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An Evaluation of Videoconferencing with Active and Passive Sites as a Means for Technology Transfer

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ABSTRACT

In an effort to broaden dissemination of the information presented at the Annual Meeting of the Transportation Research Board (TRB), TRB's Executive Committee approved an experimental videoconferencing session for the January 1984 Annual Meeting. The objective of this session was to gain experience with this communication medium in order for TRB to make appropriate decisions about its future uses for technology transfer. The session's effectiveness was evaluated by 180 respondents at 4 active sites and 186 respondents at 6 passive sites. The evaluation involved such things as demographics, environmental conditions at the remote sites, the presentations, and the session's general format. The effectiveness of a videocommunication session was compared with the effectiveness of a face-to-face meeting. In addition, some preliminary cost data for this type of program were obtained. In general, the program was very well received. Some specific findings can be reported: (a) it reached a considerably different audience than would have been present at the TRB Annual Meeting; (b) the environmental characteristics at the sites were satisfactory; (c) the speakers, as a group, were well received by the respondents; (d) participants reported a significant increase in knowledge as a result of attending the program; (e) there were minimal differences between the responses from the respondents at the active sites and those at the passive sites; and (f) on an individual-participant basis, the cost of the program was within acceptable limits. As a result of these and other findings, videoconferencing was determined to have a place in the technology transfer activities of TRB and should be incorporated in appropriate areas to increase the communication to field personnel.

Teleconferencing is a communication medium that is gaining momentum in many businesses, federal agencies, universities, and other organizations that have a strong communication component as part of their overall mission. It is being promoted by some as a potential catalyst for change in the way many organizations handle communication and technology transfer. In the next decade, teleconferencing may establish itself as a central part of the communication network in an organization. Its potential appears to be very promising.

Precise, descriptive characteristics of teleconferencing vary; however, a review of several definitions helps in understanding its overall capabilities and uses. Johnson (1) defined it by using the acronym SPIES: a structured, private, interactive, electronic, scheduled meeting. Each letter of the acronym provides a specific, descriptive dimension of teleconferencing:

• Structure relates to the carefully planned goals, audience, and agenda necessary in successful teleconferencing;
• Private signifies the special network used for identified recipients;
• Interactive relates to the live programming;
• Electronic describes the type of delivery system used for teleconferencing; and
• Scheduled refers to the planned sequence of events that occurs during a successful teleconferencing program.

From Johnson's perspective, teleconferencing is electronic communication between a sender and an identified audience for a clearly identified purpose. The communication is usually two-way: both the sender and the audience participate in the event. It is characterized by its immediacy: it is a live interaction between those involved.

The multiplicity of sites is another dimension of teleconferencing. Olgren and Parker (2) stated that teleconferencing is "two-way electronic communication between two or more groups, or three or more individuals, who are in separate locations"; it links individuals or groups of people at multiple locations in a dynamic and live interaction. The need to link individuals at several sites and at frequent intervals appears to be a growing concern of many organizations today. The ever-rising volume of information to be shared is constantly forcing organizations to seek improved means of transferring information to appropriate audiences.

Teleconferencing allows people in many different locations to engage in business meetings, professional conferences, or university courses without actually traveling to the places where these events are occurring. Increasing costs associated with travel have made teleconferencing more appealing to many groups. Limited travel budgets in many organizations make it impossible for all interested, concerned individuals to attend a particular conference or training session. Not only is the actual cost involved in travel a major concern, but so are the associated productivity costs of travel time and hours spent away from the place of employment.

Elton (3) identified five types of teleconferencing:

1. Audioconferencing, in which the participants hear what others are saying and are heard by others;
2. Enhanced audioconferencing, which may include the transmission of still images from one location to another in addition to the audioconferencing;
3. Videoconferencing, in which those involved both see and hear and are seen and heard;
4. Narrowcast, in which live television is broadcast one-way from a central site to a number of other sites with the possibility of a two-way audio transmission; and
5. Computer conferencing, which involves the use of computer keyboards to transmit information from one location to another.

These categories may not be exact; for example, a videoconference may involve sending visual and audio and receiving only audio. However, these five types provide an indication of the various communication possibilities included under the teleconferencing category.

Transmission may be made by telephone lines or by satellite. The availability of satellite capacity has contributed to the increasing attention toward and use of teleconferencing. In assessing costs associated with teleconferencing, distance plays a vital role because of increased costs of telephone lines; however, when satellites are used, costs are independent of distance (3).

Teleconferencing users are varied: Xerox Corporation, 3M Company, IBM, Meade Johnson and Company, the Republican National Committee, the Roman Catholic Church, and the U.S. Department of Commerce, to name a few (1). Also varied are the purposes of such teleconferences, as demonstrated by the following examples:

• In 1982, Ohio State University held an international teleconference, Microcomputers in Education (4). The purpose was to exchange information about possible uses of microcomputers in schools.
• Teleconferencing has been used for instructional programs by the American Hospital Association, for sales meetings by Ford Motor Company, and for stockholders meetings by Texas Instruments (5).
• Isolated and remote areas often benefit from teleconferencing. Teachers in distant areas in Alaska recently engaged in a course conducted through the medium of teleconferencing (6).

Both advantages and disadvantages of teleconferencing have been cited. Marlow (5) summarized some of the reasons for its wide acceptance:

• Higher costs of travel
• Availability of satellite capacity
• Development of low-cost hardware
• Availability of earth stations and
• Encouragement by hotel, motel, and conference facilities to use teleconferencing

Surveys of organizations that have participated in teleconferencing have revealed some positive aspects users see in the system. In one survey, 29 percent of the respondents stated that they had initiated teleconferencing to save money through reduced travel costs. Twenty-eight percent mentioned the impact of reduced travel on productivity as a catalyst for their use of teleconferencing (2). In another survey, 80 percent of the respondents cited advantages of saving travel time and making meetings more cost-effective (7). Costs of a teleconference can vary dramatically; however, when compared with a face-to-face meeting, teleconferencing is usually very cost-effective. The relative cost of teleconferencing drops substantially as the size of the audience increases (8).

Increased communication is an advantage often cited for teleconferencing (2). When an organization has people in dispersed locations, the value of this type of communication increases. Some have pointed out that teleconferencing should be viewed as "a substitute for communication that does not take place but ideally should" (9).

Disadvantages cited in surveys include lack of face-to-face meetings, difficulty in watching a video screen for a long period of time, and the hesitancy of people to interact (7). The size of the audience also appears to be a concern; although a large audience makes the teleconference more cost-effective, there may be a problem in allowing adequate interaction by the entire audience (4).

Evaluations of teleconferences offer an opportunity to obtain feedback from those involved in the process. After such an evaluation, the usefulness of this medium can be assessed. Reporting on one evaluation, Nichols (4) stressed four points for those contemplating such an endeavor:

1. Plan the teleconference early. The content and programming should be completely organized well before the teleconference.

2. Match the content to the audience. This may necessitate a needs survey to possible participants. No communication effort will be successful if it is not directed toward the needs of the consumers.

3. Use skilled presenters and moderators. These individuals play such a key role that they must be competent before a television camera and an audience.

4. Be flexible. There are always last-minute problems that arise. Program planners must be able to quickly adjust to a modification in plans as unforeseen events arise.

PLANNING FOR VIDEOCONFERENCE PROGRAM

A TRB committee was formed to plan a teleconferencing program that would be of wide interest to transportation professionals. The committee decided that videoconferencing would be defined in the following manner: those at remote sites would both see and hear the broadcast. However, one group of sites would be active, that is, participants would be able to be heard during question-and-answer periods, and one group of sites would be passive, that is, participants would not be able to participate in the question-and-answer sessions. The topic chosen for the videoconference was microcomputer applications in transportation. Considering the increased use of microcomputers both at work and in the home, the committee believed that this topic would have a broader appeal than, perhaps, other more narrowly defined technical areas.

To provide a program that could be reasonably managed with volunteer help, four active sites were used; these sites were in the states of Iowa, Minnesota, Montana, and Texas. The four active sites had one-way video and two-way audio. Thus, these sites received a picture and audio from the satellite, but could not transmit a video picture. Telephone lines were used to provide for two-way audio communication between each of the active sites and the transmission site in Washington, D.C. Participants at the active sites could ask questions of those making the presentations in Washington.

The signal for the program was carried on WESTAR IV and SATCOM III-R satellites. These satellites are commonly used by hotels, public television stations, and cable television networks that offer videoconference services. Program costs were for transmitting the signal and rental time on the satellites. There was no charge to receive the signal. Thus, the number of remote sites had no effect on the cost to TRB.

Passive sites, that is, those without two-way audio, were promoted by the committee and TRB. General information on the satellite signal, along with the time of the program, were provided in newsletters, meetings, and other forms of communication

to encourage the establishment of passive sites. There are no complete data on the number of passive sites receiving the satellite signal; however, information that was obtained indicated that there were 46 individual sites in at least 26 states. Three additional states taped the program and used it for later viewing. After the program was completed, 11 other states requested the tapes for viewing in their areas. The FHWA, U.S. Department of Transportation, also obtained copies of the tapes and circulated them to its division offices.

There is no firm count of the number of people who viewed the program. The largest confirmed audience was 150; the smallest was about 20 viewers. It would not be unrealistic to estimate an average of 50 viewers per site, with an estimated 50 sites having received the signal. Thus, as many as 2,500 individuals viewed this videoconference. The studio audience in the Sheraton Washington's Cotillion Ballroom where the presentations were made numbered about 200.

The videoconference presentations were similar to those at a regular session of the TRB Annual Meeting. However, those in attendance at the broadcast site in Washington, D.C., were not permitted to ask questions. The two question-and-answer sessions were reserved for the four active sites. A remote monitor received questions from each active site; these were screened and permitted to be received in the Cotillion Ballroom. Thus, the audience in the Cotillion Ballroom, as well as all of the audiences at both the active and passive sites, could hear the questions being asked. In addition, all participants could watch and hear the speaker's response to the questions.

The entire program was 3 hours long with no scheduled breaks. Individuals at the remote sites were permitted to come and go into the sessions as is normally the custom at the TRB Annual Meeting. Satellite time was purchased for a specific period, 2:00 to 5:00 p.m. Therefore, it was important that all time be used effectively.

OBJECTIVES OF THE PROGRAM

The major objectives of this experimental videoconference program for TRB were as follows:

1. To become more familiar with the technical requirements for videoconferencing.

2. To determine costs associated with videoconferencing;

3. To determine the planning requirements for conducting a videoconference;

4. To determine the acceptance of videoconferencing at both active and passive remote sites by attendees; and

5. To gain sufficient experience to make appropriate decisions about future use of videoconferencing by TRB.

A brief evaluation of the videoconference is given in this paper. A questionnaire was given to the attendees at all the active sites and selected passive sites. The discussion that follows addresses the responses to this questionnaire and the costs associated with the videoconference.

RESULTS OF QUESTIONNAIRE EVALUATION

Subject Population

A total of 404 people at 12 different sites participated in the evaluation of the videoconference. Of

this total, 180 respondents were at active sites, 186 respondents were at passive sites, and 38 respondents were at the broadcast site. Active sites were Ames, Iowa; Minneapolis, Minnesota; Billings, Montana; and Austin, Texas. Passive sites were Tallahassee, Florida; Lexington, Kentucky; Lincoln, Nebraska; Bismarck, North Dakota; Knoxville, Tennessee; and Salt Lake City, Utah. The broadcast site was in the Sheraton Washington's Cotillion Ballroom. The number of respondents at individual sites ranged from a low of 22 to a high of 91.

Employment Classification

As shown in Table 1, the distribution of respondents by job type was similar at both active and passive sites. Approximately one-third of the respondents

TABLE 1   Employment Classification of Respondents

Primary Type of Job Held	Active Sites		Passive Sites		Broadcast Site	
	No.	Percent	No.	Percent	No.	Percent
Administrative	58	35	47	27	7	25
Planning	27	16	28	16	10	34
Design	32	19	29	17	2	7
Operations	13	8	11	6	1	3
Construction	7	4	14	8	0	0
Maintenance	8	5	6	4	1	3
Research	12	7	11	6	7	25
Other	9	6	27	16	1	3
No response	14		13		9	
Total	180		186		38	

Note: Numbers and percentages in this table reflect the subject population who responded to these questions.

held administration jobs, one-third held planning and design jobs, and the remainder were split between operations, construction, maintenance, and research. The difference in the number of respondents who held other jobs was primarily the result of the location of one of the passive sites on the campus of a major university. Therefore, at this location, the videoconference was accessible to faculty and staff not necessarily associated with transportation agencies.

It is interesting to note that more than 80 percent of the respondents at the broadcast site in Washington, D.C., were administrators, planners, or researchers. This was different from the mix of attendees at the remote sites. At these locations, approximately 50 percent of the respondents were in these three categories.

Previous Attendance

As shown in Table 2, 17 percent of the respondents at the active sites and 14 percent of the respondents at the passive sites had previously attended a TRB Annual Meeting. Not surprisingly, 84 percent of the respondents at the broadcast site had previously attended such meetings. Of those who had previously attended a TRB Annual Meeting, approximately 50 percent at the active and passive sites had attended only one meeting. For those at the broadcast site, that is, the TRB Annual Meeting, 66 percent had attended more than three Annual Meetings.

Thirteen percent of the respondents at the active sites, 16 percent at the passive sites, and 12 percent at the broadcast site had previously attended a videoconference. Of those who had attended a video-

TABLE 2   Respondents' Prior Attendance at a TRB Annual Meeting and a Videoconference

	Active Sites		Passive Sites		Broadcast Site	
	No.	Percent	No.	Percent	No.	Percent
Previously attended TRB Annual Meeting	30	17	25	14	27	84
If yes, number of times						
1	10	40	12	48	3	14
2	5	20	7	28	2	10
3	4	16	4	16	2	10
More than 3	6	24	2	8	14	66
Previously attended videoconference	23	13	28	16	4	12
If yes, number of times						
1	10	50	17	74	2	40
2	6	30	2	9	2	40
3	2	10	3	13	0	0
More than 3	2	10	1	4	1	20

Note: Numbers and percentages in this table reflect the subject population who responded to these questions.

conference, 50 percent at the active sites, 74 percent at the passive sites, and 40 percent at the broadcast site had attended only one. Approximately 20 percent at each of the sites—active, passive, and broadcast—had attended more than two videoconferences.

Age and Education

As shown in Table 3, approximately two-thirds of the respondents at the remote sites were between the ages of 36 and 55 and an additional 25 percent was between the ages of 26 and 35 years. The breakdown by age of the respondents at the broadcast site is somewhat different. In this group, the largest percentage (37 percent) of the respondents was in the 26-to-35 age group, and approximately 50 percent was in the 36-to-45 and 46-to-55 age groups.

Data in Table 3 concerning the educational level of the respondents show that they are well educated: more than 90 percent had attended at least some college; more than 75 percent were college graduates; and approximately one-third had attended graduate school. The audience at the broadcast site appeared to be even better educated: 97 percent had attended college, 90 percent were college graduates, and 70 percent had attended graduate school.

TABLE 3   Age and Education of Respondents

	Active Sites		Passive Sites		Broadcast Site	
	No.	Percent	No.	Percent	No.	Percent
Age (years)						
Less than 25	2	1	3	2	0	0
26 to 35	42	25	44	26	12	37
36 to 45	54	32	56	33	8	24
46 to 55	51	30	57	33	8	24
56 to 65	20	12	11	6	5	15
Education						
Non-high school graduate	2	1	1	1	1	3
High school graduate	14	8	10	6	0	0
Attended college	22	13	28	16	2	6
College graduate	72	42	83	48	7	21
Attended graduate school	23	13	22	12	4	12
Graduate degree	39	23	30	17	19	58

Note: Numbers and percentages in this table reflect the subject population who responded to these questions.

TABLE 4 Respondents' Experience with Microcomputers

Use Microcomputer at Work	Use Microcomputer in Home					
	Yes		No		Total	
	No.	Percent	No.	Percent	No.	Percent
Yes	40	10	60	16	100	26
No	55	15	223	59	278	74
Total	95	25	283	75	378	100

Note: Numbers and percentages in this table reflect the subject population who responded to these questions.

Experience with Microcomputers

Because the content of the videoconference concerned the use of microcomputers, respondents were asked to provide information about their experience with microcomputers, both at home and at the office. As shown in Table 4, 10 percent of the respondents used microcomputers at both work and home; 15 percent used microcomputers only at home; and 16 percent used microcomputers only at work. Almost 60 percent of the respondents did not use microcomputers either at home or work.

Environmental Characteristics at the Remote Sites

Several questions concerned environmental characteristics at the remote sites; some were about the facilities, whereas others were about the video and audio characteristics of the presentations as received at the remote sites. Respondents were asked to rate these characteristics on a scale of 1 through 5, with 1 being very unsatisfactory, 2 being unsatisfactory, 3 being indifferent, 4 being satisfactory, and 5 being very satisfactory. Thus, a rating of 4 or 5 indicated satisfactory or better acceptance of the characteristic in question. Mean ratings were calculated for each question and a statistical comparison (t-test) was made between the means of the active and passive sites. Significant differences were determined at the 0.05 level.

Facilities

Some items on the questionnaire were aimed at determining whether such conditions as the seating arrangement, temperature of the room, and the amount of space available for the respondents were satisfactory. The relatively high means shown in Table 5 indicate overall satisfaction with the facilities at both active and passive sites.

There was no statistically significant difference between the mean values of the ratings given to the seating arrangement at the active and passive sites (3.90 and 3.83, respectively). Seventy-nine percent of the respondents at the active sites and 76 percent at the passive sites rated seating arrangements as satisfactory or better.

There was no significant difference between the means at the active and passive sites concerning satisfaction with room temperature (3.84 and 3.68, respectively). Seventy-six percent of the respondents at the active sites and 69 percent at the passive sites rated the temperature as satisfactory or better. However, several respondents at one of the sites commented that it was too cold.

Respondents at the active sites believed that there was better allocation of space than did those at the passive sites. There was a significant difference between the means for the two types of sites. The mean value at the active sites was 4.11, whereas the mean value at the passive sites was 3.90.

Video Characteristics

Not only is it important that the physical facilities be adequate for participants, but it is obviously important that the video characteristics be good. Four different categories concerning video characteristics were evaluated at both the active and passive sites: picture clarity, size of screen,

TABLE 5 Summary Evaluation of Environmental Characteristics at the Sites

Question	Active Sites											Passive Sites											Significant Difference Between Means
	Respondents Choosing a Given Rating[a]										Mean Value	Respondents Choosing a Given Rating[a]										Mean Value	
	1		2		3		4		5			1		2		3		4		5			
	No.	%	No.	%	No.	%	No.	%	No.	%		No.	%	No.	%	No.	%	No.	%	No.	%		
1. How satisfactory were the following characteristics of the facilities?																							
a. Seating arrangement	2	1	18	10	17	10	98	55	42	24	3.90	4	2	16	9	24	13	105	57	36	19	3.83	No
b. Room temperature	7	4	18	10	18	10	87	50	46	26	3.84	7	4	27	15	22	12	90	49	38	20	3.68	No
c. Amount of space	2	1	10	6	10	6	97	56	55	31	4.11	4	2	13	7	19	10	109	60	38	21	3.90	Yes
2. How satisfactory were the video characteristics?																							
a. Picture clarity	0	0	10	6	14	8	91	53	58	33	4.14	1	1	1	1	12	6	96	52	75	40	4.31	Yes
b. Size of screen	0	0	4	2	5	3	102	59	61	36	4.28	1	1	15	8	13	7	107	58	49	26	4.02	Yes
c. Distance from screen to your seating	0	0	4	2	6	4	99	58	62	36	4.28	3	2	12	6	17	9	98	53	55	30	4.03	Yes
d. Color of picture	0	0	5	3	15	9	103	61	46	27	4.12	1	1	4	3	14	8	101	55	65	35	4.22	No
3. How satisfactory were the audio characteristics?																							
a. Clarity of reception	0	0	14	8	14	8	82	49	57	35	4.09	1	1	7	5	11	8	72	55	40	31	4.09	No
b. Volume	0	0	4	2	6	4	94	56	63	38	4.29	0	0	3	2	11	8	78	60	39	30	4.17	No

Note: Numbers and percentages in this table reflect the subject population who responded to these questions.

[a] 1 = very unsatisfactory, 2 = unsatisfactory, 3 = indifferent, 4 = satisfactory, and 5 = very satisfactory.

distance from screen to seating, and color of pic-
ture. Results of this portion of the evaluation are
also given in Table 5.

Picture clarity received a high rating at both
the passive and active sites. Although there was a
statistically significant difference between the
means of the active and passive sites (4.14 and
4.31, respectively), more than 85 percent of the re-
spondents at both sites rated picture clarity as
satisfactory or better.

Respondents at the active sites rated satisfac-
tion with the size of screen higher than did those
at passive sites (4.28 and 4.03, respectively).
Although this was a statistically significant dif-
ference, more than 80 percent of respondents at both
active and passive sites were satisfied with the
size of the screen.

Respondents at active sites also rated distance
from the screen to seating higher than did respon-
dents at passive sites (4.28 and 4.03, respec-
tively). Although their responses were significantly
different, most people (more than 80 percent) were
satisfied with the distance from the screen to their
seating.

Concerning the color of the picture, there was no
significant difference between the means of the
active and passive sites. The mean value at the
active sites was 4.12 and the mean value at the pas-
sive sites was 4.22, indicating that both groups
were satisfied with the color of the picture.

Overall, respondents at both active and passive
sites were satisfied with the video characteristics.
Ratings were split, with respondents at the active
sites rating two of the characteristics higher and
respondents at the passive sites rating the other
two higher. It was suggested that, when they are
used, television monitors be elevated.

Audio Characteristics

Responses to two items concerning audio characteris-
tics at the sites are given in Table 5. For one
item, clarity of reception, there was no significant
difference between the means at the active and pas-
sive sites. In fact, both had identical means of
4.09 for this characteristic, showing a satisfactory
reaction.

There was also no significant difference between
the means at the active and passive sites concerning
volume of the audio coming into the room. The mean
value of the active sites was 4.29 and the mean
value of the passive sites was 4.17. Again, both
groups expressed satisfaction with the audio char-
acteristics.

Evaluation of Presentations

Respondents at the active and passive sites were
asked to evaluate the various presentations made in
the videoconference session. Topics covered by the
speakers were as follows:

• Overview. An overview of the use of microcom-
puters in the transportation field was the first
presentation. It was not intended to be an in-depth
presentation, but a general one that would be of
benefit to an audience having broad interests and
varying levels of knowledge. The presentation was
intended to set the stage for the program that was
to follow.

• The productive office. This presentation con-
centrated on the use of word processors and micro-
computers in enhancing the effectiveness of the mod-
ern office. Examples were given to show how the use

of computer capabilities improved the efficiency and
effectiveness of office operations, particularly
when operating under critical deadlines.

• Strategic planning. In the past few years,
strategic planning has become a vital part of many
administrative offices in state departments of
transportation and other transportation agencies.
Sensitivity analysis may be required to evaluate
various alternatives. In this presentation, an
attempt was made to look at the contributions micro-
computers can make to the strategic planning area.

• Ridesharing. The ridesharing presentation was
concerned with the manner in which microcomputers
can assist in improving the matching needs of ride-
sharing programs in urban areas. The presentation
dealt with the software and type of computer on
which the software will operate.

• Traffic engineering. The traffic engineering
presentation dealt with the use of microcomputers in
traffic engineering activities. These activities
included intersection analysis as well as intersec-
tion control in real time. Specific examples were
given of the use of microcomputers in the field to
improve the operational efficiency of specific
street and highway facilities.

• Transit operations. This presentation re-
viewed the types of software available to assist in
typical transit operations. Uses of software in-
cluded routing and scheduling of buses, scheduling
of maintenance activities, and other activities to
assist a transit manager in improving the efficiency
of the operations.

• Design and engineering. Those in design and
engineering have long used computers to enhance this
area of transportation. However, most of the soft-
ware has been available for mainframe computers
rather than microcomputers. This presentation re-
viewed the increased capabilities of microcomputers
in enhancing design and engineering activities in
transportation.

• Construction and maintenance. This presenta-
tion dealt with the use of microcomputers in con-
struction and maintenance activities. Perhaps of all
the topics under discussion in this TRB session,
construction and maintenance has been least affected
by microcomputers. However, endeavors are being made
to increase the use of microcomputers in the con-
struction and maintenance areas.

While each of the presentations was similar in
many ways, there were some differences. For example,
the use of pretaped segments and visuals varied
among the speakers. Although the analysis did not
correlate the specific characteristics of each in-
dividual presentation, the ratings that respondents
gave the presentation appear indicative of audience
acceptance.

As with the questions about environmental char-
acteristics at the remote sites, respondents were
asked to rank each category of the presentation on a
scale of 1 through 5. An evaluation was made by
using the mean value response from respondents for
each of four categories: appropriateness of content
related to audience needs, speaker's effectiveness,
speaker's use of visuals, and speaker's response to
questions.

Appropriateness of Content Related to
Audience Needs

As might be expected from a program with such a
diverse group of topics, interest in the content of
different parts of the program varied greatly. For
example, mean ratings for appropriateness of indi-
vidual presentations ranged from 3.25 to 4.09 at

active sites and from 3.24 to 4.85 at passive sites. The percentage of respondents who rated the content of the various presentations as satisfactory or better ranged from 35 to 80 percent. Type of site made no significant difference in the response to this question.

Speaker's Effectiveness

Response to this question is probably related to interest of the respondents in the topic area being evaluated. Therefore, not surprisingly, mean ratings for effectiveness of individual presentations ranged from 3.03 to 4.14 at the active sites and from 3.10 to 4.04 at the passive sites. The percentage of respondents who rated the effectiveness of the various presentations as satisfactory or better ranged from 33 to 88 percent. Respondents at active sites rated speaker's effectiveness significantly better than did respondents at passive sites.

Speaker's Use of Visuals

As mentioned previously, the use of visuals varied among speakers. Thus, the mean ratings for the individual presentations ranged from 3.20 to 4.39 at active sites and from 3.37 to 3.94 at passive sites. The percentage of respondents who rated the visuals for the various presentations as satisfactory or better ranged from 43 to 88 percent. Type of site made no significant difference in the response to this question. It was suggested that the visual aids that were shown in the upper right corner of the screen be shown full screen.

Speaker's Response to Questions

The mean ratings given to speaker's response to questions for the individual presentations ranged from 3.67 to 4.00 at active sites and from 3.50 to 3.81 at passive sites. The percentage of respondents who rated response to questions as satisfactory or better ranged from 53 to 85 percent. The responses to questions by seven of the eight speakers were rated higher at active sites than they were at passive sites. In two of these cases, the difference was significant.

General Evaluation

Respondents were queried about their general evaluation of the videoconference. Questions were asked about various characteristics of the videoconference such as the interchange between speakers and the audience, the amount of time devoted to the program, and the comparison of the videoconference with a face-to-face meeting at the TRB Annual Meeting. Evaluation of these characteristics should aid in planning future videoconferencing with interactions at remote sites. Responses to these questions are given in Table 6.

Interchange Between Speakers and Audience

Several items on the questionnaire concerned satisfaction with the interchange between the speakers and the audience. With regard to the appropriateness of questions during the question-and-answer session, respondents differed significantly depending on whether they were at active or passive sites. Active sites had a mean of 3.85, with 82 percent of the respondents reporting satisfaction, whereas the passive sites had a mean of 3.47, with only 53 percent of the respondents expressing satisfaction with the question-and-answer session.

The question-and-answer sessions were very structured and had specific times allocated for them. In the planning stages for this activity, there was some question about the amount of time that should be allocated for discussions with the audience. When asked about the time allotted for questions, 68 percent of the respondents at the active sites and 57 percent of the respondents at the passive sites expressed satisfaction.

Responding to a question about time allotted for follow-up questions, participants at the active and passive sites gave mean ratings that were not significantly different (3.36 and 3.44, respectively). Forty-five percent at active sites and 50 percent at passive sites responded with a rating of 3 or lower for this item. Because of the design of the item, it was not possible to determine if respondents' dissatisfaction resulted from too much or too little time for the question-and-answer period.

Respondents at the active sites rated their ability to hear questions higher than did respondents at the passive sites (means of 3.71 and 3.08 respectively), even though the questions could be heard at each site. This was a statistically significant difference. More than one-half of the respondents at the passive sites rated this item with a 3 or lower.

With respect to their ability to hear responses, there was a significant difference between means at the active and passive sites. Respondents at active sites gave a mean value of 4.25 for this category, whereas respondents at passive sites gave a mean of 3.94. Ninety-five percent of those at the active sites rated this item at a satisfactory level.

Respondents at both active and passive sites were asked to respond to a question about their opportunity to ask questions, although there was a category labeled nonapplicable that was intended for use by respondents at passive sites. One of the main objectives of this question was to determine whether the very structured method of permitting questions to be asked would be well received by respondents. Because of the limited time available for questions, questions were queued, that is, they were selected by the monitor for speakers' responses. Respondents did not have the flexibility of an exchange of questions and answers with speakers as one has in a face-to-face meeting. As expected, there was considerable variation as well as a significant difference in the mean ratings on this item at the active and passive sites; active sites had a mean of 3.99 and passive sites had a mean of 2.96.

Satisfaction with Program Format

Because this was the first videoconference conducted by TRB, program planners had many concerns about the format. Therefore, the questionnaire given to participants had several items about the perceived satisfaction of participants with the program format. Table 6 gives the responses of participants at the active and passive sites to questions about length of presentation, number of coffee breaks, and the total length of the program.

Each presentation was approximately 20 minutes long. The respondents at active sites gave a mean value for the length of the presentations of 4.01 and respondents at passive sites gave a mean value of 3.68. This was a statistically significant difference. Although more than 90 percent of the respondents at the active site believed that the length of the presentations was satisfactory, this dropped to about 70 percent at the passive sites.

TABLE 6 General Evaluation of the Videoconference

Question	Active Sites											Passive Sites											Significant Difference Between Means
	Respondents Choosing a Given Rating[a]										Mean Value	Respondents Choosing a Given Rating[a]										Mean Value	
	1		2		3		4		5			1		2		3		4		5			
	No.	%	No.	%	No.	%	No.	%	No.	%		No.	%	No.	%	No.	%	No.	%	No.	%		
5. How satisfactory was the interchange between speakers and your audience group?																							
a. Appropriateness of questions	2	1	5	3	22	14	121	74	13	8	3.85	0	0	6	10	22	37	28	48	3	5	3.47	Yes
b. Amount of time allotted for questions	1	1	25	15	26	16	92	55	21	13	3.65	0	0	8	14	17	29	29	50	4	7	3.50	No
c. Time allotted for follow-up questions	4	3	32	22	28	20	68	47	12	8	3.36	0	0	8	15	19	35	24	43	4	7	3.44	No
d. Ability to hear questions	0	0	23	14	26	16	90	55	25	15	3.71	6	9	15	24	15	24	24	37	4	6	3.08	Yes
e. Ability to hear responses	0	0	2	1	7	4	103	63	52	32	4.25	0	0	2	3	10	16	41	65	10	16	3.94	Yes
f. Opportunity for you to ask questions	0	0	10	6	19	12	92	58	38	24	3.99	2	9	5	22	9	39	6	26	1	4	2.96	Yes
6. How satisfactory was the amount of time devoted to the program?																							
a. Length of presentation	0	0	9	5	7	4	126	75	27	16	4.01	3	2	14	8	32	19	106	62	15	9	3.68	Yes
b. Number of coffee breaks	17	11	28	18	32	20	64	40	17	11	3.23	36	24	32	21	40	27	41	27	2	1	2.61	Yes
c. Total length of program	0	0	7	4	12	7	117	71	29	18	4.02	3	2	22	14	29	18	97	61	9	6	3.54	Yes
7. Considering the amount of money required for travel to Washington, D.C., from your location for a face-to-face meeting, how satisfactory is this type of alternative program?	0	0	2	1	9	5	55	33	103	61	4.53	2	1	9	5	15	9	62	36	84	49	4.26	Yes
8. Considering the amount of time required to travel to Washington, D.C., from your location for a face-to-face meeting, how satisfactory is this type of alternative program?	0	0	5	3	9	5	55	32	101	60	4.48	2	1	7	4	15	9	68	40	80	46	4.26	Yes
9. Overall, how satisfactory was this program when compared to a face-to-face meeting?	0	0	5	3	18	11	103	60	44	26	4.09	2	1	21	13	22	13	89	53	34	20	3.79	Yes
10. How satisfactory was the supplement information (brochures, handouts, papers, etc.) provided at the site?	0	0	9	5	24	14	98	60	34	21	3.95	26	17	13	9	56	36	42	27	17	11	3.07	Yes
11. How satisfied are you with what you learned today?	0	0	4	3	24	14	112	66	29	17	3.98	2	1	21	13	37	23	90	55	13	8	3.56	Yes

Note: Numbers and percentages in this table reflect the subject population who responded to these questions.

[a] 1 = very unsatisfactory, 2 = unsatisfactory, 3 = indifferent, 4 = satisfactory, and 5 = very satisfactory.

In response to an item about the satisfaction with the number of coffee breaks, respondents at the active sites gave a lower mean value for this category than did respondents at the passive sites. Respondents at the active sites gave a mean value of 3.23, whereas respondents at the passive sites gave a value of 2.61. Thus, there was a statistically significant difference between responses from active and passive sites. Overall, about one-half of the respondents at active sites and 71 percent of respondents at passive sites rated this item as a 3 or lower.

The total program, including the presentations and question-and-answer sessions, was approximately 3 hours long. There was also a statistically significant difference between responses of those at active sites and those at passive sites to the question about satisfaction with the total length of the program. Almost 90 percent of the respondents at the active sites were satisfied (mean of 4.02); 67 percent of respondents at the passive sites were satisfied (mean of 3.54).

Comparison of Videocommunication Session with a Face-to-Face Meeting

Three questions dealt with comparing the video presentation with a face-to-face meeting at the TRB Annual Meeting. One question dealt with the amount of money required for a face-to-face meeting, whereas another question dealt with the amount of time required to have a face-to-face meeting. The third question in this category concerned the respondent's

overall satisfaction with this type of program compared with a face-to-face meeting.

Amount of Money

There was a significant difference between the means for this question at the active and passive sites (4.53 and 4.26, respectively). Ninety-four percent of the respondents at active sites and 85 percent of the respondents at passive sites gave a ranking of satisfactory or higher. Thus, it would appear that, when considering the amount of money required for travel to Washington, D.C., for a face-to-face meeting, the respondents believed that a videocommunication session was a viable alternative for technology transfer.

Amount of Time

Respondents at the active sites gave a mean value of 4.48 to this question and the respondents at the passive sites gave it a mean value of 4.26, which was a significant difference between the means. Ninety-two percent of the respondents at the active sites and 86 percent of the respondents at the passive sites gave a ranking of satisfactory or higher to this question. Respondents believed that, when considering the amount of time required to travel to Washington, D.C., a videocommunication session was a meaningful way to transfer technology.

Overall Comparison

Respondents were asked to make an overall comparison of this type of session and a face-to-face meeting. In doing this, they were not asked to consider the amount of money or the amount of time or any other costs associated with a face-to-face meeting. Respondents at active sites gave a mean rating of 4.09 to this question, and respondents at passive sites gave it a mean rating of 3.79. Thus, there was a significant difference between the active and passive sites. Eighty-six percent of the respondents at the active sites and 73 percent of the respondents at the passive sites gave a ranking of satisfactory or higher to this question. Again, a large majority of the respondents at both active and passive sites gave strong approval to this method of technology transfer.

Supplemental Information

At each site, there generally were brochures, handouts, papers, and other items associated with the various presentations. Copies of the papers that were presented in Washington, D.C., were made available at all active sites and some passive sites. Respondents at the active sites gave a mean value of 3.95 to the question of satisfaction with supplemental information, whereas at the passive sites respondents gave a mean value of 3.07. Thus, there was a significant difference between the active and passive sites. It should be noted that 81 percent of the respondents at the active sites gave a value of satisfactory or higher to this question, whereas only 38 percent of the respondents at the passive sites gave it a value of satisfactory or higher. Obviously, some of the difference in rankings was due to the extra effort that went into providing handouts at all the active sites.

Satisfaction with What Was Learned

Respondents at both the active and passive sites were asked to indicate how satisfied they were with what they had learned. Respondents at the active sites gave a mean value of 3.98 and respondents at the passive sites gave a mean value of 3.56, which was a significant difference between the active and passive sites. Eighty-three percent of the respondents at the active sites gave a rating of satisfactory or higher to this question and 63 percent of the respondents at the passive sites gave a rating of satisfactory or higher. Thus, a large majority of respondents at both active and passive sites were pleased with what they had learned from the program.

Knowledge of Microcomputers

Two questions were related to the respondents' levels of knowledge about microcomputers. One question dealt with the respondents' levels of knowledge before attending the program; the other question dealt with their levels of knowledge after attending the program.

There were statistically significant differences in the mean scores of respondents at the active and passive sites concerning their knowledge of microcomputers before attending the teleconference (see Table 7). The mean for the active sites was 3.06 and the mean for passive sites was 2.82. Sixty-four percent of respondents at the active sites and 73 percent of those at the passive sites rated their prior knowledge as average or less.

For both active and passive sites, respondents gave mean values for level of knowledge before and

TABLE 7 General Evaluation of Level of Knowledge

Question	Active Sites											Passive Sites											Significant Difference Between Means
	Respondents Choosing a Given Rating[a]												Respondents Choosing a Given Rating[a]										
	1		2		3		4		5		Mean Value		1		2		3		4		5		Mean Value	
	No.	%	No.	%	No.	%	No.	%	No.	%			No.	%	No.	%	No.	%	No.	%	No.	%		
12. Please indicate your knowledge level of microcomputers prior to attending this program:	7	4	51	30	50	30	48	28	14	8	3.06		9	5	67	39	51	29	38	22	8	5	2.82	Yes
13. Please indicate your knowledge level of microcomputers after attending this program:	0	0	30	18	56	34	64	39	14	9	3.38		1	1	40	23	74	43	48	28	8	5	3.13	Yes

Note: Numbers and percentages in this table reflect the subject population who responded to these questions.

[a]1 = no knowledge, 2 = some knowledge, 3 = average knowledge, 4 = better than average knowledge, and 5 = very knowledgeable.

after the session that were significantly different (higher after the videoconference). Thus, respondents at both the active and passive sites indicated that their level of knowledge increased through information gained from the session.

COST ANALYSIS

A complete cost analysis was impossible because of lack of information on all costs associated with the program. Many hours of TRB staff and volunteer time were spent on the program for which there are no accurate estimates. In addition, agencies responsible for both the active and passive remote sites incurred costs for which accurate tabulations are not available. Also, the total number of individuals viewing the program is not known. However, even with the deficiencies that do exist in conducting an appropriate cost analysis, some cost data are available that will give at least a cursory view of the resources required for conducting future programs.

As stated previously, it is not unrealistic to estimate the total viewing audience to be about 2,500, which is equal to about one-half of the attendees at the TRB Annual Meeting held in Washington, D.C. Because this was a first for TRB and a reasonable level of effort was put forth in advertising the program, one might expect the attendance at future programs to vary considerably--depending on acceptance of the first program.

The out-of-pocket cost to TRB for the program (paid to WETACOM, Inc., the producer for TRB) was $37,123. The original bid was $33,561, but additional requirements were added during program formation. Information on out-of-pocket costs from the remote sites varied from a low of 0 to as much as $3,900. Several had costs in the $200-to-$300 range. Costs varied depending on whether the facilities were owned by the agencies or available to them on a low- or no-cost basis. Universities often have facilities to accommodate this type of programming and may make these facilities available to other state agencies on a low- or no-cost basis. In addition, some agencies added computer demonstrations, luncheons, handouts, and other activities to supplement the 3-hour program. Obviously, the more activities, the greater the local costs.

In a cost analysis of this type, it is difficult to aggregate the costs that accrue from all agencies involved in the program. No single agency pays for all costs. This, of course, is true if one assessed the cost of the TRB Annual Meeting. Travel costs as well as other costs are borne by the agencies sending their employees to the Annual Meeting. Although the TRB costs for conducting an Annual Meeting might be obtained, it would be difficult, if not impossible, to ascertain all costs associated with the Annual Meeting.

If there were 2,500 viewers of the program, the direct out-of-pocket costs to TRB would be $14.85 per person viewing the program. If the costs at the remote sites were one-half of the TRB outlay (i.e., $18,526), the cost per individual viewing the program would be $22.27. When considering costs of various types of technical programs, these costs are not out of line. In addition, the total cost for increasing the length of the program to two back-to-back sessions (i.e., 6 hours) would not be nearly equal to twice the basic cost. Based on the experience with this program, the basic cost can be reduced for future programs.

As previously discussed, there were minimal differences between respondents at active and passive sites in the acceptance of the program. Thus, one should consider the extra costs for providing telephone service in order to have two-way audio communication. The cost to TRB for telephone service was $3,500, which was about 10 percent of the total contract cost. There were 180 questionnaires returned from the active sites, but it is known that not all of the attendees at the active sites completed questionnaires. If there was an average of 50 participants per site, as estimated earlier, the cost per participant for telephone service at the active sites would be $17.50, which exceeds the average total cost for the 2,500 participants at both active and passive sites.

While this cost analysis is certainly not complete, it does provide some parameters for considering future videoconferencing programs. Information contained here does give a basis for preliminary evaluation of the costs associated with using videoconferencing for technology transfer by TRB.

CONCLUSIONS AND RECOMMENDATIONS

Overall, the use of the videoconference at the 1984 TRB Annual Meeting appears to have been well received. Several conclusions appear appropriate after the questionnaire responses to the videoconference were evaluated:

• The videoconference served as a method for increasing communication.
• The presenters were skilled in sharing their ideas.
• There were few differences between responses of those at the active sites and responses of those at the passive sites.
• The videoconference was cost-effective.
• TRB should consider videoconferencing as one of its technology transfer activities to increase the communication to field personnel.

Increased Communication

The videoconference served a different audience than the one that usually attends the TRB Annual Meeting. Therefore, the videoconference in all likelihood provided information to an audience that would never have received information from a TRB conference in Washington, D.C. Few of these individuals had attended a TRB meeting in Washington. Thus, technology transfer involved many individuals who otherwise would not have had the opportunity to participate. In addition, the results showed that the participants learned a significant amount about microcomputers from the videoconference. The participants indicated a significant increase in their levels of knowledge because they attended the videoconference.

It is recommended that future videoconferences continue to address the needs of the different audience identified in this survey. Further, a needs assessment could be made of those who participated at the active and passive sites, determining which of their most pressing information needs could be addressed by videoconferencing. Because the audience is different from that in attendance at the TRB site in Washington, the needs of the videoconference audience may be different from the needs of the audience at the sessions presented at the Washington site.

Skill of Presenters

At this videoconference, respondents were satisfied with the quality of the presentations. Because presenters were selected carefully for the videoconfer-

ence, it was not surprising that the audience was satisfied. Presenters had been carefully admonished concerning their modes of presentation and their use of visuals.

In future years, it is recommended that careful consideration continue to be given to the selection of presenters at the videoconference. Perhaps a list of criteria should be developed to use in the choice of speakers. Speakers should also be given a list of requirements for or expectations of the videoconference presentation; these requirements may be above and beyond requirements for an ordinary presentation at TRB in Washington.

Active Versus Passive Sites

Overall, there appeared to be few overwhelming differences between active and passive sites. Certainly, there were few differences that changed the evaluation of an item from "satisfactory" to "unsatisfactory." In fact, the videoconferencing was favorably rated when compared with a face-to-face or live presentation. The videoconference was well received by those at both active and passive sites. It does not matter whether the videoconference is active or passive; the critical factor appears to be the availability of the videoconferencing as an adjunct to the on-site conference in Washington.

Cost-Effectiveness

When the number of participants is considered relative to the costs incurred, the videoconference appears to be a cost-effective way for TRB to share information with those in the field. Respondents indicated a substantial reduction in travel costs and in loss of productivity with this type of program. The unit cost appears to make the videoconference a feasible way to share information.

ACKNOWLEDGMENTS

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