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# SUPPORTING JOINT APPLICATION DEVELOPMENT (JAD) WITH ELECTRONIC MEETING SYSTEMS: A FIELD STUDY

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## ABSTRACT

One of the more common approaches to involving users in the system development process is called JAD (Joint Application Development). The JAD approach is based on highly structured, facilitated meetings and, as such, has the potential to be supported by Electronic Meeting Systems (EMS). A multiple-site field study was conducted in which JAD meetings — both traditional and electronic — were observed. Some differences between JAD and JAD supported by EMS were found. The quality of group member participation was more equal in supported JAD meetings, but supported JAD meetings lacked the session discipline of traditional JAD. Further, conflict resolution (closure) emphasized in traditional JAD was not achieved in several electronic sessions. Overall session management activities — the responsibility of the facilitator for integration of the session with other life cycle activities — was weaker in JAD supported by EMS.

One of the leading methodologies for *user involvement* and *user participation* in the system development process is called JAD. JAD (Joint Application Development) involves users in a series of structured meetings which, traditionally, have benefitted from little explicit computer support. Yet, given the highly structured nature of JAD meetings, and the predominant role of the JAD facilitator, it appears that JAD meetings have the potential to benefit from additional computer support. Our research question is how and whether JAD can benefit from computer support in the form of Electronic Meeting Systems (EMS) (see Figures 1 and 2). The study we conducted to investigate this question can be classified as descriptive, as there is no theory of JAD and no overarching theory of EMS. Dubin (1978) argues that “there is a fundamental place for accurate description in any science. Description...provides the input for developing units of a theory, its laws of interaction, the system states, and the boundaries of the model” (p. 219). Our findings are a starting point for the development of a theory of meetings, supported by computing and not, that includes structured processes such as JAD. Our study also has practical implications — similar to those of Olson and Olson (1991) — for identifying opportunities for successful computer support.

We begin with a literature review of the intersecting methodologies and technologies, describe our field study ap-

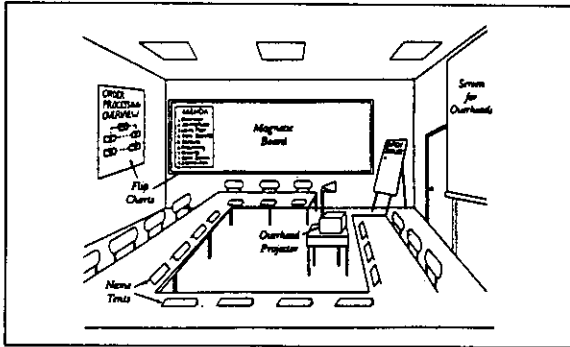
proach, and discuss our observations of JAD sessions for four broad process-related areas of interest.

## 1. LITERATURE REVIEW

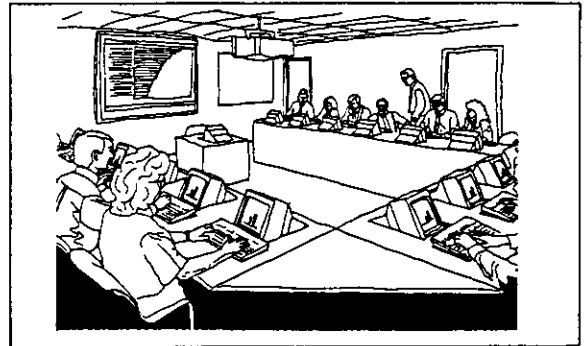
Our review of literature and practice encompasses several intersecting fields: JAD, Electronic Meeting Systems, and the focus of our research, Electronic-JAD.

### 1.1 Joint Application Development

JAD<sup>1</sup> came about because of a pragmatic realization that more intense user participation would lead to better systems. The practical operationalization of increased user involvement is to focus on meetings (sessions) in which all the “involvement” (dialogue) takes place. The JAD user meeting then becomes the event around which the rest of the system development activities revolve. The approach is *participatory* in that the users are queried more (and hence involved more) than users typically were before the advent of JAD. The innovation in the JAD approach, as it has developed today, is that the user meeting is structured, disciplined, and is a foundation of the Systems Development Life Cycle (SDLC). JAD is said to lead to increased quality, reduced costs, and life cycle time reduction.



**Figure 1. A Typical JAD Room  
(From Wood and Silver 1989)**



**Figure 2. A Typical Electronic Meeting Room**

JAD originated at IBM in the late 1970s and began attracting broad industry-wide attention only several years later (Rush 1985; EDP Analyzer 1986; Gill 1987). The interest in the JAD approach has remained exclusively in industry where (by extrapolating figures from various sources) we estimate that there have been well over ten thousand JAD-like meetings. The JAD approach is instilled in its practitioners through manuals (Guide 1986), books (Wood and Silver 1989; August 1991; Martin 1991), and continued exposure in the trade press (Martin 1990a, 1990b; Andrews 1991; Crawford 1991; Hill 1991). As JAD has matured, it has become part of industry's "new thinking" about systems development methodologies: a component of *Best Current Practice* (McDonnell Douglas 1991) and of RAD (Martin 1991). JAD is a practitioner's tool with a strong practical flavor, but there has been little if any academic research on the topic. Some industry research has been performed (Jones 1991; Rubin 1990; Guide 1986; EDP Analyzer 1986).

There is no one structure or definition for JAD. Over the years, JAD has evolved to become a framework for "how to run a meeting." Users attend the meeting to define or design an information system. The JAD approach is both a technique and a methodology. It is a technique because it is a structure for conducting a design meeting with user participants. It is a methodology because when introduced into the SDLC, JAD sessions/workshops/meetings form the core around which all of the activities revolve.

The JAD approach emphasizes structure and agenda. This is evident in the JAD literature that reads somewhat like cookbooks (IBM 1986; Guide 1986; Wood and Silver 1989; August 1991). Everything is explained in great detail: "to do" lists are included, as are copies of useful forms.

There are four necessary building blocks for a JAD session:

1. *Facilitation.* A designated leader (or leaders) manages the meeting. Most JAD practitioners consider the meeting leader to be key to process success, even

above the act of gathering the users in one place, the *raison d'être* of JAD. The facilitator (a member of neither the IS team nor the user group) is specifically trained to lead such meetings. The facilitator should have training in group dynamics (or an instinctive flair), and in systems development methodologies. She is responsible for all activities: the agenda, the discussion, and documentation of the session results. She carefully controls all discussions, guiding, interrupting and cutting off discussion where necessary.

2. *Agenda setting/structure.* The meeting must have a plan of action.
3. *Documentation.* A designated person (or several people) carefully documents everything in the meeting. He is often referred to as a *scribe*. Lists are rigorously maintained.
4. *Group Dynamics.* Group dynamics techniques such as those described in Doyle and Straus (1976) are used for inspiring creativity (e.g., brainstorming), resolving disagreements (e.g., airing facts, documenting them as "issues," taking notes), and handling speaking protocols (e.g., enforcing "one conversation at a time").

A typical JAD session early in the SDLC has participants compiling a list of assumptions, constraints and open issues; targeting specific people and organizations for tasks; and constructing timelines. Lists and other text are often maintained on wall charts, such that the walls end up being covered with flip-chart paper. Some facilitators encourage the users to roam around the room and fill in the wall charts (DEC 1990), while the more traditional techniques allow only the facilitator to control the marker. The use of creative visual aids is broadly recognized as helpful to assist users, many of whom are IS novices at developing information systems, in visualizing the software (one vendor offers a \$400 suitcase of custom-designed magnetic color-coded symbols). JAD vendors emphasize the facilitation skills of their professionals as the main contribution of

**Table 1. Comparison of Classic Design Meetings to JAD Meetings**

Dimension	“Classic” design meeting	JAD meeting
User involvement in meeting	Low to non-existent. Usually only IS designers are involved	Intensive involvement, but problems of training and understanding exist.
User involvement in between meetings	Low to non-existent	Low
Meeting control technique	None, democratic ethos	Facilitated, <i>not</i> democratic
Process technique	usually none	regimented agenda with specialized tasks
Typical meeting size	3 to 5	5 to 15

their services. Today, many JAD sessions are conducted using CASE tools: graphic tools for depicting data flow diagrams, Entity-Relationship diagrams, state transitions and other diagramming techniques, and screen painters. Table 1 contrasts the better-known “classic” design meeting and JAD. (For related research on design meetings see: Xerox PARC, Tang and Leifer, 1988; MCC, Ellis, Gibbs and Rein 1991; and the University of Michigan’s Machine Intelligence Center, Olson and Olson, 1991).

## 1.2 Electronic Meeting Systems

JAD is fundamentally a meeting technique and as such may be supported by a new type of software environment: Electronic Meeting Systems (EMS) (Dennis et al. 1988). EMS combines technology, procedures and facilitation to make meetings more effective.

One of the significant research efforts in this field, and one on which the rest of this study is based, is the University of Arizona GroupSystems, referred to from hereon in as GroupSystems (Dennis et al. 1990; Nunamaker et al. 1991) (also see Figure 2). At this writing there are approximately one hundred EMS globally using GroupSystems. GroupSystems is the result of the Plexsys project (Nunamaker et al. 1992), which in turn evolved from one of the first attempts to automate the systems development process: PSL/PSA. In the 1970s, the Plexsys researchers encountered a frustrating real-life problem: the “users” of a Navy system hired consultants to define system requirements for them instead of specifying them using PSL/PSA. This experience pointed to the need for computer support of the user requirements stage and led to the development of the now well-known computerized meeting rooms. Once this room was in place, it was discovered that it was useful for general managerial planning activities, which is the direction of much of the early research. The study described in this paper is a closing of the loop of the original philosophy of Plexsys — a return to its roots in the domain of requirements definition and elicitation.

During the last decade of EMS research, no overarching theory of EMS has emerged, but other theories have been used as a basis for EMS study. Two of the more prominent theories involve group process gains and losses (Nunamaker et al. 1991) and adaptive structuration theory (Poole, Holmes, and DeSanctis 1991). Both applications of theory stress that outcomes from EMS use are not deterministic. Rather, they depend on either the balance of process gains and losses resulting from EMS use (Nunamaker et al. 1991), or on the nature of the EMS and how the group chooses to use it (Poole, Holmes and DeSanctis 1991). Whatever the actual mechanism, EMS use can affect how a group behaves and performs in a meeting, and this in turn helps determine the outcomes. One of the more discussed effects is the potential for the equalization of participation (Nunamaker et al. 1991). Several other potential group outcomes mediated by EMS use include decision quality, consensus, satisfaction, and time to decision (Dennis et al. 1988; George et al. 1990).

## 1.3 Electronic JAD

With the proliferation of EMS in many locations and the obvious overlap between EMS and JAD, it was not long before essentially “automated JAD sessions” began taking place. IBM personnel reported conducting several such sessions in some of their electronic meeting rooms as early as 1989. Some JAD-like sessions were conducted on an experimental basis at the University of Arizona (Ram et al. 1989; Daniels et al. 1991) and at the University of Minnesota (Wanninger and Dickson 1992). Several framework papers have appeared (Nunamaker et al. 1992; Carmel, George and Nunamaker 1992), but the study described here is the first broad treatment of JAD use in electronic meeting rooms. In 1989, the term *Electronic-JAD (E-JAD)* was coined at the University of Arizona to describe EMS support for the JAD process.

**Table 2. Demographics of Organizations and the Respective Projects**

Organization/ Session	Organization type	Project
MUNIC1	Large municipality	Risk Assessment
MUNIC2		
FINANCE1	Fortune 500 Lender	Tax subsystem
FINANCE2		Executive Information System
SCHOOL	Large school district	Personnel system
AERO	Major aerospace co.	Cost accounting
COMPUTER1	Major computer co.	Data Administration
COMPUTER2		Equipment leasing
COMPUTER3		Order entry
MILITARY1	Branch of military	Base logistics
MILITARY2		Base scheduling

**Table 3. The Demographics of the Study's Sessions**

(IC = Incomplete/unreliable data)

Session Name	JAD type	Duration in days	Net hours in JAD session (net of breaks)	Number of users	Number of other participants
MUNIC1	Traditional	0.5	3.3	3	5
MUNIC2	Traditional	0.5	4.25	3	4
FINANCE1	Traditional	0.5	1.75	6	4
SCHOOL	Traditional	1	8.25	10	2
AERO	Traditional	0.5	2.0	2	3
COMPUTER1	Electronic	4	17.0	11	3
COMPUTER2	Electronic	10 half days	IC	17	3
COMPUTER3	Electronic	1	5.25	9	5
FINANCE2	Electronic	0.5	2.15	21	4
MILITARY1	Electronic	4.5	30.30	17	7
MILITARY2	Electronic	3	18.35	7	5

## 2.0 METHODOLOGY

We chose to conduct a multiple-site field study (Benbasat, Goldstein and Mead 1987) because the field is where JAD is practiced and best understood, and because of the importance of studying it in its natural context. JAD sessions are thought to be effective for systems and organizations in the large, where large complex webs of issues and items exist that are represented by the people and the entities involved.

The unit of analysis is the *session*. Eleven sessions were studied in detail: five Traditional JAD (T-JAD from hereon) sessions and six Electronic JAD (E-JAD) sessions (Tables 2 and 3). All organization names reported here are pseudonyms. The study involves snapshots of JAD sessions that occurred during actual system development in a variety of settings and conditions.

Data collection was conducted by multiple means: Pre- and post-session interviews with key people in each session, in-session observations, document collection, post-session questionnaires, a participation table (discussed in Section 3.1), and a timetable of activities. Qualitative and quantitative data complement each other and serve as a form of triangulation. All data were systematically and carefully collected (see Carmel [1991] for additional information). The questionnaire data were aggregated by session and compared by JAD type (E-JAD and T-JAD). Due to small sample size, Mann Whitney/Wilcoxon non-parametric tests failed on all questions.

The sample of sessions is a convenience sample. Although not perfectly representative of all JAD sessions (as no sample with six organizations can be), the organizations studied were fairly diverse in that some are public and some private, they represent a spectrum of products and services, and the sessions themselves were spread out over three states.

The comparisons need to be examined carefully because there were many factors which differentiated the sessions and could not be controlled for: E-JAD sessions had more participants than T-JAD sessions; the tasks performed varied across the sessions; none of the JAD approaches were done systematically (JAD is a fairly loose framework and there is no E-JAD methodology as of yet); the specific GroupSystems tools, their order and duration, varied from session to session; and facilitation behavior also varied.

We focused on four specific areas of interest in the study: equality of participation and equality of influence, degree of session discipline, identifying and resolving conflicts, and session facilitation. These specific areas were chosen because of their important roles in the JAD process in particular and also, in some cases, because of their relevance to the EMS literature. Each of these areas, why they were of interest, and our expectations regarding them will be examined in turn in the next section.

## 3.0 AREAS OF INTEREST AND FINDINGS

We examine four process areas in the study.

### 3.1 Equality of Participation and Equality of Influence

The JAD group dynamics are said to foster openness to encourage greater breadth of input. This in turn is supposed to help lead to better design and greater user ownership of the system being developed. Related to equality of participation is equality of influence. If one or more participants dominate systems development meetings, the benefits from the potential for equal participation are lost. For example, Franz and Robey (1984) found, in a case study of user-led design, that one particular user came to dominate the system development process to the detriment of others. In summary, it seems that the JAD approach strives to equalize participation and influence.

As stated earlier, theory and research have pointed repeatedly to equality of participation as one of the main changes in group process in electronic meetings. This seems to stem from anonymity, which decreases the threat of critical feedback to ideas (i.e., evaluation apprehension), and from parallel work, which increases access capabilities.

Given the potential of EMS to equalize participation, we expected E-JAD groups to demonstrate more equal levels of participation. We examined the differences in rate of participation between E-JAD and T-JAD. All of the sessions — electronic and non-electronic — had an uneven contribution of users. The data do suggest, however, that in some ways E-JAD sessions had greater equality of participation, supporting our expectations.

Table 4 summarizes session participation data for IS staff, the facilitators, the users, and the EMS. Columns 1 through 3 were gathered by noting the speaker (e.g., whether it was a user, etc.) at frequent fixed time intervals during the sessions. When GroupSystems was used (column 4), there was no speaker. The right-most column (combining user and EMS time) allows the reader to inspect the data using a key assumption: that participation in a GroupSystems activity is, by definition, democratic and equal, and thus serves to equalize participation. Past EMS research has supported this assumption. Also, we observed that, as a general rule, all users contributed to the electronic sessions through the keyboard. The data reveal that, on average, E-JAD sessions allowed the users greater participation time either verbally or via GroupSystems and hence seems to have an equalizing effect on participation.

The questionnaire results unanimously point to a perception, on the part of the users, of greater equality in E-JAD sessions, as indicated by two influence measures: Influence1 and Influence2. The first measure indicates that there was a higher perception of equal participation in E-JAD than T-JAD (3.08 for E-JAD, 3.38 for T-JAD, where 1 is "very equal"). The second measure is perhaps the strongest indication. In spite of the considerably larger groups in the E-JAD sessions, on average, each of the participants felt that they contributed more than those in T-JAD sessions (E-JAD: 3.02; T-JAD: 2.94; where 5 means "I played a major part").

**Table 4. Participation. Percent of total in-session time.**

(IC = Data incomplete or unreliable; NA = Not applicable  
(EMS is not used in T-JAD))

Session Name	JAD Type	IS staff (1)	facilitator(s) (2)	users (3)	EMS (4)	(3) + (4)
MUNIC1	Traditional	9	66	25	NA	25
MUNIC2	Traditional	2	47	51	NA	51
FINANCE1	Traditional	IC	IC	IC	NA	IC
SCHOOL	Traditional	0	36	64	NA	64
AERO	Traditional	31	31	38	NA	38
COMPUTER1	Electronic	IC	IC	IC	46	46
COMPUTER3	Electronic	15	10	15	57	73
FINANCE2	Electronic	IC	IC	IC	47	47
MILITARY1	Electronic	IC	IC	IC	78	78
MILITARY2	Electronic	IC	IC	IC	77	77
Avg T-JAD						44%
Avg E-JAD						64%

### 3.2 Degree of Session Discipline

JAD is an approach that emphasizes discipline, structure, and rigor; it is a structured meeting with an agenda, objectives, rules and regulations. The JAD literature points to session discipline as important in bringing about a successful JAD session, although the EMS literature is silent on the topic. We chose two aspects of session discipline: an objective one, utilization of time, and a subjective one, session mood. We have no theory on which to base expectations, so we have none.

Time utilization (maximizing productive work time) was measured in two ways: as "net group work" time and by an item in the post-session questionnaire. The time spent on work activities was recorded and compared to total session time, resulting in net work time. The average net group work for T-JAD was 83%, while net group work for E-JAD was only 60%. The questionnaire assessment supported this: the average E-JAD user response was 4.20 and the average T-JAD user score was 4.53, on a 5-point scale where 5 was the least amount of wasted time.

The more striking difference was in the session *moods*. In marked contrast to the JAD task-oriented approach where rules such as "everyone takes a break together" are enforced, three of the E-JAD sessions bordered between informal and chaotic. The three E-JAD sessions in ques-

tion (COMPUTER1, FINANCE2, MILITARY1) were in separate locations, coordinated by three different facilitators — all of which suggests a possible correlation. One session could be described as a "party," another as a "social gathering," and the third in terms such as "warfare" and "disruptive." One possible explanation is that the absence of the leader/facilitator removes the element of discipline allowing the participants to get up from their independent and collaborative electronic tasks and wander away to (respectively) listen to rock music, eat at the buffet, smoke and debate politics outdoors. As EMS users have pointed out, it is difficult to sit for extended periods in an electronic meeting and frequent breaks are desired. Sitting for long periods of time in a JAD session can also be a problem, but computer work (e.g., typing, reading screens) adds another dimension in that the everyday user cannot do it for an extended period of time without diversions.

### 3.3 Identifying Conflicts and Resolving Conflicts

We define conflicts to include disagreements, differences in interpretations, semantics, as well as broader political and ideological differences. Conflict can be seen as a way to generate stimuli that lead to creativity, which in turn leads to exploring issues in depth. Conflicts are therefore treated as "constructive" if managed properly, although, clearly,

conflicts are often destructive, disruptive, and time consuming. One of the advantages of the JAD methodology over the traditional method is that the users — the peers — themselves are said to resolve their differences instead of leaving it to analysts or an executive third party (Guide 1986). The JAD approach has a semi-formal way of dealing with conflicts. The (typical) *JAD conflict model* consists of six stages: 1) Creates an atmosphere that “discovers” conflicts of viewpoints and conflicts of interest; 2) Identifies the conflicts (or “issues” in JAD parlance); 3) Documents the conflicts; 4) Discusses alternative solutions; 5) Resolves the conflict (through consensus, impasse strategies, executive fiat, or voting); 6) Documents the resolution.

The JAD conflict model has within it techniques which support both divergence (i.e., inducing conflict) and convergence (i.e., conflict resolution; for example, agreeing on the wording of a document). This is the convergence-divergence dialectic of the meeting which is very difficult to manage properly. EMS research has measured consensus (convergence) as a dependent variable and has shown that consensus is less likely with EMS (George et al. 1990; Turoff and Hiltz 1982), or there is no difference (Watson, DeSanctis and Poole 1988). Poole, Holmes and DeSanctis (1991) demonstrated that groups working with EMS surface and resolve conflict differently than groups working with more traditional meeting techniques. They attributed some of these differences to the use of the EMS. However, they also found that not all EMS groups used the technology in the same way, with some using EMS for productive conflict management, while others ended up inhibiting such outcomes. These findings support adaptive structuration theory. Therefore, we would expect E-JAD groups to handle conflict differently than T-JAD groups, but we would also expect there to be a large amount of variance across E-JAD groups in managing conflict.

We focus here on the most critical stage: Stage 5 (resolve the conflicts). While there was at least some closure in T-JAD sessions, in two E-JAD sessions (COMPUTER1 and FINANCE2) there was almost no “closure” (resolution) on issues that came up. In both sessions it was left to the principal analysts to synthesize the text, discover the differences and then resolve the differences *after* the session. Thus, there is a danger that E-JAD may dilute the powerful techniques of a JAD session by losing the conflicts in a mountain of (electronic) text. In contrast, in other E-JAD sessions (MILITARY1 and MILITARY2) specific steps were taken to document and resolve conflicts (or “issues” as they are called in JAD parlance) using the Idea Organization tool. That E-JAD groups did handle at least some conflict differently from T-JAD groups, and that the handling of conflict varied across E-JAD groups, matches our expectations.

### 3.4 Facilitation

There are strong sentiments about the key role of the facilitator in JAD (Martin 1990b) and other group pro-

cesses. McGoff et al. (1990) found that GroupSystems facilitators feel that traditional facilitation skills are more important than technology skills. The emergence of GDSS facilitation research can be seen in Lewis and Whiteley (1992) and in George, Dennis and Nunamaker (1992). The traditional form of facilitation for GroupSystems facilitators can best be characterized as “low-intervention” (see Table 5). Low intervention translates into low involvement in planning, infrequent follow-up, and (relatively) few interruptions during the session. In contrast, JAD facilitation responsibilities include many activities outside the meeting room and not in view of the participants: planning and preparation.

Successful facilitation of a JAD session within the systems development process is a complex assignment that involves a combination of management skills, social skills, systems development skills, and experience. We define *session facilitation* factors to include agenda setting, goal setting, structure, handling conflict, controlling and encouraging participants, using traditional JAD techniques such as lists, and careful documentation. We define *session management* to include planning and preparation, as well as integration of the JAD session(s) into the overall system development process. The JAD literature argues that the facilitator is responsible for both micro and macro aspects of the session although they pragmatically acknowledge that the facilitator often has little leeway in the macro aspects.

As there has been very little academic research or theory development regarding the role of the facilitator in EMS, our observation and analysis of facilitation here is purely descriptive. Again, as with session discipline, we have no real basis for expectations.

Table 6 summarizes our qualitative observations of the strengths and weaknesses of session facilitation (the micro level) and session management (the macro level). As with previous subjective assessments, these were synthesized from observations and interviews. We begin with the micro level: *session facilitation*. Since GroupSystems tools cannot fully support conflict discovery and conflict resolution, the (E-JAD) facilitators had a tendency to either be unaware of, or to neglect, this area somewhat. The JAD facilitator is largely responsible for enforcing the *structure* of the meeting through a careful agenda, enforcing rules of conduct, enforcing a “work ethic,” and including techniques, frameworks, and methodologies. T-JAD sessions were assessed to have a higher degree of “structure” for most of these variables which are largely enforced by the facilitator.

The second dimension, the macro level, overall *session management* dimensions, showed some clearer differences between E-JAD and T-JAD. Three E-JAD sessions are particularly noteworthy: FINANCE2, MILITARY1, and MILITARY2. In all of these sessions, those responsible for the session (the IS coordinators) had a tendency to allow the EMS “to take care of the session.” Although planning was done in all three cases, the sessions themselves were clearly disjoint from the normal system development



**Table 5. The JAD Mode of Facilitation is More Activist than the GroupSystems Mode**

High intervention	Low intervention
Typical JAD approach	Traditional GroupSystems approach
<p><i>The facilitator...</i></p> <ul style="list-style-type: none"> <li>• has stake in process</li> <li>• has stake in outcome</li> <li>• may spend several days preparing for session</li> <li>• is responsible for follow-up</li> <li>• is the focal point of the meeting</li> </ul> <ul style="list-style-type: none"> <li>• intervenes in conversations</li> <li>• monitors and controls conversations</li> </ul>	<p><i>The facilitator...</i></p> <ul style="list-style-type: none"> <li>• has almost no stake in outcome</li> <li>• spends several hours preparing for session</li> <li>• has no responsibility for follow-up</li> <li>• often shares focal point of meeting with others (e.g., executive in charge)</li> <li>• rarely intervenes in conversations</li> <li>• monitors electronic conversations but does not control them</li> </ul>

**Table 6. Strengths and Weaknesses of Session Facilitation and Session Management**

Session	Type	Overall Session Facilitation (the micro level)	Overall Session Management (the macro level)
MUNIC1	Traditional	Strong	Strong
MUNIC2	Traditional	Strong	Strong
SCHOOL	Traditional	Strong	
FINANCE1	Traditional	Weak	Weak
AERO	Traditional	Weak	Strong
COMPUTER1	Electronic		
COMPUTER2	Electronic		Strong
COMPUTER3	Electronic		Weak
FINANCE2	Electronic	Weak	Weak
MILITARY1	Electronic	Weak	Weak
MILITARY2	Electronic	Strong	Weak

process. As noted above, this was largely outside the control of the meeting facilitator, but the lack of integration (and by implication the lack of close management support) had adverse effects on the overall success of the session.

Finally, facilitation is perceived by the user participants as important. Satisfaction ratings of various factors in the JAD sessions were captured by the post-session questionnaire. E-JAD users rated *satisfaction with facilitation* higher than any other measure of satisfaction (4.22 on a

5-point scale, where 5 was "Very Satisfied!") Their next highest rated item was GroupSystems, at 4.0). T-JAD users rated facilitation second highest (4.08), behind satisfaction with output (4.16).

In summary, E-JAD introduces a technology component into the JAD approach, which to varying degrees, serves to lessen the role of the JAD facilitator. It is not clear that the technology itself has of yet taken up the slack that the facilitator no longer fills.

#### 4. CONCLUSIONS

In our descriptive study of Electronic JAD, through systematic observation and analysis of questionnaire responses, we found the following: E-JAD sessions were characterized by more equal participation by meeting participants; E-JAD sessions demonstrated a relative lack of session discipline, compared with traditional JAD sessions; participants in E-JAD sessions were less likely to successfully resolve conflicts on issues, in that there were problems with "closure," but some E-JAD groups were better able to handle conflict than others; overall session management was weaker in E-JAD sessions, even though both E-JAD and traditional JAD participants ranked facilitation as one of the most important aspects of a JAD meeting.

The findings on participation and conflict management, though not statistically significant, met our expectations, which were based on existing empirical research and theory development in the EMS literature. We had no a priori expectations in the other two areas, as there is little empirical or theory building research that is relevant. Our findings in all four areas can serve as a basis for developing theories relevant to computer support of JAD and other highly structured tasks. Our findings also have some practical import: we suggest that, for design tasks, the principal weakness in E-JAD may be the under-emphasis on facilitation. The facilitator needs first of all to be a JAD facilitator and only secondly to be an EMS facilitator.

#### 5. ACKNOWLEDGMENT

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## 7. ENDNOTE

1. This discussion uses the term *JAD* in the sense of *Joint Application Development*, not *Design*. Such a definition seems closest to a broader and truly generic one.