrial staff
	A6 Groups of industrial practitioners sharing resources and outcomes with academics	Email, groupware, standards for technology use	Developing balanced power relationships in resource sharing	B6 Groups of academic staff share resources and research outcomes with industrial staff
Macro Level	A7 Industrial institutions providing access to academic staff / students for placements	Security management procedures Operational policy	Negotiation of extent of access to resources	B7 Academic institutions provide access to industrial institutional staff for personal development and training
	A8 Industrial institutions providing access and facilities to academics for educational projects	Security management procedures Tactical policy	Negotiation of extent of access to projects	B8 Academic institutions provide access and facilities to industry for educational projects
	A9 Industrial institutions sharing resources/outcomes (joint venture)	Strategic policy	Negotiation of extent of access to rewards	B9 Academic institutions share resources/outcomes (joint venture)

The following approach to exploring collaboration is proposed:

1. Define the benefits and outcomes for each partner.
2. Define the level at which the collaboration is to take place and categorize the collaboration in the taxonomy.
3. Assess the role and contribution of ICT in enabling the collaboration in terms of process, communication, knowledge sharing and trust building.
4. Identify the 'gap' remaining for purposeful collaboration.
5. Agree changes to policy, process and/or skill profiles to address the issues in the 'gap' identified.

For example, a manufacturer approached an independent corner shop suggesting that an on-line collaborative system would be a more efficient method of placing orders, replacing the current weekly telephone order. The benefits to the manufacturer included a reduction in transaction costs. The benefits to the shop would include 24x7 flexible ordering. The proposed collaboration can be positioned at Meso level 4 as the manufacturer is offering to provide access to information about stock and pricing levels, enabled by ICT. However, this requires the shop staff to have confidence in the security and reliability of the system and confidence in their own abilities to use the system. This was addressed by significant investment by the manufacturer in the training of the store staff. Telesales staff with whom the store already had a rapport trained the store owners on their premises and sat next to them as they entered their first orders. Meso level 4 suggests that purposeful collaboration requires the development of a common ontology and this was a significant issue in this particular case. The change from telephone to on-line ordering initiated changes in process for both trading partners, new skills were needed and new policies had to be put into place to deal with situations such as wrong/incomplete orders entered/delivered. In this case, in the ordering process, transaction costs decreased for the manufacturer but increased for the store owner; ordering was 'more flexible' but more time-consuming to enter orders and find out about special offers. This led to a reduction in the quantity of products purchased. ICT supported the transaction process but was insufficient as an enabler of collaboration.

Figure 1 shows recurrent practice representing the outcome of organisational culture [1], a concept widely recognised as critical but which often acts to effectively stall analysis of knowledge and information requirements analysis and hence, the appropriate use of technology to deliver these. Simple tasks in some relatively immature areas of collaboration, for example, A1, A4, A7 appear to be effectively supported by ICT tools with highly efficient outcomes. Gaps here appeared to be concerned with effectiveness within the operational context. Complex tasks in relatively mature areas of collaboration on the other hand appeared to show that ICT tools have both less efficiency and effectiveness in supporting purpose. Social issues predominate in the choice of supporting technology and in the gaps left between this technology and overall achievement of task purpose.

This practice based model suggests that support for e-business requires an iterative, recursive approach to ICT application that identifies and situates social science based associated activity for e-business support to address these error gaps. The next section identifies concepts from within social practice theory that might be relevant to such gap management.

6 Closing the Gap in Supporting Purposeful Collaboration

The developing area of social practice theory sets as its main focus the study of organisational culture through the medium of the work practices that comprise and result from it. It covers an eclectic body of research and provides useful tools for the analysis of work practice identified through the taxonomy developed above.

Blackler's taxonomy of knowledge is a significant move away from the traditional concept of knowledge as abstract, disembodied, individual and formal [4]. Rather than studying knowledge as something individuals or organizations supposedly possess, the attribute of 'knowing' is seen as something that they do. This is used to analyse the dynamics of the systems through which knowing is accomplished. With this reorientation of approach, '...knowing in all its forms is analysed as a phenomenon which is: (a) manifest in systems of language, technology, collaboration and control (i.e. it is mediated); (b) located in time and space and specific to particular contexts (i.e. it is situated); (c) constructed and constantly developing (i.e. it is provisional); and (d) purposive and object-oriented (i.e. it is pragmatic'[4]. Blackler uses activity theory [8] to identify this knowledge situated within communities of practice. Engestrom's model of socially distributed activity systems explores the dynamics between agents, such as the users of collaborative systems, objects of activity, such as trading processes, and the community that this trading takes place within. Analysis is then carried out into how these elements are mediated. Mediation may take place by implicit or explicit rules, by roles and divisions of labour and by instruments and technology such as their information systems. This approach to identifying task dependencies is particularly useful in the micro area of task analysis identified in figure 1. At this micro level of practice activity theory treats ICT as a particular mediator of action and as such provides a valuable approach to complementing technology implementation to the community which uses it.

At the meso, or intermediate level of task analysis shown in figure 1 the concern is more about the use of technology by professional groups. Using Blackler's taxonomy of knowledge, professional groups use embedded and encultured knowledge within categories of e-business tasks and support of collaborative efforts in these tasks need to address these knowledge types. The concept of communities of practice and its associated idea of *legitimate peripheral participation* [11] is now a well established approach to understanding working groups. The example of academics and industrial workers in collaborative projects might be considered as a 'community of communities'. Dynamic social models such as this help to bring more effort to the consideration of the detailed social structure of collaborative efforts in real situations and this effort is reflected in a more considered evaluation of the purposeful deployment of ICT resources.

Finally, at the macro level, tasks involve policy and strategy formulation. The means of deployment of ICT resources to facilitate such tasks is less explicit. Strategic ICT such as data mining, visualisation aids and web based agents are often suggested for tasks in this area. However this area of practice is primarily concerned with entrepreneurship, innovation, power and negotiation. Examples of purposeful support for these processes lies with the concepts within such commentators as Foucault (1979) whose domains surround issues of power, knowledge and ethics and

provide an insight into macro levels of collaboration that might inform decisions on how ICT might be employed as a facilitating element in a particular context.

7 Conclusion

Considerable progress has been made in the use of ICT to remove the technical barriers to collaboration making it easier to communicate at a distance but this is sometimes at the neglect of the rationale for collaboration. Providing an easy means for two people to talk to each other does not mean that they will use it. The purpose of the particular collaboration, the need for this particular collaboration and the benefits for both parties in the joint practice involved in such collaboration needs to be addressed. The proposal of how this practice might be analysed in more detail involves the devolution of its study to the level of individual task analysis, rather than identifying aggregated responses to the demands of corporate policy. However, to avoid an instrumentalist approach, this needs to be carried out as an open system that recognises the impact of policy and resource effects from elsewhere in the wider environment. The approach proposed here involves the development of a basic taxonomy of practice that can be examined as individual phenomenon. The application of some of the approaches to analysis found within social activity theory provides a means to analyse the work-based behaviour. This approach provides a means to better understand the nature of the work, the knowledge associated with it and the explicit information components that are associated with that knowledge.

Two outcomes have emerged: Firstly, in the specific case of facilitating collaboration through ICT, the extent to which information systems and the ICT that delivers them can enable work processes needs to be evaluated. This evaluation allows social support processes to be identified that are necessary to both take advantage of, and support those information systems. Collaborative systems are important to successful e-business systems, which are in turn a vital component of modern business, but the nature of collaboration is not clear. This is problematical because practices can turn out to be different from what might be expected from policy specification and knowledge required by these work practices can be located in places or media inaccessible to the IS and ICT supposedly enabling them.

Secondly, an approach to improving the ability of collaborative information systems to support authentic work practice is proposed. This begins by identifying taxonomies of practice for the specific work situation under examination. It moves onto evaluate existing and proposed ICT against the local purposes of these collaborative tasks. Shortfalls or gaps in the extent of facilitation provided by these ICT tools are identified and finally conceptual tools from social activity theory are identified in order to better determine the information requirements of systems to support the collaborative practice. ICT components of e-business are necessary to support collaboration but in themselves are often insufficient as enablers of collaboration.

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