



Adoption and Usage of Collaboration Information Technologies in Australia and New Zealand

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ABSTRACT

IT can potentially play a significant role in task collaboration if it can enhance the quality of communication and coordination between group members asynchronously or synchronously. This paper empirically assesses the pattern of deployment of IT in supporting task-oriented collaboration in organizations in Australia and New Zealand. Data collected from one hundred and forty-seven organizations is analyzed to gain insights into adoption and use patterns of seven popular IT clusters that have the capability to support collaboration between workgroup members. Our analyses show that e-mail and proprietary groupware are the most widely adopted and used IT while dataconferencing tools and electronic meeting systems have the lowest level of both adoption and use

INTRODUCTION

This paper focuses on the organization context and patterns of IT adoption and use to support task-oriented collaborative work in organizations in Australia and New Zealand. Some of the technologies that can support group work have been around for nearly two decades while others have emerged over the last few years. The adoption patterns of some individual technologies like GSS (Lewis et al. 2000) and enhanced EMS or Web Groupware (Dennis et al. 1998) have been explored recently. However, there is a need for large-scale investigations across multiple technologies to inform IT practice and research.

DEPLOYING IT TO SUPPORT TASK-ORIENTED COLLABORATION

Amongst others, there are three key factors that pose challenges in trying to collaborate to accomplish tasks, especially when participants are separated geographically. These include: speed (time) for information transmission, complexity of information, and the quality of communication channels. Fortunately, the digital world can provide dependable solutions for effective and efficient collaboration (Line 1997) under such circumstances. The role of IT in distributed group process or in collaboration has also been strongly reinforced by others (Tung & Turban 1998). While a multitude of IT solutions can be deployed to support collaboration, it has been urged that research be undertaken to study distributed groups using combination of communication technologies (Tung & Turban 1998). This parallels the conventional wisdom that alternative communication channels for group collaboration are important and required (Turoff et al. 1993).

While there is little doubt that several IT clusters have the capability to lend some type of support in task-oriented collaboration, each approach has different capacity to process rich information. Information richness is the "ability of information to change understanding within a time interval" (Daft & Lengel 1986, p. 560). Since group tasks often vary, it is plausible that there is no single preferred IT that should be selected to support all types of task-oriented collaboration. A combination of several IT clusters might be appropriate in many circum-

stances, especially for important or complicated exchange of information. In general, the choice of such technologies may depend upon the amount of information required, the time requirement for information (how fast is it required), effectiveness of communication required, and efficiency of communication required (Cheng et al. 2000).

Based upon this theoretical premise, in this paper we explore the organization context and the adoption and use of seven IT clusters that have the capability to support task-oriented collaboration. Given the scarcity of empirical research exploring the adoption and use of IT-enabled task-oriented collaboration, a large-scale study was undertaken to specifically address the following research questions.

- To what extent is task-oriented collaboration being promoted in Australian and New Zealand organizations?
- What is the level of access and availability [adoption] of various IT approaches used to support task-oriented collaborative work in Australian and New Zealand organizations?
- What is the relationship between organization size, IT function size and level of adoption of IT to support task-oriented work in Australian and New Zealand organizations?
- What is the level of use of IT to support task-oriented collaborative work in Australian and New Zealand organizations?
- What is the relationship between organization size, IT function size and level of use of IT to support task-oriented work in Australian and New Zealand organizations?

The next section explains the study methodology. IT clusters and the variables included in the study are identified, along with the appropriate measures. The data collection process is outlined. This is followed by the response profile and analyses of data.

STUDY METHODOLOGY

Based upon the past literature, seven different information technologies that have the capability to support collaboration amongst work groups were identified. Examples of specific products for each of the seven technologies were also identified to guide responses. These were E-mail, Teleconferencing, Videoconferencing, Dataconferencing, Web-based Collaborative Tools, Proprietary Groupware Tools, and Electronic Meeting Systems.

Response Profile

From 500 questionnaires one hundred and forty-seven (147) responded in two rounds for and an excellent response rate of 29.4%. With such a large total response rate, it was felt that non-response bias was likely to be minimal and the responding sample would be representative. The respondents were mostly middle management, from large organizations, but with much smaller IT functions than their US counterparts.

Data Analyses

A majority of the respondents indicated that top management promoted intra and inter-organization collaboration. While Table 1 shows the descriptive statistics, 67% of our respondents either “agreed” or “strongly agreed” that intra-organization collaboration is promoted and 50% “agreed” or “strongly agreed” that inter-organization collaboration is promoted by top management. Only 38% of the respondents either “agreed” or “strongly agreed” that virtual teams were used for collaboration. Despite the promotion of collaborative efforts, only 21% of the respondents “agreed” or “strongly agreed” that there was a designated organizational position for managing and promoting collaboration in their organization. This is apparent in the low mean value of 2.32 in Table 1 for collaboration responsibility.

Table 2 shows the adoption status (number and % of adopters/non-adopters) of the responding firms along with the descriptive statistics. Adopter percentages indicate that e-mail has been adopted by almost all of the organizations, followed by teleconferencing, videoconferencing, and proprietary groupware, with Web-based tools, dataconferencing, and electronic meeting systems much lower. Looking at the extremes, the responses indicate that 98% of the firms had adopted e-mail while only 32% indicated they had EMS access and availability.

The mean values in table 2 indicate once again that e-mail has by far the highest level of adoption, followed by proprietary groupware (Lotus Notes and the like), both achieving mean adoption levels of close to a point or more than the other technologies. These figures suggest that e-mail is available to everyone and that, where adopted, proprietary groupware is made available to almost everyone. The moderate to low levels of adoption for the other technologies (teleconferencing, videoconferencing, Web-based tools and EMS) suggest that they are available to fewer users in organizations. An examination of the correlation of these adoptions levels with the type of collaboration promoted showed that promotion of intra-organizational collaboration was significantly correlated with the adoption levels of all technologies except e-mail (because it was so uniformly highly adopted there was too little statistical variation) and EMS (probably because its adoption was uniformly weak). On the other hand, significant correlations of promotion of inter-organizational collaboration occurred only with adoption of web and proprietary groupware (demonstrating their perceived rel-

Table 1. Promotion of collaboration in responding firms

Collaboration Promotion Items	N	Mean	SD	Agreement (response 4,5)	Disagreement (response 1,2)
Intra-organization collaboration	145	3.74	1.03	67%	15%
Inter-organization collaboration	145	3.38	1.01	50%	21%
Collaboration using virtual teams	145	3.02	1.15	38%	36%
Collaboration responsibility	145	2.32	1.26	21%	32%

Table 2: Adoption status of information technologies

Collaboration IT Cluster	N	Adopters	Non-Adopters	Mean	SD
E-mail	125	122 [98%]	3 [2%]	3.49	0.78
Teleconferencing	124	96 [77%]	28 [23%]	2.29	1.09
Videoconferencing	124	83 [67%]	41 [33%]	2.35	0.98
Dataconferencing	120	50 [42%]	70 [58%]	1.98	1.13
Web-based Tools	116	46 [40%]	70 [60%]	2.13	1.15
Proprietary Groupware	123	75 [61%]	48 [39%]	3.13	1.07
Electronic Meeting Sys	120	38 [32%]	82 [68%]	2.00	1.12

Table 3a. Firm size and IT adoption level

Collaboration IT	Firm Size									Sig. Level
	Small			Medium			Large			
	N	Mean	SD	N	Mean	SD	N	Mean	SD	
E-mail	24	3.63	0.71	81	3.41	0.96	20	3.15	1.09	0.252
Teleconferencing	23	1.57	1.67	81	1.73	1.28	20	2.20	1.24	0.275
Videoconferencing	24	0.75	1.22	80	1.74	1.39	20	1.90	1.07	0.003**
Dataconferencing	22	0.73	1.28	78	0.83	1.21	20	0.90	1.25	0.897
Web-based Tools	22	1.27	1.55	74	0.65	1.09	20	1.10	1.45	0.078*
Proprietary Groupware	24	2.29	1.88	79	1.86	1.74	20	1.65	1.60	0.441
Electronic Meeting Sys	23	0.74	1.29	77	0.61	1.60	20	0.60	1.10	0.882

evance and their ease of adoption via the Internet for this type of collaboration).

In order to gain insights into the relationship between size-related contextual variables, three logical groupings of organization size (number of employees) and IT function size (total number of IT employees in the organization) were created.

A one-way ANOVA was used to test for any differences in mean adoption levels of the seven IT clusters between the three organization size and three IT function size groupings. Tables 3a and 3b show the summarized results. There were significant differences in mean adoption levels of two IT clusters between the three organization size groupings and the same two IT clusters between the three IT function size groupings. Videoconferencing was significantly less adopted by the smaller firms, perhaps reflecting the significant capital and current costs associated with providing such a facility. The adoption of web-based tools showed a moderately significant variation, with higher adoption by both small and large firms than for medium-sized firms. These may be attributed to a number of interacting factors (types of tasks, team structures, industries, etc.) which may require further investigation.

When considering the relationship of adoption of IT to IT function size, the general pattern is similar with the same technologies showing significant variation on IT function size (namely, videoconferencing and web-based tools), perhaps for similar reasons.

It is also important to know to what extent they are actually being used. Table 4 shows the utilization status of IT for collaboration along with the descriptive statistics. Level of use figures parallel the adoption results. E-mail is being used by almost all of the organizations (98%), followed by teleconferencing, videoconferencing, proprietary groupware, dataconferencing, Web-based tools, and finally EMS (33%).

As with organizational adoption, e-mail and proprietary groupware were the most highly used technologies with average levels of 3.48 and 3.01, respectively. The former reflects the acceptance of e-mail by users as a common, fundamental collaboration technology, while the latter may reflect the range of easy-to-use tools they provide but also their association with the e-mail system (as with Lotus Notes' mail system, for example). Videoconferencing and teleconferencing seemed to have moderate use, while the others were used much less. Thus, it

Table 3b. IT function size and IT adoption level

Collaboration IT	IT Function Size									Sig. Level
	Small			Medium			Large			
	N	Mean	SD	N	Mean	SD	N	Mean	SD	
E-mail	28	3.57	0.84	45	3.40	0.84	52	3.33	1.08	0.545
Teleconferencing	28	1.43	1.48	44	1.70	1.39	52	2.03	1.24	0.165
Videoconferencing	28	1.00	1.15	44	1.39	1.47	52	2.04	1.25	0.002**
Dataconferencing	27	0.70	1.03	41	0.63	1.20	52	1.04	1.31	0.241
Web-based Tools	27	0.81	1.33	39	0.51	1.07	50	1.12	1.33	0.080 ⁺
Proprietary Groupware	28	2.14	1.92	43	1.67	1.70	52	1.98	1.70	0.509
Electronic Meeting Sys	27	0.85	1.49	42	0.50	0.92	51	0.63	1.06	0.449

Table 4. Level of use of information technologies

Collaboration IT	N	Users	Non-Users	Mean Use	SD
E-mail	123	120 [98%]	3 [2%]	3.48	0.74
Teleconferencing	120	96 [80%]	24 [20%]	1.99	0.83
Videoconferencing	120	84 [70%]	36 [30%]	2.02	0.84
Dataconferencing	110	46 [42%]	64 [58%]	1.63	0.64
Web-based Tools	105	39 [37%]	66 [63%]	1.69	0.83
Proprietary Groupware	117	74 [63%]	43 [37%]	3.01	1.14
Electronic Meeting Sys	109	36 [33%]	73 [67%]	1.64	0.83

appears that even when the technology is available in the enterprise, several of these tools are seldom used in most firms at this point. In examining the correlations with the types of collaboration promoted, again significant positive correlations were found between promotion of *inter*-organizational collaboration and both web and proprietary groupware (both internet-based). On the other hand, most technologies associated positively with promotion of *intra*-organizational collaboration.

Tables 5a and 5b show the only significant differences in mean utilization levels among the seven IT clusters between the three organization size groups was for videoconferencing, while between the three IT function size groupings both videoconferencing and web-based tools were significant. Videoconferencing usage increased significantly with size (on both measures), perhaps indicating that the larger Australian and New Zealand organizations are more dispersed and decentralized, so with greater resources at their disposal are able to make available this form of collaboration support which has a higher level of media richness, thus making usage more attractive to the users (Daft and Lengel, 1986). For most technologies the means for level of utilization were greater in organizations with larger IT functions.

For the IT function size, the general trend suggests that organizations with small IT functions are generally more likely to exhibit lower levels of utilization of IT supporting collaboration than organizations that have large IT functions. However, five of the seven are not significant. These are videoconferencing again and web-based tools which are lower in utilization in firms with medium-sized IT functions and higher at the extremes.

Table 5a. Firm size and level of IT use

Collaboration IT	Small			Medium			Large			Sig. Level
	N	Mean	SD	N	Mean	SD	N	Mean	SD	
E-mail	25	3.36	0.99	80	3.40	0.88	18	3.44	0.98	0.956
Teleconferencing	23	1.35	1.11	79	1.63	1.13	18	1.72	0.83	0.470
Videoconferencing	24	0.75	0.99	78	1.56	1.22	18	1.67	0.77	0.006**
Dataconferencing	21	0.52	0.81	73	0.70	0.92	16	0.81	0.98	0.613
Web-based Tools	22	0.64	0.90	67	0.54	0.91	16	1.00	1.21	0.227
Proprietary Groupware	24	2.29	1.76	75	1.84	1.72	18	1.67	1.64	0.437
EMS	21	0.43	0.75	72	0.56	0.96	16	0.63	0.89	0.791

Table 5b. IT function size and IT use

Collaboration IT	Small			Medium			Large			Sig. Level
	N	Mean	SD	N	Mean	SD	N	Mean	SD	
E-mail	29	3.14	1.03	44	3.55	0.70	50	3.42	0.99	0.171
Teleconferencing	27	1.33	1.07	43	1.63	1.16	50	1.70	1.04	0.359
Videoconferencing	27	1.11	1.09	44	1.27	1.32	49	1.71	1.00	0.055*
Dataconferencing	25	0.84	0.94	38	0.47	0.86	47	0.77	0.91	0.207
Web-based Tools	24	0.54	0.88	37	0.38	0.79	44	0.89	1.08	0.052**
Proprietary Groupware	26	2.19	1.77	42	1.69	1.76	49	1.94	1.66	0.500
Electronic Meeting Sys	26	0.65	1.23	38	0.53	0.76	45	0.49	0.82	0.759

DISCUSSION

There was widespread agreement that both intra- and inter-organizational collaboration is being promoted in a large proportion of firms. This would seem to confirm the commonly reported perception that collaboration is an increasingly important activity in modern organizations. The use of virtual teams seems to be growing in the majority of respondents' organizations. This would seem to imply a growing need to support such virtual teams, which should be an opportunity for the use of appropriate IT systems.

E-mail and teleconferencing are the most heavily adopted, as measured by the *proportion* of adopters. IT clusters for supporting collaboration, with 98% and 77%, respectively, reporting that these technologies are available to at least some members of their organizations. While substantial majorities of respondents indicated that proprietary groupware and videoconferencing were available in their organizations, significantly fewer reported adoption of Web-based tools and dataconferencing, and only 32% reported the availability of EMS.

Amongst adopters, proprietary groupware joined e-mail with a high adoption *level*, indicating that when they do make it available to users, organizations tend to provide it for all. The adoption level of teleconferencing and videoconferencing are much lower (despite a relatively higher proportion of adopters), suggesting they are provided more selectively. Web-based tools, dataconferencing and EMS are available to relatively fewer users in fewer organizations. Further, it seems that adoption levels of most technologies correlate highly with the promotion of *intra*-organizational collaboration, while only internet-based technologies such as proprietary and web-based groupware correlate highly with the promotion of *inter*-organizational collaboration.

In general, it appears that larger firms, and firms with larger IT departments may be likely to adopt many of these IT clusters and make them available to users. This may be due to the resource and support requirements for these technologies. However, the relationship to of adoption to size measures are fairly weak for most of these technologies. By contrast, the U.S. study found most of the relationships fairly significant (Bajwa and Lewis, 2002), thus indicating that assumptions about similar cultures of collaboration (in the U.S. and Australia/New Zealand) may need to be examined in much more depth.

In terms of level or frequency of use, e-mail once again dominates, followed by proprietary groupware. E-mail is the only technology that was commonly reported as being used frequently for the support of collaboration, while proprietary groupware is used less frequently, but more often than any of the other technologies. This was different from the US where teleconferencing was second to e-mail with usage levels much higher than proprietary groupware and the other technologies. The use of the other IT clusters was reported by most firms as relatively infrequent, with EMS use significantly lower than most of the other technologies.

Except for videoconferencing, the general usage pattern does not seem to vary significantly across either different size of firm or different size of IT function. Therefore, in the Australian and New Zealand context, usage behaviours seem to be similar in different sized firms. This was not the case in the U.S. study, where size was a factor for most of the technologies (Bajwa and Lewis, 2002). The lack of significance in this study may be related to the sampling population which consisted of large firms by Australian and New Zealand standards. Nevertheless, though the organizations were large in total revenue there was quite a variation in terms of number of employees in the IT function and the organization as a whole, so it may be necessary to consider the impact of other issues (structure, style, economy, etc.) to be understand the adoption and use of these task-oriented collaborative technologies.

CONCLUSIONS

This study confirms that collaboration is an important issue for firms in Australia and New Zealand, and that many firms are promoting collaboration and increasing their use of virtual teams. There does seem to be a perception that IT can be useful in supporting collaboration, with virtually all firms reporting the adoption and use of some form of IT for collaboration support. All the IT approaches studied in this

project have been adopted to at least a minimal extent by a majority of the firms participating, except for EMS which have a low adoption rate of about 32%. Adoption rates appear to be unrelated to firm size and size of the IT department.

However, when we look below the surface of initial adoption, the picture is somewhat different. Only e-mail is used by most firms with high frequency. Proprietary groupware (most likely primarily Lotus Notes) is used with high frequency by a smaller, but significant number of firms. All the other technologies are used with low frequency or not at all. The size patterns appear to be different between the U.S. and Australia/New Zealand and this may lead to questioning of the assumption that if these countries all follow a 'western' culture their collaboration patterns and the need for IT support of collaboration should be similar. Other issues such as organizational structure, corporate style, size and structure of economy, and extent of foreign ownership may all have a part to play. This may have implications for vendors, practitioners, educators and researchers of this technology

Why is it that many of these IT systems are used with such low frequency? Are the systems poorly designed? Are they a poor fit to organizational needs? Is it difficult to convince users to try these technologies? Are developers doing a poor job of demonstrating the benefits? Does the success of these systems depend on an internal champion and collaboration manager? This project has investigated such issues in both the U.S. and in Australian/New Zealand for one technology, EMS, and the results have been reported elsewhere (Lewis & Bajwa 2001; Pervan and Lewis, 2002). However, the current study does not answer these important questions for the remaining technologies, but proposes them for future research. In addition, this study presents only a snapshot of IT use for collaboration at one point in time. We are not able to discuss how these patterns of adoption and use are changing over time.

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