



**Exploring the Role of Coordination Technologies
as Mechanisms for Managing a Dispersed Work Force
within RPMD and the RTCs**

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CTS
HE
213
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D47
1991

September 1991

Study Sponsor

This study was sponsored by the Center for Transportation Studies at the University of Minnesota, 110 Civil and Mineral Engineering, 500 Pillsbury Drive S. E., Minneapolis, MN 55455.

Acknowledgement

Rich Dethmers of the Minnesota State Planning Agency and Leslie Kiltie of the Transportation and Logistics Management Program served as research associates on this project. Rich Dethmers contributed to the overall design and implementation of the study. Leslie Kiltie aided in data gathering for the study.

The researchers thank all of the RPMD employees who gave of their time to participate in this study. Special thanks are given to Dwight Maxa and to Roger Root and Jim David, who worked closely with the researchers throughout the study.

The views expressed in this report are solely those of the author and not of the research sponsor or associates.

The financial support of oil overcharge funds distributed through the Minnesota Department of Administration is acknowledged, but the authors assume complete responsibility for the contents herein.

Summary

This study examined work coordination among administrative/managerial personnel within the Residential Program Management Division and Residential Treatment Centers of the Minnesota Department of Human Services. The study assessed how administrative/managerial work is currently coordinated within and between RPMD and RTC facilities and explored how computing and telecommunications technologies might be used to enhance coordination activities. The study considered such issues as: (a) current use and non-use of technology to facilitate coordination, (b) employee commuting patterns and work-related transportation on the job, (c) current use of transportation systems, and (d) employee attitudes toward their work. Commonalities and differences on these issues were identified across various work locations.

Data gathering efforts included library research, examination of work documentation, such as organization charts and procedures manuals, structured and unstructured interviews, work sampling, and a survey of administrative/managerial personnel. In all, 75 interviews were conducted and 251 surveys were completed.

Study results show that administrative/managerial personnel at RPMD/RTCs are experienced, competent, and, on the whole, fairly satisfied with their worklife. Work tasks are moderate in difficulty, variety, and stress level, and they require a high degree of regular coordination with other people for their completion. The typical administrative/managerial employee is a member of several formal work groups and project teams and interacts on a regular basis with people from a variety of work locations. A great deal of time is spent attending informal and formal meetings, preparing memos and reports, and making and receiving telephone calls; but available technology to support for these activities is minimal in most cases.

The findings suggest a strong need to expand the use of computing and telecommunications technologies at all sites. Information systems are needed to support improved record keeping and reporting and to improve the management of office work--particularly report writing and management of paperwork. Communication systems, such as facsimile transmission and videoconferencing need to be expanded so that more people have access to these technologies. There is a need to improve the telephone systems, particularly to replace switchboard technologies and to expand the availability of voice mail. There would also appear to be value in undertaking more pilot projects to explore the use of coordination systems (such as calendaring, joint writing, and meeting management software) at RPMD/RTCs. Survey respondents indicated a strong need for additional professional training, and multimedia systems to support training are thus a need as well.

Employees at RPMD/RTCs are heavy users of transportation systems, with the typical individual commuting 16.3 miles to and from work. Most employees do not travel between facilities on a regular basis, but there is a fair amount of travel to non-DHS locations, such as county offices. There is very little availability or use of public or state-provided transportation. Consequently, travel is primarily via the individual's private car. This tends to limit inter-facility travel and, because communication systems are not extensive or sophisticated, there are significant differences in the operations and work culture of various facilities. Expansion of information, communication, and coordination systems would facilitate standardization and integration of work across the facilities.

The RPMD/RTCs represent a large, geographically dispersed organization that, according to our study, could benefit across the board from improved technology support. Resources are needed to improve information sharing, communication, and coordination within and among all of these facilities. Updating of existing systems, improved availability and access to new systems, and infusion of new systems are all needed. Improvements in management support systems, coupled with a "wheel-and-spoke" managerial model, may help the organization tremendously in the future. The wheel-and-spoke model has a central office (RPMD) which serves as a hub for centralization and control, but there is a high level of sharing of knowledge and resources across facilities.

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Background, Purpose, and Scope of the Study

Background

The management of a geographically dispersed workforce represents a major concern to many Minnesota state agencies. With offices located throughout the state, employees must coordinate with other employees, and with the public whom they serve, who are located across campuses, cities, counties, and regions of the state. In addition, agency employees also must coordinate, at times, with other government and private agencies. The result is a complex process of workforce coordination that occurs across time and space. To facilitate coordination, a variety of mechanisms are used, both administrative (e.g., procedures, rules, committees) and technical (e.g., use of telephone, mail systems, automobile transportation). As agency services expand and populations become more mobile, coordination processes become more complex. There is increasing interest in using computer and telecommunications technologies to facilitate inter- and intra-agency coordination processes.

Coordination and coordination technologies. "Coordination" is the overhead cost associated with linking the tasks of individuals together, where such linking is regarded as necessary in order to achieve the goals of the larger group in which the individuals operate. Coordination consists of the extra activities added to work to achieve necessary organization. Group decision making, mutual report writing, status reporting, planning, and resource management are example of coordination activities that occur in many organizational groups. Coordination of workers can be

understood in terms of the people, technologies, and goals involved in the coordination process. Management of coordination involves activities such as: assigning tasks to people in ways that maximize efficiency or effectiveness; allocating resources to tasks; arranging mechanisms for exchange of information among tasks; and combining the outputs created by tasks in such a way that system synergy is achieved. The tasks of coordination are heavily information-based, and for this reason, technical systems are often built in order to facilitate the coordination process.

"Coordination technologies" refer to a class of computer and telecommunications-based systems as they are applied to support dispersed workers. These include telephones, personal computing, cellular phones, low cost telecommunications linkages, local and wide-area networks, and powerful applications software intended to support group work. Distributed work arrangements that may be supported by coordination technologies include various types of work at home; regional work centers; remote, satellite or shared offices; and mobile offices (e.g., vans equipped with fax, cellular phone, personal computer). Distributed work arrangements display two key characteristics: 1) they distribute organizational work outside of the core office location, and 2) they depend heavily on technology, coupled with appropriate organizational and community policies and structures.

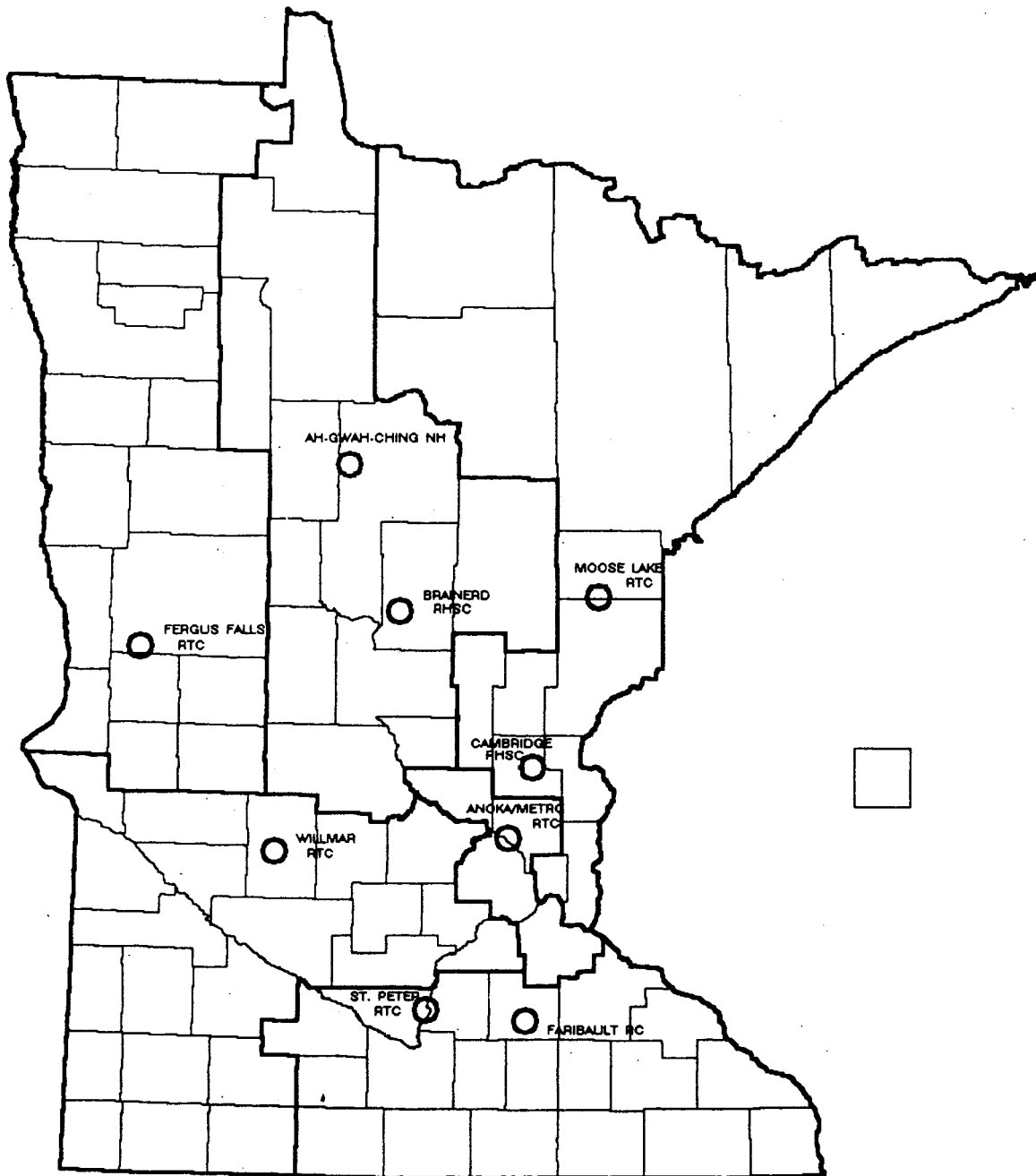
Computer and telecommunications-based technologies have the potential to facilitate coordination largely by reducing coordination costs, that is, by substituting

information technology for transportation and other efforts (e.g., face-to-face meetings) required to link the tasks of workers together. So, for example, communication networks can be used instead of "telephone tag" to send and receive messages between people. Facsimile systems can facilitate document exchange instead of courier services, and videoconferencing can be used instead of face-to-face meetings. Specialized computer software can be used to help with the sorts of coordination tasks mentioned earlier, such as designing, authoring, scheduling, and decision making.

Purpose

This study examined work coordination among administrative/managerial personnel within the Residential Program Management Division (RPMD) and Residential Treatment Centers (RTCs) of the Minnesota Department of Human Services (DHS). RPMD, located in the central DHS offices in St. Paul, provides coordination and support for the RTCs. The collection of RTCs represent a large, dispersed organization with staff, facilities, and clients located throughout the state (see Figure 1). The residential and related facilities consist of large numbers of staff that service very large numbers of clients. In many cases, RPMD and RTC staff must commute long distances to the facilities and must travel between facilities or to county or other government offices in the course of their work; also, many facilities, particularly the RTCs, are located on large campuses with numerous buildings spread across open areas. As group homes gradually supplement, or in some cases replace, RTCs, the dispersion of the workforce is expected to increase.

Regional Treatment Facilities



DATANET PLUS MAPPING

Figure 1. Location of RTCs.

Land Management Information Center

DATANET
Plus
MAPPING
Land Management Information Center

This study assessed how work is currently coordinated within and between RPMD and RTC facilities and explored how computing and telecommunications technologies might be used to enhance coordination activities. The study considered such issues as: (a) current use and non-use of technology to facilitate coordination, (b) employee commuting patterns and work-related transportation on the job, (c) current use of transportation systems, and (d) employee attitudes toward their work. Commonalities and differences on these issues were identified across various work locations. The study had three purposes:

- (1) to examine how work is coordinated among individuals and work units;
- (2) to assess the tradeoffs of using computing and telecommunications technologies to facilitate work coordination; and
- (3) to develop recommendations for expanding the use of computing and telecommunications technologies within RPMD and the RTCs.

The major goal of the study was to identify whether and how use of computer and telecommunications technologies might improve coordination and to suggest possible priorities.

Scope

The focus of the study was on administrative/managerial aspects of work, rather than delivery of clinical service. Although clinical service is paramount within RPMD and the RTCs, it was believed that important knowledge could be gained from taking a close look at coordination processes among administrative/managerial staff. Clinical staff were included in the study, but the focus was on the managerial

aspects of work rather than clinical responsibilities. Further, the study focused on coordination of people, as opposed to coordination of documents, forms, or specific services. The focus was on how people communicate and work together on a daily basis. The focus was on the mechanisms of coordination, not the content of the work being coordinated.

The study broadly examined interpersonal coordination throughout the division, but due to resource constraints in-depth study was confined to three locations: the St. Paul central office, Cambridge Regional Center, and Moose Lake Regional Treatment Center. St. Paul was selected because it is the locus of coordination for the RPMD division. Cambridge and Moose Lake were selected based on (a) their representing a range of service offerings, (b) their representing one "close" and one "distant" location relative to St. Paul, and (c) the willingness of parties at these sites to participate in the data gathering aspects of the study.

It is important to note that this was a research study, not a consulting project. As such, the assessment of coordination was more confined than otherwise might be the case. Recommendations are based on data gathering procedures which were limited in scope and did not consider the "big picture" of the division. Consequently, the recommendations are tentative at best. The researchers do not claim to have a comprehensive knowledge of the organization, its missions, constraints, or plans. The contribution of the study should be to discussion and planning for technology use within the division. The hope is that the information contained in this report will be useful to the division as it moves forward in

developing technology directions.

Data Gathering and Research Approach

The study proposal was developed in the summer of 1990, and data collection took place between September 1990 and May 1991. Data gathering efforts included the following:

- (1) library research, including an extensive database search on computer-supported collaborative work;
- (2) examination of work documentation, such as organization charts, meeting minutes and memos, job descriptions, and procedures manuals;
- (3) unstructured interviews with St. Paul, Cambridge, and Moose Lake staff;
- (4) structured interviews with St. Paul, Cambridge, and Moose Lake staff;
- (5) work sampling of selected St. Paul, Cambridge, and Moose Lake staff;
- (6) a survey of administrative/managerial personnel from 12 RPMD locations, representing all RTC and nursing home campuses and the central St. Paul office.

In all, a total of 75 interviews were completed, as shown in Table 1.

Table 1
Number of Interviews Conducted

Location	Structured Interviews	Unstructured Interviews
St. Paul	17	12
Cambridge	18	7
Moose Lake	18	3

Unstructured interviews focused on the general aspects of the facility and job in which the individual worked. The purpose was to give the researchers a basic understanding of the organization and the nature of work within the particular facility. Interviews were approximately one hour in length.

Structured interviews consisted of approximately 80 pre-established questions on the nature of the individual's work. Questions dealt with job responsibilities, reporting relationships, job satisfaction, work groups, communication patterns, work on project teams, use of computer and telecommunication systems, and use of transportation systems. In addition, individuals were asked to describe events that illustrated effective and ineffective coordination in their work, and they were asked to suggest ways in which their work might benefit from changes or improvements in telecommunication, computing, or transportation systems. Interviews were approximately one hour in length.

Most structured interviews were accompanied by work sampling, collecting information on actual use by the individual of computers, telephone, fax, mail, and transportation systems on the day of the interview. Samples were also taken of attendance in meetings and recent contacts with other people in the course of carrying out work duties.

The survey consisted of 140 items and was distributed to approximately 350 employees. 251 surveys were returned, yielding a 72% response rate, which is impressively high given the survey's length. The survey included questions about the individual's work and work habits, perceptions of RPMD and the facility in

which they worked, and assessment of job satisfaction; questions about use of transportation systems; and questions about current and potential uses of computing and telecommunications technologies. The survey was quite comprehensive and included several previously validated and reliable scales. In addition, respondents were asked to provide written (open-ended) suggestions on how computer, telecommunication, or transportation systems might be used to improve the nature of their work and professional development.

The survey was distributed at the following locations: the St. Paul central office, RTCs, group homes, and clinics. Responses were received from all of these locations. A breakdown of responses by location is shown in Table 2. Some respondents did not complete every question on the survey. Unless otherwise indicated, all subsequent analyses are based on all 251 responses; the term RPMD/RTC is used to refer to the collective groups shown in Table 2.

Table 2
Number of Completed Surveys

Location	Completed Surveys
St. Paul (RPMD)	11
Ah-Gwah-Ching	10
Anoka metro	18
Brainerd	13
Cambridge	93
Faribault	16
Fergus Falls	28
Moose Lake	19
Oak Terrace	3
St. Peter	20
Willmar	7
Nursing homes, group homes & clinics	9
Total	251

Survey Results

50.2% of the survey respondents were male, and 49.8% were female. Most were long-term employees of DHS, serving an average of 12.4 years for the agency. They represented a variety of professional affiliations, including administration/general management (41%), training/human resources (14.4%), social workers (8%), psychologists (7.6%), and many others (29%).

Perceptions of Work and Work Life

In this survey, respondents indicated that they find their work to be challenging and, on the whole, fairly satisfying (see Table 3). On a day-to-day basis work tasks are moderate in level of difficulty and variety; work is by no means routine for the majority of respondents. Despite these challenges, respondents do not feel a high degree of uncertainty in their jobs; in fact, they feel quite competent to perform their work duties. The experience and long-term employment of most respondents may account for these positive reactions despite difficult and varied work duties. More experienced ($r=.11$, $p=.04$), higher reporting level ($r=.16$, $p=.006$), and less educated ($r=-.14$, $p=.02$) employees tend to report higher overall job satisfaction.

Respondents report a moderate degree of work stress. Stress levels may not reach extreme levels because of the high amount of experience that respondents have in doing the work in their jobs. Despite challenging levels of task difficulty and variety, respondents do not perceive high task uncertainty. It may be that if respondents were less experienced in their work, task uncertainty and stress levels would be notably higher. Job stress is also related to satisfaction, with those

Table 3
Respondents' Perceptions of Their Work

Perceptions of Work (1=not at all, 5=to a great extent)	Average	St. Deviation
Task uncertainty	2.67	1.2
Task variety	3.94	1.0
Task difficulty	3.02	.83
Portability of work tasks	2.54	1.0
Personal competence	4.27	.58
Job stress	3.42	1.0
Job satisfaction	3.66	.87
Satisfaction with amount of training	2.92	1.3
Satisfaction with quality of training	3.03	1.1
Importance of coordination with others	4.39	.79

experiencing more stress tending to report lower job satisfaction ($r=-.15$, $p=.009$).

Most encouraging is the fairly positive level of satisfaction that respondents report about their job as a whole, including the work itself, the work environment, and the reward systems. Though not wildly enthusiastic, the respondents indicated a strong sense of satisfaction with their work. Although the coverage of job satisfaction on the survey was quite general and relied on only a few questions, the average score of 3.66 is impressively high. Further, the respondents also report that they are, on the whole, satisfied with the quality of training and professional development that they receive, but they feel that the amount of training they receive is too low. It could be that additional, high-quality training would help to reduce stress levels and improve job satisfaction even further.

Particularly noteworthy is the lack of wide variance in respondents' perceptions of these aspects of their work and work life. Standard deviations for all measures were quite low. Given the high demands of work within RPMD and the RTCs, the less than optimal working conditions, agency budgetary constraints, and other obvious pressures, the numbers in Table 3 suggest a dedicated workforce with a strong sense of competence on the one hand and a desire to improve their professional skills on the other. No doubt this is a strength of the RPMD/RTC organizations which needs to be maintained, and it is a good foundation on which to build in the future.

Coordination Patterns

Administrative/managerial work at RPMD/RTCs is much like that in other organizations in that the work consists of independent activities that the individual can complete alone, on the one hand, and inter-dependent activities that involve heavy coordination with others, on the other hand. The employee has a great deal of autonomy in determining precisely where, when, and how activities are accomplished, but completion of activities requires interfacing with other parties-- sending or receiving information with other people and timing activities so that critical, common deadlines are met. The typical administrative/managerial employee is a member of multiple work groups that he or she interacts with on a regular basis: (1) the formal supervisory group, to whom the employee reports, (2) the group of people whom the employee supervises, (3) peers who are the same reporting level as the employee and who share the same supervisor, (4) project

teams who are made of people from different work groups, (5) people within the same campus or building complex, (6) contacts who are in other RPMD/RTC locations, and (7) contacts outside of the organization, such as those in state or county offices.

Table 4 summarizes the frequency of interaction that respondents to our survey have with various types of formal and informal work groups. On average, respondents interact most heavily with people whom they supervise, followed by those outside of the formal work groups to which they belong, particularly contacts on the same campus or building complex where they work. That is, respondents are most likely, on a day-to-day basis, to have contacts with people who are in their supervisory group or otherwise outside of their formal work groups than they are with their peer group, their supervisor, or fellow members of project teams. Many of the informal contacts located on the same campus or building complex presumably include other professionals who are critical to accomplishing specific work tasks.

Contact with peers at the same reporting level is next in frequency of interaction, followed by the immediate supervisor, contacts in other RPMD/RTC locations or outside of RPMD/RTCs altogether, and contacts with fellow project team members.

There are some interesting differences in the interaction patterns of people located in the St. Paul RPMD office relative to those in RTC locations. For example, RPMD employees interact less frequently formal work group members than

Table 4
Extent of Daily Interaction that Respondents have with Various Parties
(Average and St. Deviation)

Extent of Daily Interaction (1=rarely, 5=constantly)	Respondent Location		
	RPMD	RTCs	Overall
Formal work groups			
With immediate supervisor	2.36(.92)	3.17(.97)	3.13(1.0)
With the group supervised	3.00(.00)	3.99(.77)	3.99(.77)
Peers at the same reporting level	2.33(.87)	3.20(1.1)	3.17(1.0)
Fellow project team members	2.67(1.1)	2.52(.93)	2.56(.95)
Informal work groups			
All contacts outside of formal work groups	4.00(.77)	3.60(.98)	3.62(.98)
Contacts on the same campus	3.73(.90)	3.64(.95)	3.62(.99)
Contacts in other RPMD/RTC locations	3.36(.92)	2.52(.98)	2.61(1.0)
Contacts outside of RPMD/RTC locations	3.18(.75)	2.61(1.1)	2.68(1.1)

with those from informal work groups. RPMD employees interact less with their immediate supervisor, their peers, and those they supervise than do RTC employees. RPMD employees interact more frequently with all of the informal work groups, particularly those in other RPMD/RTC locations and those outside of the RPMD/RTC locations. This pattern in the survey data most likely reflects the fact that the St. Paul office serves as a coordination center for the other locations. Consequently, communication flow is high between RPMD staff and RTC staff and between RPMD staff and other departments or agencies within state or federal government. It is also important to note that RPMD staff have better access to

contacts outside their own campus or office complex than do RTC staff, through telephone systems, computer systems, and fax machines.

Tables 5 and 6 summarize the mechanisms and media that respondents use to coordinate with various formal and informal work groups. The patterns suggest that informal (unscheduled) and formal (scheduled) meetings, along with memos, letters, notes, and telephone calls, are popular methods of coordination, particularly within supervisors, supervisees, and peers. The presence of extensive policies and procedures which document relationships between supervisors, supervisees, and peers, probably allows people to coordinate otherwise through informal means. The patterns are slightly different for project teams and other contacts, many of whom are located in different campuses or building complexes. Communication with project teams is largely via memos or other written documents, as well as formal meetings. Telephone calls and written documents are most popular for communicating with people outside of the formal work groups. Overall, coordination is accomplished by a combination of formal mechanisms, such as meetings, memos, and policies, and informal mechanisms, such as unscheduled meetings and telephone calls.

Table 5
Frequency of Media used to Communicate with Various Parties
(ranked from 1=most frequent to 8=least frequent)

Media	Immediate Supervisor	Group Supervised	Peer Group	Project Teams	All Other Contacts
Informal meetings	1	1	1	3	3
Memo, letters, notes	2	2	2	1	2
Formal meetings	3	3	4	2	4
Telephone call	4	4	3	4	1
Conference call	5	5	5	6	7
Voice mail	6	6	6	7	6
Electronic mail	7	8	8	8	8
Fax	8	7	7	5	5

Table 6
Frequency of Mechanisms used to Coordinate with Various Parties
(ranked from 1=most frequent to 8=least frequent)

Mechanism	Group Supervised	Peer Group	Project Teams
Policies and procedures	1	2	3
Work plans or schedules	2	3	4
Informal contacts	3	1	2
Special/as-needed meetings	4	5	5
Regularly scheduled meetings of all group members	5	4	1
A work group supervisor	6	6	8
Regularly scheduled meetings of a subgroup	7	7	7
Peer-level coordinator	8	8	6

Use of Computer and Telecommunication Systems

RPMD/RTC employees engage in a great deal of communication and coordination activities as part of their work, and they are heavy users of systems that are available to them for supporting these activities. For example, the respondents to the survey report attending two meetings a day, with one being scheduled less than a day in advance. 30% of the respondents attend five to six meetings per day. The single most heavily used system is the telephone, with more than 95% of respondents using this technology on a regular basis, at least four times per hour. Paging systems, fax machines, and microcomputers are used as well. Microcomputers are primarily used to prepare reports and memos for communication with others. There is strong interest on the part of respondents in using additional systems in their work, such as voice mail, electronic mail, and videoconferencing (see Table 7). The percentage of people indicating interest in these technologies is quite high given the fact that many people have little knowledge about how these systems work or precisely how they might be used in their particular job.

Doing work at home is not commonplace at RPMD/RTCs, but a sizable number of people have at least some equipment to support supplemental work at home, such as telephone answering machines and microcomputers with word processing and spreadsheet software (see Table 8). Currently, this home equipment is not used much for work purposes, though 33.5% percent of computer owners use the technology at least occasionally for work purposes and 12.1% use do work at home on their computers on a weekly or daily basis.

Table 7
Percent of Respondents Interested in Using Various Systems

Type of System	Would use regularly if conveniently located	Now use regularly
Voice mail	34.9%	7.5%
Microcomputer	31.3	40.1
Electronic mail	29.4	3.2
Videoconferencing	27.4	.8
Personal telephone	21.4	95.2
Modem	21.4	7.9
Paging system	19.4	48.8
Fax machine	18.3	48.0
Audioconferencing	17.1	10.3

Table 8
Percent of Respondents with Systems at Home

Systems Currently Available at Home	Percent of Respondents
Hardware	
Telephone answering machine	37.3%
Microcomputer	33.3
Printer	28.2
Modem	10.7
Fax	1.6
Software	
Word processing	32.5%
Spreadsheet	20.2
Database	15.9
Graphics/drawing	11.9
Communications	8.7

Use of Transportation Systems

Employees of RPMD/RTCs are heavy users of transportation systems. Commuting distances for the respondents to the survey range from under a mile to over 100 miles one-way to work. On average, the respondents live 12.8 driving miles from work; but their actual commuting distance is much longer, at 16.3 miles, due to stops associated with grocery shopping, taking children to school or day care, and other errands. St. Paul employees commute further, on average, than RTC employees, but the most extreme commutes are among RTC and other employees. For example, one group home employee commutes 80 miles each way to work. Most of respondents take "side trips" between work and home on a regular basis. Average commuting time is 50 minutes, but this varies a great deal, with some people commuting only a few minutes to work and others up to two hours in travel time. Commuting distance and time also varies a great deal across work locations, as shown in Table 9.

Most people commute to work by car, driving alone (see Table 10). 11.7% share rides, usually with one other person. A very small number of respondents walk, bicycle, or use a motorcycle to get to work. Use of public transportation is virtually nonexistent. 89.3% of respondents report that there is no public transportation near their home that they could use to go to and from work.

Table 9
Commuting Distance to and from Work

Location	Average	Standard Deviation
Commuting distance to and from work (in miles)		
St. Paul (RPMD)	21.1	19.3
Ah-Gwah-Ching	17.0	12.9
Anoka metro	22.3	23.4
Brainerd	12.5	10.8
Cambridge	19.8	22.3
Faribault	14.5	16.0
Fergus Falls	7.86	9.2
Moose Lake	19.7	23.8
Oak Terrace	23.7	20.7
St. Peter	6.35	6.9
Willmar	9.83	9.3
Nursing homes, group homes & clinics	15.0	13.9

Table 10
Transportation to and from Work

Commuting Method	Percent of Respondents
Driving alone	80.5%
Carpooling or vanpooling	11.7%
Bus or other public transportation	.9%
Motorcycle or moped	1.4%
Bicycling	2.3%
Walking or running	3.2%

On average, the respondents travel very little between facilities, just a few times per year, but some people travel between facilities on a regular basis, such as once per week. Proximity to the Twin Cities or other facilities has less to do with inter-facility travel than the nature of the particular individual's work (though not to their formal reporting level). Most work-related travel is to non-DHS locations, such as county offices, followed by visits to group homes, RTCs, and the central St. Paul office. Travel to these locations is largely via the individual's private car. State cars are the second most popular source of transportation, followed by shared rides with another employee.

Respondents report that travel to attend training or professional development classes is rarely inconvenient (see Table 11). When asked "are you interested in reducing the amount of traveling you do for training purposes?" 31.7% replied "yes," and 68.3% replied "no." Travel for training provides a break in the usual work routine. Given the physical isolation of many work locations, the opportunity to leave the regular work place is welcomed by many people. Travel for training purposes, therefore, is not a pressing problem for most people. It is important to note, however, that nearly a third of respondents believe that reducing travel associated with training would be beneficial.

One way organizations have tried to reduce commuting pressures for employees has been to use flexible work schedules rather than rigid hours for arrival and departure to work. At RPMD/RTCs respondents believe that there is some flexibility in their work hours; in fact, 25% perceive "a great deal" of flexibility in

Table 11
Perceptions of Travel, Work Scheduling,
and Doing Work at Home

Perceptions of Travel, etc. (1=rarely, 5=constantly)	Average	St. Deviation
Inconvenience of travel for training or professional development	1.89	.90
Importance of deadlines	4.43	.88
Importance of being on-time for work	3.49	.97
Flexibility in work hours	2.87	.95
Actual variability in work schedule	2.29	1.1
Frequency called into work during "off hours"	1.47	.68
Frequency of taking work home	2.15	1.1
Frequency of work-related telephone calls at home	1.84	.94

their work hours. Meeting deadlines is considered to be more important than arriving at work at a specific time each day. Despite this, most respondents keep a routine, rigid work schedule; only 13% of respondents vary their work hours on a day-to-day basis. Moreover, most respondents take some work home at least on an occasional basis, and 32.7% taking work home "somewhat frequently" or "rather frequently." The necessity to take work home is particularly high in the St. Paul RPMD location; respondents from here reported a much higher frequency of taking work home than in the RTCs. The results suggest that it may be worthwhile to explore flextime or occasional work-at-home as options for reducing commuting pressures.

Work Settings and Locational Issues

The final set of issues examined in the survey related to respondents' perceptions of their work setting and commonalities and differences across various work locations (see Table 12). The results suggest some notable differences among locations in terms of how they operate and their mutual understanding and cooperation with one another. -- This is despite the fact that the RPMD/RTCs organization is, according to respondents, more centralized than decentralized in its management. The survey respondents indicated that there is not a good level of understanding between facilities in terms of how they operate; different locations do not operate in highly similar ways; there is relatively little visitation of staff between facilities; and there is some conflict between work locations in terms of goals or how things should be done.

There are some interesting differences between the perceptions of RPMD versus RTC staff, and between employees of different reporting levels. For example, St. Paul staff rate the organization as a bit more decentralized than do their RTC staff. People at RPMD believe there is more participation in the decision making about how things will be done at all locations than do RTC people. St. Paul staff also perceive more conflict between work locations in terms of goals and how things should be done, and they rate other locations as more helpful to them in getting their work done. St. Paul staff perceive they understand other locations better but that other locations have less understanding of how things operate in St. Paul.

Table 12
 Respondents' Perceptions of Work in Their Location
 and Locational Differences
 (Averages and St. Deviations)

Perceptions of Work (1=disagree, 5=agree)	Respondent Location		
	RPMD	RTCs	Overall
Decentralization of management in this location	2.09(.94)	2.55(.94)	2.55(.96)
Decentralization of management in RPMD/RTCs overall	2.91(1.1)	2.35(1.0)	2.40(1.0)
"People in other locations don't understand how things work here."	3.91(.70)	3.52(.74)	3.55(.76)
"People in our location have a good understanding of how things work at the other locations."	3.00(1.3)	2.44(1.1)	2.47(1.1)
"People in other locations are interested in what happens here."	4.00(1.0)	3.01(.95)	3.09(.97)
"People across locations visit here often."	3.55(1.4)	2.50(1.0)	2.55(1.0)
"People from different locations participate in the decisions about how things will be done at all locations."	3.18(1.1)	2.79(1.1)	2.82(1.1)
"Other locations are helpful to us in getting our work done."	4.18(.60)	2.98(.97)	3.04(1.0)
"There is very little conflict between work locations in terms of goals or how things should be done."	1.54(.69)	2.86(.93)	2.79(.97)
"For the most part, other locations operate the same way we do here."	2.45(.93)	3.05(.77)	3.00(.78)

Respondents' perceptions of work in their location and locational differences vary depending on the reporting level of the individual (see Table 13). Those higher up in the reporting hierarchy are more likely to perceive the organization as investing in the future, as valuing effectiveness more than efficiency, and as

practicing a decentralized management approach overall though centralized at their location. Those higher in the reporting hierarchy say that people are less likely to get work-related calls during off hours, but they are more likely to take work home with them. Higher level employees are more likely to think that things work better at their location than at other locations; they express less interest in working at a different location; and they are less bothered by the distance between RPMD/RTC locations. On the other hand, they perceive more conflict between locations than do lower-level employees.

Table 13 highlights the fact that perceptions of one's work and work location depend the nature of one's work; the work experience of people varies depending on their reporting level in the RPMD/RTC hierarchy. Note, however, that the correlation coefficients are not extremely high (though they are statistically significant). This means that reporting level matters in how individuals perceive their jobs, but reporting level is by no means the only factor accounting for job perceptions. Type of job, work location, personal experiences, and other factors may all affect how the individual perceives his or her work.

Table 13
Relationship between Work/Locational Perceptions
and the Reporting Level of Respondents

Perceptions of Work (1=disagree, 5=agree)	Correlation Coefficient ¹	Probability Level
"This organization invests in the future."	.25	.00
"Doing things right is better than doing things fast in this organization."	.21	.00
"People usually expect to take work home."	.15	.01
"People get work-related calls during 'off' hours (like nights and weekends)."	-.25	.00
Decentralization of management in this location	-.12	.04
Decentralization of management in RPMD/RTCs overall	.12	.04
"Things work better at our location than at other locations."	.26	.00
"I wished I worked at a different location."	-.19	.00
"It would be better if the different locations weren't so far apart."	-.19	.00
"There is very little conflict between work locations in terms of goals or how things should be done."	-.15	.01

¹Pearson correlation coefficient between perceptions of the work setting and the organizational level of the respondent. The correlation coefficient represents the degree of relationship between the respondents' perceptions and their reporting level. Values can range from -1.00 to +1.00.

Other Findings

Findings reported in this section are based on interview and observational data. These are qualitative interpretations that complement the quantitative findings provided by the survey.

Working atmosphere and culture

(1) There is a strong work ethic within RPMD/RTCs. Most administrative/managerial staff at all facilities work long hours, arriving early in the morning, often by 7:00 a.m., and working late, until 5:00 or 6:00 p.m.

(2) The RPMD/RTCs are organizations that are constantly in transition. Regulations are constantly changing, reporting relationships change frequently, and priorities change as funding and legislative mandates bring change to operations. The effect is that RPMD/RTCs is a challenging but also stressful place to work. Though turnover among high-level staff is low, people can lose their energy and become more focused on the pressures of their work after many years. As one person put it, "We're in a fish bowl...we serve the most difficult and controversial clients..and also set standards...So, we're under a whole lot of scrutiny, for one thing to make sure we follow the standards we set."

(3) Stress is particularly high in the central St. Paul office, where the pace of work life is notably higher than in outstate locations. Average commuting distance is high, the volume of mail, telephone calls, meetings, reporting, and so on, is high, and the general atmosphere is less relaxed in this large urban setting amidst the heart of state offices.

(4) There is much greater use of, and interest in, computing and telecommunications use in St. Paul than in outstate offices--at least with regard to day-to-day office work. Personal computers, voice mail, and so on are prevalent in the central office but not in the RTCs, yet people in St. Paul are, at least on

average, much more likely to express a desire for additional technology to help them with their work.

(5) Across all locations there is a culture of doing work in the office rather than at home and a practice of keeping regular rather than flexible work hours. With a few notable exceptions, everyone interviewed explicitly said that they prefer not to work at home. This is interesting in light of the fact there are a large number of women and parents with young children in the managerial ranks, who typically desire flextime or work-at-home options. Moreover, there is a fair amount of work that could be done at home, such as report writing and phone calling.

Some (though few) people have expressed an interest in doing some of their work at home so that they can get quiet "think" time, without interruptions, so that they can save on commuting time, and so that have more time with their families.

(6) Although some administrative/managerial staff in outstate locations communicate with St. Paul staff on a regular basis and visit there often, the majority do not feel connected to the larger organization or identify themselves as working for RPMD or DHS. In general, administrative/managerial staff below the executive levels often feel isolated and regard the central office with some suspicion. Some comments by managers illustrate the point:

"Each culture is different in the facilities."

"Each facility is an island...kind of like the states, where the federal government puts out regulations and then each state decides what the regulations mean and how to implement and monitor them."

"I don't know how long it's been since someone from St. Paul came in here." Suspicion does not mean resentment or animosity. Outstate staff clearly express strong respect for the RPMD office and the role it provides, but they do not feel a strong sense of belongingness to the larger organization. They identify themselves as working for the single facility in which they work rather than the organization at large.

(7) The work atmosphere in St. Paul is fairly typical of that in any downtown office environment. People concentrate on paperwork, operate with a fair amount of autonomy, and have high respect and interest in technology to facilitate their work. The culture tends toward being formal rather than informal.

The culture within the RTCs is an interesting, attractive blend of the formal and informal work environment. On the one hand the RTCs are very traditional bureaucracies, with a rigid job hierarchy and extensive use of formal meetings, procedures, and documentation to manage coordination. On the other hand there is an informal working atmosphere in which superiors and subordinates are on a first name basis and "management by walking around" is used extensively, especially in coordination of managerial work. The typical manager/administrator who wants to inform a colleague of something or discuss an issue does not schedule a formal meeting, write a memo, or call to leave a message. Rather, he or she gets up and walks to the colleague's office for an immediate conversation. If the colleague is not in their office, then the manager/administrator has a fairly good idea of where he or she might be so just takes a walk to find them. Along the way the

manager/administrator stops to chat with other colleagues and perhaps some clients. Despite the fact manager/administrators are extremely busy professionals, they enjoy the informal atmosphere in their workplace; they project the sense that they enjoy their work and the place they work.

(8) Despite cultural differences across locations, there is a common organizational culture within the RPMD/RTCs that serves as the "glue" that helps hold the organization together. The two critical aspects of this culture are: (a) a sense of bureaucracy - common concern with rules, regulations, and procedures that have to be met, and (b) service to the client as paramount; all locations share this objective. In sum, there may not be a sense of a common organization across the locations, but there is certainly a sense of everyone being in the same business and sharing some common goals.

Current use and non-use of technology to facilitate coordination

Attitudes and preferences. Staff in the outstate locations generally prefer traditional means of coordination (e.g., walking around, calling someone on the spot) than more technology-based approaches (e.g., leaving messages, scheduling formal meetings), and they are more likely to say that they have no need for any changes in the computing or telecommunication systems they currently have (or do not have). This is despite the fact that work in RTCs is physically quite dispersed (larger buildings and campuses than at RPMD).

Adding technology to work can tend to formalize it and increase work stress. As one person put it, "It seems computers should have lightened our work load, but

that hasn't happened...it seems the more work we do, the more we seem to have." This means that adding technology to facilitate managerial coordination is something that must be done with care. Within RPMD, some staff may resist the idea of office computing and greater use of telecommunications technologies not because they are against technology per se but because they like the informal way in which they coordinate with one another now. They do not want to add more bureaucracy to their working environment.

At the same time, it must be pointed out that there is a history in RPMD/RTCs of people who are not technology literate of accepting and using the new technologies they are given. For example, central office staff with little computer experience now regularly use PCs for managing their paperwork, and those who "hated" answering machines now use them regularly. All those interviewed who had PCs provided to them report having come to rely on the technology and to appreciate it. A strong program of training and support during the introduction of these technologies was critical to their successful adoption and ongoing use.

There is a strong, vocal minority of staff in the RTCs who have a keen interest in bringing technology into the office and feel frustrated that their workplace is "so behind" technically. In some cases people have purchased their own equipment and brought it to work. Many of these people say that they are not sophisticated or knowledgeable in their use of computing, but they crave access to technology and opportunities to gain computing skills. This minority cuts across organizational levels, including both executives and professional staff. This bodes well for

implementing systems down the road, since there is not only top management support but cross-sectional support as well.

Interestingly, the "technology proponents" are, in general, people who are heavily involved in activities outside of the given facility in which they work. They tend to be more active in extending their work beyond rigid confines of a job description; they work extremely hard, are growth-oriented in their work, do more travel, and (not surprisingly) experience both more satisfaction and more stress in their work.

Computing at home. A surprising number of those interviewed have computers, but most do not use them much at all. In fact, most seem to have a real lack of knowledge on how to use the systems that they do have. One problem is that people do not have the same software at home as they do in the office. In the future, if work is to be done at home, then this would mean providing people with office software to use at home.

Technology knowledge. The vast majority of staff have little or no knowledge of computing or advanced telecommunications systems. For example, most people are unaware of how technology might be used in the office (beyond answering machines). Telephone tag is a real problem almost everywhere, but most are accepting of this as "the way it goes" and do not express a burning desire to get rid of telephone tag. The implication is, of course, that implementation of any systems will require substantial staff training and simple, easy-to-use systems.

Technology desires. In general, central office staff express more interest in and need for advanced technologies than do staff in outstate locations, but, as noted earlier, there is a vocal minority in the RTCs who express strong interest in technology. Regardless of location, those who do use computer or other systems express satisfaction with the level of support that they receive. No one complains about the lack of support; they feel the support level is fine, they just want more. Those who are using computing currently in their work generally want more.

There is a great deal of interest in multimedia systems and videoconferencing, particularly among central office personnel and those in Moose Lake. These would be used to hold long-distance meetings, to facilitate case reviews, and to aid in training, among other things. As noted earlier, there is relatively little visitation or regular exchange among RPMD/RTC locations; videoconferencing systems have the potential to facilitate greater communication of staff across facilities. Further, they would facilitate exchange between RPMD/RTCs and those outside of the organization, including clients, universities, other professionals, and so forth.

The two strongest complaints that came from the RTCs were: (1) inadequate telephone systems (the persistence of switchboard systems and not enough outside lines), and (2) the limited availability and poor quality of state cars. The phone system and car transportation are basic and critical to the daily work life of many staff. These issues take much higher priority (and understandably so) in the minds of those interviewed than introduction of advanced computing and telecommunications systems.

Computer applications. There is a very obvious lack of computing resources throughout the division. There is a desperate need, recognized by almost everyone, for basic data processing systems. Quality, timely delivery of service to clients requires smooth management of information about those patients and the facilities that house them. Without a core information system (such as the AIMS project would have provided), the organization struggles to operate efficiently. Inadequate financial support for information systems development presents a major, ongoing challenge for the division.

Despite lack of adequate staff and other resources for technology, innovations still have taken place, however. For example, a psychotropic medication tracking system and an incident reporting system were developed at Cambridge and are being used at other RTCs. Designed for desktop operation, these systems are relatively inexpensive to develop, use, and maintain. The trouble is that there is no formal mechanism for developing, maintaining, and diffusing the use of these "homegrown" systems. Development has relied largely on the ingenuity of a few individuals. One strategy may be to capitalize on opportunities to develop small application systems and provide more resources and better management to this process. A recently established statewide committee for management of information systems may provide a useful mechanism for taking on some of these responsibilities and coordinating various RTC efforts. Of course, adequate resources must be devoted to the effort for real gains to occur.

Transportation. Ironically, the closer the location is to the central office (i.e., the closer the facility to St. Paul), the more transportation systems are used. For example, administrative/managerial staff at Cambridge travel, on average, more frequently than do Moose Lake staff; they are more likely to go to seminars, meetings, etc. and to make "quick trips" to St. Paul or St. Cloud. As a result, there is more concern about the state car problems at Cambridge than at Moose Lake (although this is a concern at Moose Lake as well). CRC personnel seem to be much more mobile, on the road and going to meetings, conferences, etc. Remote areas may need more access to transportation systems even though they are less likely to complain about what they currently have. More likely, however, transportation is less of a concern at more isolated locations, such as Moose Lake, due to the inconvenience of travel from these places; long distances required for travel means that travel is more of a burden and causes greater disruption in work. Use of technology (such as a sophisticated phone system, use of videoconferencing, electronic mail) as a substitute for transportation is more likely to benefit these locations, allowing them to have contact with other facilities within and outside RPMD/RTCs without the disrupting work to travel long distances.

Although there is not an extremely high degree of inter-facility travel at the present time (according to the survey results), various forces point toward greater pressures for increasing transportation needs in the future: an expanding, more diverse client population; managerial pressures to establish more consistency in the operations of various facilities; and the need to continually develop the knowledge

and skills of professional staff. The state car system is clearly inadequate to meet these future needs. Further, greater exploration of technologies as substitutes for transportation is needed.

Critical Issues in Technology Planning and Use

Need for office systems

Administrative/managerial work throughout RPMD depends heavily on team work. Professional staff are often jointly responsible for a case load or project. Any one manager or administrator typically serves on several standing committees. Many are also members of task forces, special projects, case review, and other cross-functional teams. Since so much work relies on cross-unit communication, the result is that individuals sometimes have trouble identifying *who* they work for (i.e., which specific individual, unit, or department); there is high autonomy within the bureaucracy. Since so much of the "real work" occurs outside of the formal unit to which the individual reports, management by walking around can help only to a point. The prevalence of team work and high levels of paper flow throughout the division creates a working environment that could benefit a great deal from greater use of computing and telecommunications technologies. Office systems within facilities and then across facilities would facilitate coordination tremendously. Ideally, each administrator/manager should have a personal computer, standard desktop software (word processing, spreadsheet, graphics, data base) and have access to network-based systems such as electronic mail, voice mail, and division-wide teleconferencing and bulletin board systems.

The biggest barrier to implementing office systems is, of course, financial. In addition to this constraint, future plans to provide office systems should take into account the following: First, that there will be some resistance to greater use of office technologies, particularly within the RTCs. This is surely surmountable, but it needs to be well managed. Second, office technologies have the most impact when they are available throughout the organization, rather than just in certain locations. For example, at the present time voice mail operates only in the central office (though a few outstate staff have purchased answering machines). The central office people like the technology but complain that "too many people who call don't use it properly; they just hang up or leave just their number but not a message." At the same time, those outstate complain they "don't like to call and get a machine." The impact of the technology would be much more positive if everyone had voice mail, not just a select few. The same is true of other office systems. Unless everyone has access to the technology, it will not be used to its fullest advantage.

The key issue is whether office systems are a priority. Modest improvements in the phone system and state car fleets may be more immediate needs in the RTCs. Also, greater access to PCs in those locations would be an important first step in improving support of office work. The central office seems to be one that could benefit from electronic mail and other local area network applications, such as file sharing and the ability to exchange, copy, and archive paperwork.

Standardization and integration of computer applications

Development of a comprehensive information system, such as the AIMS project would have yielded, would go a long way toward not only providing basic information management within RPMD/RTCs but also toward assuring standardization of system-wide data. Moreover, it would provide a platform for facilitating integration of application software that is currently either nonexistent or scattered throughout the division. Such a comprehensive information system could be based on large-scale systems development using mainframe computers or networked minicomputers, or it take a more decentralized approach using networked microcomputers and sets of small computers that act as servers to these microcomputers. Whatever the technology environment, development of an integrated system for information management in RPMD/RTCs would take substantial planning and funding resources.

Barring completion of a major systems improvement program, the more feasible approach may be, as mentioned earlier, to promote greater use of desktop software, such as dBase, to build small, customizable applications. This practice provides a less expensive and more expedient alternative to providing some degree of information systems support to the division. If the small-system approach is followed, however, key issues are standardization and integration. As these small systems prosper the result is "islands of information" -- systems that are unstandardized, poorly documented, and unable to be integrated. Their development and operation relies on the knowledge of a few support personnel. Devoting greater

resources to not only the development of these systems but also to their *management* would appear to be worthwhile investments. This way staff could work on not only developing the systems, but doing some planning, documentation, training, updating, and so on. Good systems management will prevent chaos down the road. At it is, insufficient resources are being devoted to managing the development of these small systems.

The centralization-decentralization tension

All organizations with dispersed operations struggle with the tension between centralizing and decentralizing managerial control. RPMD/RTC staff clearly recognize that implementation of technologies can affect this tension in either positive or negative ways. Nevertheless, it is worthwhile to reiterate the point here.

On the one hand, physical distance and the history of independence among the RTCs encourages decentralization. On the other hand, the central office encourages centralization (through policy development, systems development, and budgeting). Decisions to implement new technologies will affect the balance. For example, standardization of systems is desirable, but this may be interpreted by outstate locations as centralization and thus be resisted. A key advantage of advanced computing and telecommunications technologies (such as the office systems mentioned above) is that they can help to reduce the *psychological distance* between outstate locations and the central office. But the telecommunications-distance reducing tradeoff is not a one-for-one exchange. As people become less isolated, they crave more interaction and, hence, more travel and more technology-based

access to other sites. Opportunities for physicians to work with other physicians and with clients from a distance at Moose Lake, for example, will attract more work volume, rather than less, and greater demand for additional technology to improve the quality and efficiency of work.

Models of management

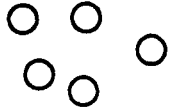
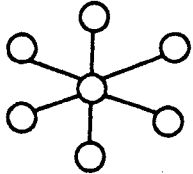
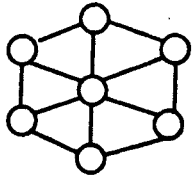
Unless our impressions are misguided, there is surprisingly little sharing of knowledge between RTCs, except at very high management levels or through specialized task forces. Nurses, for example, from one RTC rarely interact with those at other RTCs. Systems developed at one location are not easily shared at another location. Communication within RPMD/RTCs seems to be a "star model" rather than a "wheel-and-spoke" model. The star model emphasizes standardization and control at the center and, while improving coordination over an "island" model, tends to decrease creativity and innovation. It also reinforces the centralization-decentralization tension, or urban-versus-rural, dichotomy. One central office person put it aptly: "Some people push 'we know best,' but I don't. Sometimes we do, but sometimes we don't."

The RTCs feel that they generate knowledge that would be useful to others. Gradual movement toward a wheel and spoke model might encourage more communication among the RTCs themselves, particularly at levels below the executive one. In the wheel-and-spoke model, St. Paul would still serve as the hub, with centralization and control located in St. Paul, but St. Paul would facilitate greater sharing of knowledge and resources across facilities. For example,

technology innovations developed at Cambridge could be shared throughout the system; this happens now but there is not really a mechanism, or a culture, for promoting innovations and diffusion of innovations. The idea is that some standards would evolve (in a managed way, of course) and would not occur purely through central office edict.

Movement to a wheel-and-spoke management model is worth considering. There is a cost to doing this, in terms of meetings, transportation, and so on. Telecommunications and computing technologies, such as teleconferencing, electronic mail, conferencing, or bulletin boards, would allow employees across all RPMD/RTC locations to conveniently converse with one another and work together more effectively. Less expensive alternatives might include: more extensive newsletters, perhaps customized for certain job or departmental categories; annual meetings in which the focus is on staff presenting particular innovations that they have developed; incentive systems for developing procedures or systems that might be implementable across all facilities; an annual "productivity" or "excellence" award that recognizes accomplishments within specialized work areas and which all facilities participate in selecting winners; and an improved telephone system that eases communication among facilities.

Table 14
Models of Management within RPMD/RTCs

Old model	"Islands"	
Each RTC operates on its own, in relative isolation from the others.		
Current model	"Star"	
St. Paul office provides a central node of communication and coordination.		
Possible model for the future	"Wheel and Spoke"	
St. Paul office provides a central node of communication, but linkages between facilities are strong.		

Conclusion and Recommendations

Regardless of the particular model of management which the RPMD/RTCs adopt, a hierarchy of systems is needed to support management needs. A general typology of systems is given in Figure 2. Several of these areas could benefit from greater technological support at RPMD/RTCs. Information systems support organizational and office operations, as well as the knowledge work of the individual. Communication systems focus on movement of information between parties or locations. Coordination systems are the focus of the future. Coordination systems build on information and communication technologies to support formal and informal work groups; they represent a blending of information and communication systems to support work that is widely dispersed across time and space.

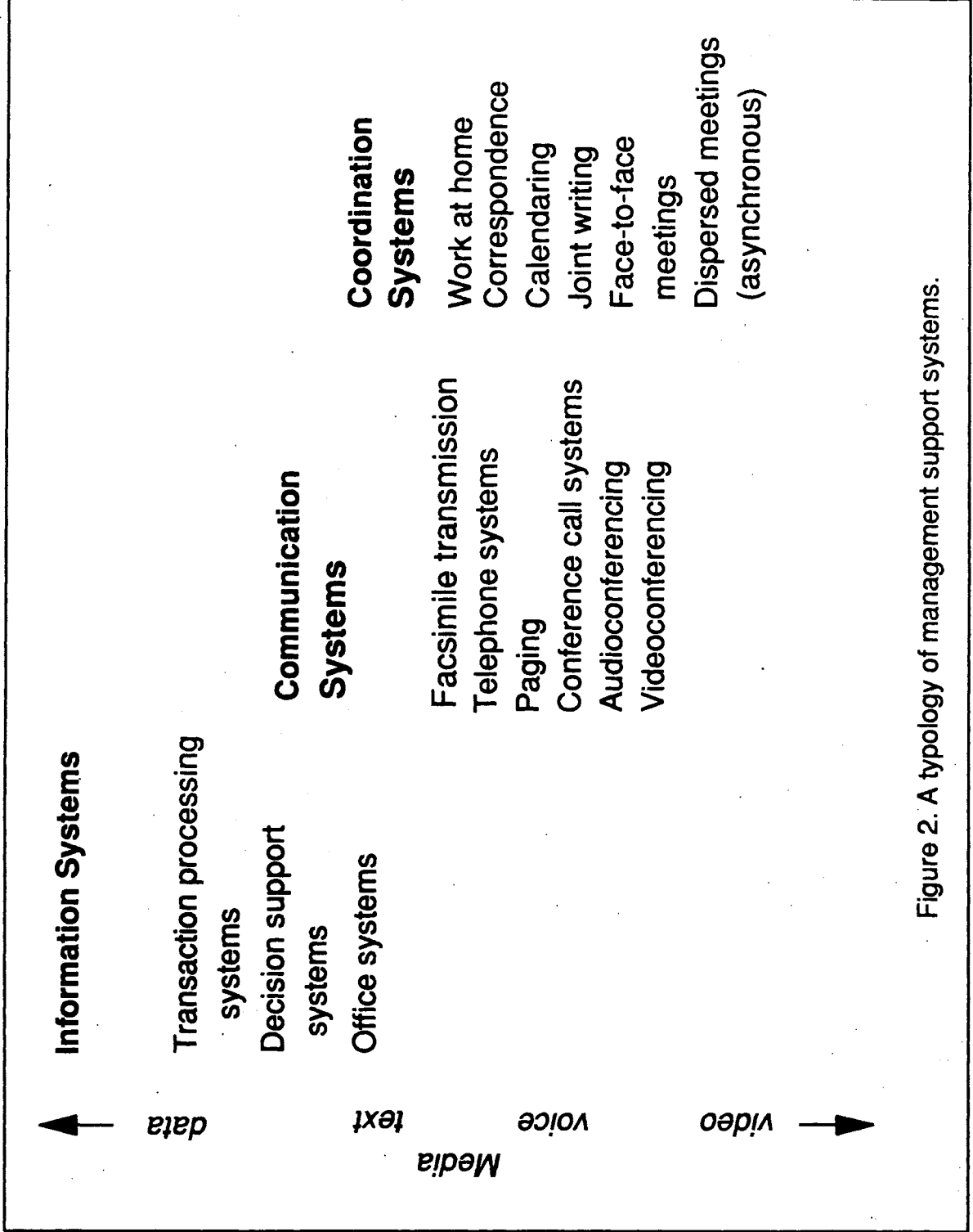


Figure 2. A typology of management support systems.

Ideally, organizational *information systems* are developed in the following order, gradually building a new set of systems atop those below: First, transaction processing systems (TPSs) are developed. These include systems to manage patient records, personnel records, pharmacy, admissions, discharge, and so on. TPSs represent the foundation of other information systems and are essential to effective organizational functioning. Data is organized in a planned data base and reports are produced on a regular basis. Transaction systems are the most expensive information systems to build but are considered important to smooth "running of the business." The HSIS and AIMS project have been critical to accomplishing TPS development within RPMD.

Second, decision support systems are built off of the TPSs. These support such activities as forecasting, budgeting, data base query, and production of specialized reports. There are some systems of this sort in RPMD/RTCs right now, but because they are not integrated into a more comprehensive TPSs, the result is "islands of information" - customized databases and reporting systems that are not integrated, cannot communicate with one another, accommodate an individual's or department's needs rather than the organization at large, and lack standardization.

Office systems are the third tier in the information systems hierarchy. These systems are based on desktop computing and traditionally target the management of paperwork. They include office productivity tools, word processing, graphics, data base, spreadsheet, desktop publishing, electronic and voice mail, and group note taking and file sharing systems. At the RTCs many people are still dictating text

information and relying heavily on secretaries for support of office work; this creates time delays and will become increasingly expensive as secretarial costs continue to rise. Further, within RPMD there is a tremendous problem with paper management; some people admit to not attending to all of their paperwork because they are overburdened with paper and regard patient duties as primary. Office systems would aid the "paper shuffle" within offices, particularly if systems were linked via local area networks so that reports, etc., could be routed and filed electronically.

RPMD/RTCs have made great strides in the area of *communication systems* in the past few years, but more needs to be done. The telephone is the single most important communication system for the organization on a day-to-day basis. The installation of fax machines, paging systems, and voice mail has been a tremendous success, expanding communication systems beyond the telephone. Conference calling is also used fairly frequently, and the Jarvis project has brought a major initiative in the area of point-to-point video conferencing. RPMD/RTCs have successfully obtained outside grant funds for applied technology projects, such as for videoconferencing and multimedia studies. These projects may lead to development of systems to aid in training, consultations, and research. The survey and interview data presented earlier in this report support the need for continued efforts in the communication area. Voice, data, and video are now available in networks that can operate over standard telephone lines, and telephone, computers, and fax are all being integrated into single desktop systems. Given the high level of communication traffic within and among RPMD/RTC sites, there is every reason to

estimate that new technologies such as these could bring meaningful benefits to the RPMD/RTC organization.

As in other organizations, information systems at RPMD/RTCs have developed separately from communication systems. Information systems traditionally have been data-based, whereas communication systems have been voice-based. With the emergence of multimedia technologies, information and communication systems will gradually blend--not only in a technical sense but also in a managerial sense. Planning and operation of office systems, for example, will include consideration of the telephone system and conferencing systems. Multimedia technologies are also bringing about the development of coordination systems, which are systems for helping formal and informal work groups work together across time and space.

Coordination systems are still in the infancy of their commercial development, but there is tremendous industry interest and vendor "push" for these technologies. Consequently, RPMD/RTCs should continue to follow developments in this area and pursue pilot projects that might prove certain systems to be useful in the future. Of particular interest might be systems for managing correspondence between offices (e.g., PC-based fax) and local area network-based applications such as calendaring (used for meeting scheduling and employee location) and joint authoring systems (used for group report writing). Systems to support face-to-face meetings and dispersed, asynchronous meetings should also be explored. RPMD/RTC workers spend a tremendous amount of time attending or commuting to meetings. Videoconferenced links are one way to reduce travel to meetings. Other system

options include software to help manage meeting agendas and record and distribute meeting notes, and software to support meetings that take place via computer networks. Coordination technologies are particularly helpful in reducing geographical barriers and commuting pressures, so there would appear to be tremendous potential payoff in embarking on pilot projects that further explore use of these technologies.

In the long term, the RPMD/RTCs are encouraged to invest in technologies to support managerial work. Such an investment is expensive but worthwhile, even at the pilot project level. Some projects can be cost justified, with technology investment bringing savings in labor or processing time. Other projects bring gains in the quality of work or service provided, as well as general management knowledge about the potential role of new systems in the organization. Consequently, the RPMD/RTCs are encouraged to continue to pursue funding for pilot projects that explore use of information, communication, and coordination technologies. Pilot projects provide a mechanism for bringing innovation into the organization in times of tightening budgets. Further, the results of pilot projects may provide the data necessary to justify larger scale investment in technologies.

In the short term, some efforts can be made in the following areas:

- o devoting resources to the development and management of small transaction processing and decision support systems;
- o improving coordination of small-system development across RPMD/RTC locations;

- o making modest improvement in the phone systems, particularly in RTCs that still rely on switchboards and lack access to voice mail;
- o continuing efforts to develop computer-based, multimedia training programs. Survey respondents indicated a strong need for additional professional training, but transportation systems are insufficient ;
- o improving the state car fleet so that inter-facility travel is made more economical and accessible to employees;
- o adding electronic mail and other local area network applications, such as file sharing and the ability to exchange, copy, and archive paperwork;
- o establishing a pilot program for supplemental (partial) work-at-home for administrative/managerial staff.

In the long-term the RPMD/RTCs can continue to pursue resources that would bring improvements in all of the system areas outlined in Figure 2. The RPMD/RTCs represent a large, geographically dispersed organization that, according to our study, could benefit across the board from improved technology support. Resources are needed to improve information sharing, communication, and coordination within and among all of these facilities. Updating of existing systems, improved availability and access to new systems, and infusion of new systems are all needed. Improvements in management support systems, coupled with a "wheel-and-spoke" managerial model, may help the organization tremendously in the future.

