

Delphi Conferencing: Computer-Based Conferencing with Anonymity

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Abstract

This paper is a report on an on-line (computer-automated) conference that was conducted for thirteen weeks in the spring of 1970. The conference involved twenty individuals throughout the country who were able to engage in the conference discussion at their convenience by going to a computer terminal at their time of choice. The computer maintained a real-time accounting of the discussion items entered by the various respondents and of how the group had voted on these items with respect to scales of desirability and feasibility (for proposals), or importance and confidence (for comments).

The purpose of the conference was to evaluate potential applications of this type of conference system and to critique the author's design of the particular system in use. During the first part of the conference, no conferee was aware of the identity of the other conference members. In addition, the computer did not provide to the conferees the identification of originators of the items or of individual votes. Because of this anonymity, such systems may be referred to as "Delphi Conferencing Systems."

The conference group was deliberately chosen by the author to be a mixture of Delphi designers, computer specialists, and operations research analysts. The group was also evenly divided as to affiliation with government, industry, nonprofit organizations, and universities. About one-third of the group had no previous experience with computers or terminals. Another third had only minimal contact as users of computer services provided by others.

"It takes two of us to create a truth, one to utter it and one to understand it."—Gibran.

Background¹

Beginning the week of March 16, 1970, twenty individuals throughout the United States were contacted by telephone and invited to participate in a computer-based conference. They could participate in this conference from any teletype or teletype-compatible computer terminal available to them. The conferencing system was designed to be self-instructing from the terminal; only the appropriate telephone number and log-in procedure were provided verbally. Although over one-third of the conference group had no previous experience with computers or terminals, there was no difficulty in activating the group members by means of a telephone call and ten minutes of instruction. Over the thirteen conference weeks, the only recurring difficulty for a few of the respondents was communication reliability (see section on Hardware, Software, and Cost Considerations).

A member of the conference, once on a terminal, was able to:

- view the discussion items that had been entered by members of the conference
- vote on any or all of the discussion items according to evaluation scales automatically provided by the computer
- view the vote on any or all items once a specified threshold for a number of votes entered had been exceeded

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¹A short description of this system appears in *Futurist* (magazine of the World Future Society) April, 1971.

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- enter one or more discussion items of his own

The conferee was able to go to the terminal whenever *he* wished, and the computer provided him with whatever had occurred up to that point in time—a continuous operation. The conferencing system also allowed nonparticipants to observe the discussion as it took place.

Discussion items were of two types: *proposals* evaluated by scales of desirability and feasibility; *comments* evaluated by scales of importance and confidence (validity).

The monitor of the conference (author of this paper) entered an initial ten items as a starting point for the discussion of the potential utility of systems of this sort and for a critique of the particular design. The discussion evolved to the preset limit of ninety-nine items.

This exercise may be of some disappointment to those interested in new computer technology, since the computer only played the role of a real-time accountant, keeping track of discussion items and votes instead of, for example, scales records and factory orders. This technology has been available for a significant number of years. Some of the factors as to why this is the first concrete demonstration of this type of computer application were brought out in the conference discussion.

The conference system design was, in part, based upon an earlier Delphi design used in a paper-and-pencil exercise.² During the first six weeks of the conference, no conferee had any knowledge of the identity of his fellow conferees. In the last seven weeks, after the monitor distributed (via the terminal) a list of the conferees, there was still no mechanism provided by the computer to link a conferee with a particular discussion item or with his vote on an item. Since the system maintained the anonymity of the conferees—a chief characteristic associated with Delphi exercises—but provided the essentially real-time discussion feedback, characteristic of a group conference or discussion, the author chose to refer to such a system as a Delphi Conference. Delphi exercises are usually characterized by a two-to-five-week delay necessary to summarize manually the inputs of each individual into a group result for feedback on the next round.

In actual fact, this type of system has elements of a Delphi exercise, a conference telephone call, a committee meeting, and a conference or seminar.

The differences and similarities are summarized in Table 1. The Delphi Conference, therefore, is no more than an alternative form of group communication which has certain characteristics that appear to make it attractive for particular applications. It has, for example, the time-urgent capabilities of a conference telephone call but would allow a significantly greater number of individuals to confer upon an issue.

Basically the Delphi Conference appears to have utility when one or more of the following conditions are met:

- the group cannot meet often enough in committee to give adequate timely consideration to the topic because of time or distance constraints
- there is a specific reason to preserve anonymity of the conferees (e.g., refereeing of position papers or a free exchange among different levels in an organizational structure)
- the group is too large for an effective conference telephone call or committee exchange

² See Murray Turoff's paper in *Technological Forecasting and Social Change*, 2 (1970), No. 2. This paper also provides a reasonably comprehensive background and bibliography on the Delphi technique and its application.

Table 1
Group Communication Techniques

	Conference Telephone Call	Committee Meeting	Formal Conference or Seminar	Delphi Exercise	Delphi Conference
EFFECTIVE GROUP SIZE	Small	Small to medium	Small to large	Small to large	Small to large
OCCURRENCE OF INTERACTION BY INDIVIDUAL	Coincident with group	Coincident with group	Coincident with group	Random	Random
LENGTH OF INTERACTION	Short	Medium to long	Long	Short to medium	Short
NUMBER OF INTERACTIONS	Multiple, as required by group	Multiple, necessary time delays between	Single	Multiple, necessary time delays between	Multiple, as required by individual
NORMAL MODE RANGE	Equality to chairman control (flexible)	Equality to chairman control (flexible)	Presentation (directed)	Equality to monitor control (structured)	Equality to monitor control or group control and no monitor (structured)
PRINCIPAL COSTS	Communications	Travel Individual's time	Travel Individual's time Fees	Monitor time Clerical Secretarial	Communications Computer usage
OTHER CHARACTERISTICS	Time Urgent Considerations Equal flow of information to and from all Can maximize psychological effects	Forced Delays	Efficient flow of information from few to many	Forced Delays Equal flow of information to and from all Can minimize psychological effects Can minimize time demanded of respondents or conferees	Time Urgent Considerations

- the group is interdisciplinary to the extent that a structured or refereed communication mode as opposed to a committee or panel approach is more desirable in promoting an efficient exchange of information
- telephone and letter communications, on a one-to-one basis, are insufficient or too cumbersome to augment the particular committee activity
- disagreements among members of the group are too severe for a meaningful committee or face-to-face process for the exchange of views and information

In addition, the Delphi Conferencing approach should not be considered solely as an alternative for other group-communication methods. As the conferees pointed out, it can be an important adjunct or supplement to a working committee or professional conference. It can increase the effectiveness of the actual committee process by exposing areas of agreement or disagreement and thereby focusing subsequent verbal deliberations. For professionals this type of approach offers an opportunity to improve the communication capability of the "informal" communities believed to be the stimulus for advancement in most research fields.

The individuals who participated in the Delphi Conference are listed below in alphabetical order. The author is grateful for their contribution to the proceedings contained

in the following sections. In some cases, unusual for a Delphi, two individuals acted as one conferee. This in particular allowed the conference to proceed when one of the two conferees was on a trip. The paired conferees did not appear to have difficulty in reaching agreement, at least not to the monitor's knowledge. The pairing did provide, however, one unintentional benefit for the doublet, in that the monitor (and designer of the system) could not always ascertain who was specifically responsible for a given item or vote. This is, of course, one method whereby respondents to Delphis can protect their anonymity, even from the monitor.

Conferees:³

Dr. A. Bender, Mr. M. Cochran, Smith Kline and French, Pennsylvania.
 Prof. J. Bright, Dr. H. Johnson, University of Texas, Austin, Texas.
 Mr. J. Coates, National Science Foundation, Washington, D.C.
 Mr. J. K. Craver, Mrs. C. Bower, Monsanto, St. Louis, Missouri.
 Mr. C. Darling, III, National Industrial Conference Board, New York.
 Mr. D. DelGuidice, Dr. J. Strange, National Academy of Public Administration, Washington, D.C.
 Mr. S. Enzer, Dr. O. Helmer, Institute for the Future, Connecticut.
 Mr. J. Goodman, Lockheed, California.
 Prof. A. Jones, Dr. R. Piccirelli, Wayne State University, Michigan.
 Dr. M. Kay, Dr. W. Graham, RAND, California.
 Lt. Col. J. Martino, United States Air Force, New Mexico.
 Prof. A. Oettinger, Harvard University, Massachusetts.
 Mr. D. Pyke, TRW, California.
 Mr. T. Pyke, Dr. H. Grosch, National Bureau of Standards, Maryland.
 Dr. S. Rosen, Hudson Institute, New York.
 Mr. R. See, Dr. R. Davis, National Institute of Health, Bethesda, Maryland.
 Dr. A. Sheldon, Harvard Medical School, Massachusetts.
 Dr. H. Wiedemann, Department of State, Washington, D.C.
 Mr. R. Wilcox, Office of Emergency Preparedness, Washington, D.C.
 Dr. J. Williamson, Johns Hopkins University, Maryland.

"I shall arrange the facts and leave
 the interpretation to the reader," said the
 hopeful biographer to the somber historian.
 "The moment you begin to arrange you interpret,"
 emitted the somber historian.

—Carl Sandburg
The People, Yes

³ During the conference or in the year of elapsed time since the holding of the conference, the following individuals changed affiliations:

Mr. J. Coates was with the Institute for Defense Analyses during the first three-quarters of the conference.

Dr. R. Davis is at the National Bureau of Standards.

Mr. J. Goodman is at the College of Marine Studies, University of Delaware.

Dr. H. Johnson is with Emerson Electric in St. Louis, Missouri.

Mr. D. Pyke is with Academic Planning and Research at the University of Southern California in Los Angeles.

Mr. R. See is with U.S. Naval Medical Research Unit No. 2 in Taiwan.

Dr. S. Rosen is now a consultant in New York City.

Conference Proceedings

Evaluation Scales

A member of the conference could enter either a proposal or comment-type discussion item. The following scales were associated with these items:

Proposals

<i>Desirability</i>	<i>Feasibility</i>
Very Desirable	Definitely Feasible
Desirable	Possibly Feasible
Undesirable	Possibly Infeasible
Very Undesirable	Definitely Infeasible

Comments

<i>Importance</i>	<i>Confidence (Validity)</i>
Very Important	Certain
Important	Reliable
Slightly Important	Risky
Unimportant	Unreliable

In addition, a No Judgment choice was allowed for each scale. The following summaries show how the ninety-eight items entered in the discussion over the thirteen-week conference period were finally distributed as to average vote by the respondents. The number of vote changes that occurred during the conference was more than 20 percent of the total.

Comments (total of 54)

	Certain	Reliable	Risky	Unreliable
Very Important	2	5	1	0
Important	2	31	6	1
Slightly Important	0	3	2	0
Unimportant	0	0	1	0

Proposals (total of 44)

	Definitely Feasible	Possibly Feasible	Possibly Infeasible	Definitely Infeasible
Very Desirable	2	5	0	0
Desirable	10	22	0	0
Undesirable	0	3	2	0
Very Undesirable	0	0	0	0

The discussion itself was divided into three major discussion threads by use of the association capability for referencing a new item to an older one. These were: (1) potential applications of the system; (2) implications of systems of this type; (3) a critique of the design of the system.

The conferee group can be broken down by professional area and by organizational affiliation in the following manner:

Professional Area	Number	Organizational Affiliation	Number
Delphi Designers	10	Industry	5
Computer Specialists	5	Nonprofits	5
Operations Research and Policy Studies Specialists	5	Government	5
		Universities	5

For each item where five or more individuals seemed to disagree with the rest of the group on one or both of the judgment scales, a check was made to determine if the disagreement reflected either professional or organizational affiliation. Aside from a few items, which will be mentioned in the discussion that follows, there was a general lack of correlation between the factors above and any disagreements among the conferees.⁴ It was the author's intention to choose a group of fairly independent individuals and the success of this attempt is perhaps borne out by the foregoing observation. In fact, one cannot help observing that this particular group might have serious difficulties operating as a face-to-face panel or committee. Probably more significant is the observation that members of this group normally would never have come together, since they tend to work in very different professional areas, attend different professional meetings, and have disjoint professional associates.

Tables 2 (pp. 165–169), 3 (pp. 169–171), and 4 (pp. 172–175) presenting the discussion items also provide the following information:

- The item number indicates the order in which the item appeared.
- The *No JV* column indicates the number of No Judgment votes for the item.
- The *Rank Order* columns indicate the ranking of the item, in relation to the other items, based on the average of the vote for Importance and Confidence, or Desirability and Feasibility. These columns could have been used to reorder the items by any of the four evaluation scales.
- The average vote (on a linear scale) is also presented in terms of the original scales with the following added notation to provide a slightly finer breakdown of the location of the average evaluation.

Symbol Explanation

- = within 20 percent of the judgment designated by a point on the scale.
- > 20 to 50 percent above the judgment designated by a point on the scale.
- < 20 to 50 percent below the judgment designated by a point on the scale.

The word *Split* indicates that somewhere between seven and ten (or one-third to one-half) of the voters voted against the majority, and the average is therefore misleading.

The word *Minority* indicates that somewhere between four and six (or one-fifth to one-third) of the voters voted against the majority and some dissent is therefore indicated.

⁴ Because of the small sample size, those few correlations that were observed can only be considered as interesting but definitely not conclusive.

Table 2
Applications Summary

DISCUSSION ITEM	No JV	RANK ORDER				AVERAGE JUDGEMENT
		I	C	D	F	
3. This system has many potential uses. (Associate with this item any proposed applications of this system).	0 0	2 16				< Very Important = Reliable (SPLIT)
4. This system can be used by a committee or panel before its meeting to insure that all issues are on the table and that all concerned have had an opportunity to consider their views on the issues.	1 0		10		25	> Desirable = Possibly Feasible
11. This system would be more effective if a participant had to vote (at least once) prior to his being able to view the status of the existing vote on items.	0 0		7		5	> Desirable < Definitely Feasible
5. This system can be used by a committee or panel between meetings to keep the group abreast of developments and maintain a dialogue or continuous conference, especially when meetings are weeks or months apart.	0 0		5		24	< Very Desirable = Possibly Feasible
6. This system can be used after a committee or panel process as a means of summarizing the results.	0 0		22		27	= Desirable = Possibly Feasible (SPLIT)

DISCUSSION ITEM	No JV	RANK ORDER				AVERAGE JUDGEMENT
		I	C	D	F	
3+ 7. Within the next decade it will become common for groups of individuals engaged in common endeavors to maintain continuous contact through systems of this sort for the exchange and evaluation of information and ideas.	0 0	15 37				> Important < Reliable (SPLIT)
13. This system is useless or misleading when statements of precise timing are linked with imprecise descriptors associated with the proposed event. (For example in Item 7 is the respondent to consider 'decade' or 'common'?)	0 1	23 32				= Important (MINORITY) < Reliable (MINORITY)
14. This system should allow for a third type of item which would request from the respondent a numeric estimation (within specified limits) of a quantity (cost, year, etc.) and his confidence (using the current scale) in the estimate.	0 0		5		14	< Very Desirable > Possibly Feasible
15. Estimates can be obtained crudely within the present format by inserting a series of comments with differing estimates and getting votes of confidence on each, as for example in the next three items.	1 1		25		12	= Desirable > Possibly Feasible
16. Within the next five years, Delphi Conferences will become acceptable to less than 10 percent of Senior Federal Career Executives.	3	43				= Risky (MINORITY)

Table 2—Continued

DISCUSSION ITEM	No JV	RANK ORDER				AVERAGE JUDGEMENT
		I	C	D	F	
3- 7- 13- 14- 15- 17. Within the next five years Delphi Conferences will become acceptable to 10 to 25 percent of Senior Federal Career Executives.	4		44			= Risky
18. Within the next five years Delphi Conferences will become acceptable to more than 25 percent of Senior Federal Career Executives.	3		46			> Unreliable
80. We (National Academy of Public Administration) plan a Delphi (involving public administrators, educators and students, senior and junior government people from all levels) on assessing prospective changes in the character of the public service and their impact on public administration education. (Also associated with Item 7).	7		4			< Very Desirable
	6				11	< Definitely Feasible
9. Because of the current availability of teletypes, this system could be used to convene in a day a conference on a time-urgent issue. (Vote VERY UNDESIRABLE if you see no advantage of this system over a series of conference calls).	0			26		= Desirable (MINORITY)
	0				27	= Possibly Feasible (MINORITY)

DISCUSSION ITEM	No JV	RANK ORDER				AVERAGE JUDGEMENT
		I	C	D	F	
3- 9- 12. This system can be used to obtain rapid reaction of dozens of key persons at distant locations to alternative actions or policies when faced with a sudden national emergency.	1			3		< Very Desirable
	0				30	= Possibly Feasible (MINORITY)
19. For emergency utilization the following conditions must be met: direct dial up (no switch board), a logical interactive log-in procedure, acceptance of a number of common terminal types (not just teletypes) and consistently good response.	3	7				> Important
	3		22			= Reliable
24. Periodically updated item lists, activity summaries, etc. should be made available by mail or hard copy device associated with CRT (Display) terminal off-line. (Also associated are Items 2, 4, 5, and 6).	0			11		> Desirable
	0				6	< Definitely Feasible
31. Secretaries, junior staff, graduate students may be utilized to obtain lists of new items as they occur and to fill in the vote as directed until CRTS and rapid display aids are generally available and compatible.	1			20		= Desirable
	1				13	> Possibly Feasible
32. Conference calls may be preferable when conferees are well acquainted with each other. This sort of Delphi offers either anonymity or non-anonymity.	1	24				= Important (MINORITY)
	2		33			< Reliable (SPLIT)

Table 2—Continued

DISCUSSION ITEM	No JV	RANK ORDER				AVERAGE JUDGEMENT
		I	C	D	F	
3- 9- 32- 47. A conference call cannot handle well more than five to ten individuals whereas systems of this sort should be able to accommodate a considerably higher number.	0 0	10	5			> Important > Reliable
37. Systems of this sort can be used by a decision maker to improve the objectivity of advice he receives from those whom he wishes to consult.	0 0	13	42			> Important > Risky (MINORITY)
38. A decision maker's confidence in the results of a study will be increased if he is able to preassign weightings to the judgments of specific participants for each item considered.	0 0			27	25	< Desirable (SPLIT) = Possibly Feasible (MINORITY)
75. Clearer specification of alternative uses required (e. g., sense of meeting vs. decision making) to sort out many of the issues raised. (5a expertise is sometimes important, sometimes not.)	2 2			16	17	= Desirable > Possibly Feasible
92. Decision makers often give different weights to the opinions of their consultants. System should be modified to accommodate this requirement without encroaching on the anonymity of the panelists.	1 1			19	28	= Desirable = Possibly Feasible (SPLIT)

DISCUSSION ITEM	No JV	RANK ORDER				AVERAGE JUDGEMENT
		I	C	D	F	
3- 37- 39. To insure the objectivity of judgments concerning controversial issues it is essential that the participant have complete confidence that his anonymity will be preserved.	0 0	5	9			< Very Important > Reliable
55. This system should be developed sufficiently so that it can completely replace committees formed for certain purposes.	0 1			32	36	> Undesirable (SPLIT) = Possibly Infeasible (MINORITY)
56. This system can be developed sufficiently so that it can completely replace committees formed for certain purposes.	2 1	25	45			= Important (MINORITY) < Risky
66. Computer Assisted Delphi Method (CADM) systems cannot replace all committee operations. It is sometimes desirable to have face-to-face contact in collective deliberations. CADM systems are not suitable for rewording draft committee papers.	0 0	10	3			> Important < Certain
67. Computer Assisted Delphi Method (CADM) systems should be used instead of ordinary Delphi methods (that is, without computer assistance) unless there is a specific reason for not doing so.	1 1			29	35	> Undesirable (SPLIT) > Possibly Infeasible (SPLIT)

Table 2—Continued

DISCUSSION ITEM	No JV	RANK ORDER				AVERAGE JUDGEMENT
		I	C	D	F	
3- 59. A system of this sort, tailored to my environment and peer group, or for my use on a group, would be worth a system cost (dollars per hour on terminal per individual) of: 25(1); 25 to 15(2); 15(3); zero(4). Use Confidence scale for highest choice.	10	5				< Very Important
	8					More than \$25: 2 \$25 to \$15: 4 Less than \$15: 6
60. View of activity status and ability to add item is available to a worldwide audience limited only by: availability of suitable terminal, knowledge of the entry codes, and capacity of the input-output system.	0	33				> Slightly Important (SPLIT)
	0		35			< Reliable (SPLIT)
61. To protect the integrity of the results of this type of study, it is essential that each participant keep his voting code in absolute confidence.	0	16				= Important (SPLIT)
	1		6			> Reliable
63. This is a good example of a system where costs for communication can far exceed computer costs, actual utilization of a line while on terminal is probably less than a tenth of capacity highlighting need for communication tariff by volume and time-sharing of lines. (Also associated with 59).	3	9				> Important
	5		12			> Reliable
73. System of this type could be used in labor-management or citizen-government relations role. Labor or citizens supplying items and management or public officials supplying vote. (A quick filter process to set priorities on formal considerations.)	1			28		< Desirable (SPLIT)
	1				34	< Possibly Feasible (SPLIT)

DISCUSSION ITEM	No JV	RANK ORDER				AVERAGE JUDGEMENT
		I	C	D	F	
3- 70. This type of system could allow a three way anonymous exchange and evaluation among: the editor of a professional journal, the panel of specialists-referees, and the author of a paper submitted for publication.	0			26		= Desirable (MINORITY)
	0				33	< Possibly Feasible (SPLIT)
83. A system of this type can be adopted by government agencies or executives as a rapid-response policy research and planning capability. for example to aid the National Science Foundation in monitoring, evaluating and reacting to the present crises in the science community.	1			12		> Desirable (SPLIT)
	1				26	= Possibly Feasible (MINORITY)
85. We(John Hopkins University, Department of Medical Care) need a project director to head study of Delphi and other methods to estimate empirical medical data. (An M. D. is ideal, contact Dr. J. Williamson).. Is Delphi Conference good for recruiting professionals?	1			30		> Undesirable (MINORITY)
	3				31	< Possibly Feasible (MINORITY)
86. A group of Congressmen, seeking a common objective or piece of legislation, could use this type of system to maintain a continuous caucus. (Unanimous consent of the caucus group would be required for membership.)	1			21		= Desirable
	4				29	= Possibly Feasible
88. A Delphi variant analogous to parliamentary procedure, with votable proposals having non-votable comments and voting rights not synonymous with comment rights, would enjoy wider acceptability for applications in hierarchical groups.	2	12				> Important
	2		18			= Reliable

Table 2—Continued

DISCUSSION ITEM	No JV	RANK ORDER				AVERAGE JUDGEMENT
		I	C	D	F	
3- 89. Incorporation of a wait mode which triggers the terminal when a new item or message has been entered from another terminal would allow use of system for an intensive one day scenario type simulation with monitor feeding events and groups reacting.	1			14		> Desirable = Possibly Feasible
	2				21	

Table 3
Implications Summary

DISCUSSION ITEM	No JV	RANK ORDER				AVERAGE JUDGEMENT
		I	C	D	F	
10. This whole exercise is a logical paradox. (Consider the implication of a resulting unfavorable evaluation of this system, arrived at through the use of the system, being in fact correct.)	1	38				> Unimportant = Risky (MINORITY)
	3		44			
21. There is no paradox in Item 10. If a committee decides to adjourn, this does not negate the committee process.	3	37				< Slightly Important > Risky (SPLIT)
	3		39			
20. This system is equivalent to a polling of experts.	3	27				< Important > Risky (SPLIT)
	3		41			
34. Delphi techniques applied to user-oriented on-line computer systems represent a major step in the development of a computer assisted collective human intelligence capability. (The merger of the two may produce a whole > the sum of the parts.)	0	11				> Important < Reliable (MINORITY)
	0		31			
62. I have found the actual group exchange and consideration of items in this exercise sufficient to have justified my participation (as separated or aside from the opportunity to test and evaluate a new system as an individual). (Acid test of 34).	3	26				= Important = Reliable
	2		21			

Table 3—Continued

DISCUSSION ITEM	No JV	RANK ORDER				AVERAGE JUDGEMENT
		I	C	D	F	
20- 34- 87. As presently conceived this system exhibits many weaknesses: lack of editing, semantic problems, tendency to snowball, constraints imposed by the voting categories, etc. With such changes the true value of this system will become evident.	2	1				= Very Important > Reliable
	2		10			
97. The current terminal interaction does not effectively allow on-line consideration of the issues. It still demands the same off-line think time for the individual respondents as a paper Delphi. The possible casual adding of items may be detrimental.	1	6				> Important = Reliable
	1		14			
99. The primary advantage of this system, over a paper Delphi is the freedom of the respondent to interact at his own pace with no forced delay time of weeks or months between interactions as occurs in paper Delphis. Rethink time is lost time.	1	18				= Important = Reliable
	1		23			
35. This procedure should be expanded to ask for the reasons for extreme votes. Without these reasons, the basis for changing a vote is very weak and Item 20 becomes correct.	1	4				< Very Important > Reliable
	1		8			
64. Since the group using this sort of system supplies the intelligence, whether or not the application results in a poll or conference with feedback depends on the group action. Voters at the extreme may always speak out if they wish. (Also associated with Item 20).	1	18				= Important > Reliable
	2		10			

DISCUSSION ITEM	No JV	RANK ORDER				AVERAGE JUDGEMENT
		I	C	D	F	
20- 49. More fruitful results might be obtained if the exercise was based on a suitable hypothetical issue involving masked but determinably correct decisions and results.	0	30				< Important (SPLIT) < Reliable (SPLIT)
	0		35			
93. The downward trend in respondent participation suggests that this exercise is suffering now that its novelty is wearing off. This may be of fundamental significance to the Delphi technique.	1	14				> Important < Reliable (SPLIT)
	1		36			
96. I believe in Delphi and this experiment was novel and therefore fun. But the value is less because of the bland nature of the topic. Also allowing respondents to add items without restriction is an adulteration of the Delphi technique.	2	12				> Important (MINORITY) > Reliable
	2		7			
79. What I have been participating in is more accurately defined as a conference as opposed to, or contrasted with, a poll. (Please check your consistency among 20, 34, 35, 62, 64, and this item).	1	24				= Important (MINORITY) = Reliable (MINORITY)
	3		25			
29. This exercise is a benchmark (significant event) in the joint use of computers and communications. (Perhaps also a bit ironical occurring simultaneous with a mail stoppage.)	1	20				= Important (MINORITY) < Reliable (MINORITY)
	1		27			

Table 3—Continued

DISCUSSION ITEM	No JV	RANK ORDER				AVERAGE JUDGEMENT
		I	C	D	F	
29- 30. Systems of this sort should not be considered communication systems in the regulatory sense of the word (i. e., subject to Federal Communications Commission regulation as a communication system if offered commercially).	7 9	8	30			> Important < Reliable (MINORITY)
46. Concept of this system should strongly emphasize its aspect as collective problem--solving or evaluation and strongly deemphasize communication aspect. (Consider 5, 7, 29, 30, 34, and this remark.)	4 5	17	19			= Important = Reliable
94. We want to do a Delphi with students, faculty, and administrative respondents on issues such as curriculum design, research and admissions policy, criteria for appointing and advancing faculty. This should be done using this system in a self-modifying mode.	3 3			15	32	= Desirable < Possibly Feasible (MINORITY)
91. The utility and general availability of computer-based conferencing systems will depend upon adequate competition. If user groups can choose the most suitable design among alternatives, the development of improved systems will occur naturally.	3 3	19	28			= Important < Reliable (MINORITY)

DISCUSSION ITEM	No JV	RANK ORDER				AVERAGE JUDGEMENT
		I	C	D	F	
29- 30- 91- 95. A Delphi exercise on the present subject is well suited to be a laboratory for a graduate-level course on the Delphi method provided the form of the statements and responses can be determined and continuously modified by the participants.	1 2			19	17	= Desirable > Possibly Feasible

Table 4
Critique Summary

DISCUSSION ITEM	No JV	RANK ORDER				AVERAGE JUDGEMENT
		I	C	D	F	
2. This system can be used by individuals with no experience on computers or terminals if ten minutes of terminal instruction is provided. (Associate with this item any suggestions which would raise your confidence in this statement).	0	3				<Very Important = Reliable (MINORITY)
	0		26			
8. Systems of this sort would be more convenient to use if run on higher speed display terminals with auxiliary printers for hard copy when desired.	0	3				<Very Important <Certain
	0		2			
26. The ability to interrupt computer output and, in general, to reduce output verbosity still further would be helpful, especially with S L O W teletypes.	0		1			= Very Desirable = Possibly Feasible
	0			20		
27. It would be nice to be able to print a number of items and their vote summaries without OK'ing each one, thus allowing me to do some useful work in the interim.	1			10		>Desirable <Definitely Feasible
	0			9		
22. System will be acceptable only with much faster response, fewer idiosyncracies, and some voice or face-to-face communication.	2			18		= Desirable = Possibly Feasible
	1			23		

DISCUSSION ITEM	No JV	RANK ORDER				AVERAGE JUDGEMENT
		I	C	D	F	
22- 23. Multiple association capability is desirable. (E. g. . Item 22 should be associated with 12 as well as with 2.)	2			16		= Desirable = Possibly Feasible
	1			23		
28. If multiple associations are allowed, the ball-game begins to get more complex and a scorecard may be required--or at least a big sheet of paper!	1	19				= Important = Reliable
	1		15			
36. New system version created in one day because system written in XBASIC. You may use; this abbreviated version if you know the logic options by number. Reconsider 22, 26, 27, 33. Assume on utility that accepted software change items will be made in follow-on system.	11	12				>Important <Certain
	12		4			
69. Single-shot applications to different groups will require tailoring of system to the group and the application. Hence important for such use system be written in languages such as BASIC for easy modification by the designers as required.	0	15				>Important >Reliable
	1		11			
41. It can be beneficial to some applications of systems of this sort for the respondents to know who the members of the group are even though they still will not know who added what item or voted which way except by intuition.	0	28				<Important (MINORITY) <Reliable (MINORITY)
	0		29			

Table 4—Continued

DISCUSSION ITEM	No JV	RANK ORDER				AVERAGE JUDGEMENT
		I	C	D	F	
22- 41- 42. It would be beneficial to the outcome of this exercise to know who the members of the group are before the exercise is completed. Monitor should act on this if vote is favorable.	0	31				<Important (SPLIT)
	0		26			= Reliable (SPLIT)
76. Knowledge of the individuals involved in this exercise has caused me to reconsider my vote on one or more significant items. (You may still, of course, change your vote based upon the items themselves or the vote distribution.)	2	36				= Slightly Important (MINORITY)
	2		38			>Risky (SPLIT)
78. Knowledge at the start of the exercise of the individuals involved would have significantly improved my policy on adding new items (wording, consideration, content, frequency, etc.) (Only one more item per respondent from here on please.)	1	34				>Slightly Important (SPLIT)
	3		13			= Reliable
77. A discussion with another respondent has caused me to reconsider my vote on one or more significant items.	3	35				>Slightly Important (SPLIT)
	3		17			= Reliable (MINORITY)
33. On this particular exercise, I should be able to signal an operator for help on the teletype itself, rather than by another phone call.	0			5		<Very Desirable
	0				20	= Possibly Feasible

DISCUSSION ITEM	No	RA	ORDER		AVERAGE JUDGEMENT
			I	F	
25. Respondents should only be allowed to add items after they have expressed a vote on all earlier items (no judgment included).				25	= Desirable (MINORITY)
				1	= Definitely Feasible
51. This system should be modified to permit consideration of 100 active plus rejected items.				33	>Slightly Desirable (MINORITY)
	6			15	>Possibly Feasible
65. One hundred active items is far too many. The upper limit should be about 50.	3	22			= Important (MINORITY)
	2		37		<Reliable (SPLIT)
84. This computer-based system would be more useful if voting were constrained to a relatively few main issues, with respondents entering views via additional, non-voted, associated items.	1			8	>Desirable
	1			16	>Possibly Feasible
40. I want the options of voting on all, some, or none of the following issues: Importance, Confidence, Desirability, Feasibility. This should be independent of whether an item is a proposal or a comment.	2			23	= Desirable (MINORITY)
	2			8	<Definitely Feasible
43. The five voting options do not apply to many comments. Suggest replacing them with new options expressed in terms of agreement and disagreement choice (3) should be neutral.	1			8	>Desirable
	1			7	<Definitely Feasible

Table 4—Continued

DISCUSSION ITEM	No JV	RANK ORDER				AVERAGE JUDGEMENT
		I	C	D	F	
40- 43- 45. There appears to be no semantic difficulty in considering the Confidence scale, where appropriate, to mean: Strong Agreement (1), Agreement (2), Disagreement (3), Strong Disagreement (4), Neutral (5). (This is what I have been doing.)	0	16				= Important (MINORITY) >Risky (SPLIT)
	0		40			
53. Before using this system with a particular group, some test should be applied the results of which would make it clear to the respondents that they have a reasonably common understanding of the voting scales.	0			11		>Desirable = Possibly Feasible
	0				22	
54. No Judgment and Neutral do not have the same semantic content.	0	5				<Very Important <Certain
	0		1			
44. Including both multiple associations and a choice of more than two evaluation variables per item (out of Importance, Confidence, Desirability, Feasibility, Agreement, Probability, and Estimate) would restrict use to a fairly sophisticated and quantitative respondent group. (Also associated are Items 23, 28.)	1	20				= Important (MINORITY) <Reliable (MINORITY)
	2		33			
68. Incorporation of all desirable options mentioned will only be feasible for a group which uses system on a continuous basis. Single shot applications may have to be more constrained or rigid than this exercise has been.	0	16				= Important = Reliable
	0		20			

DISCUSSION ITEM	No JV	RANK ORDER				AVERAGE JUDGEMENT
		I	C	D	F	
40- 44- 68- 82. The system has promise and deserves further experimentation. It seems likely to be more helpful to a group's secretariat than directly to the participants themselves.	2	21				= Important = Reliable (MINORITY)
	2		24			
50. A comment should be accepted only if it has both sufficient Importance and sufficient Confidence (likelihood of validity). A proposal should be accepted only if it has both sufficient Desirability and sufficient Feasibility.	1			28		<Desirable (MINORITY) <Definitely Feasible
	1				4	
71. Confidence vote on comment items should be replaced with Agreement vote coded as follows:(1) Strongly Agree (2) Agree (3) Disagree (4) Strongly Disagree (5) No Judgment.Item 30 is good example of item needing this change.	0			9		>Desirable = Definitely Feasible
	0				3	
72. If Item 71 is accepted, Agreement vote should be vote on which Acceptance/Rejection is based rather than Importance vote.	4			24		= Desirable = Definitely Feasible
	2				2	
74. Items with high Importance or Desirability placed in significant class. Both high Importance and Confidence or high Desirability and Feasibility in accepted class. Author may reword his item only if it is still pending and the date of modification is put in the Activity Summary. A list of his vote on all items should be available on-line to the respondent.	7			17		= Desirable <Definitely Feasible
	6				11	

Table 4—Continued

DISCUSSION ITEM	No JV	RANK ORDER				AVERAGE JUDGEMENT
		I	C	D	F	
40- 48. Comment 19 is a compound question--can't answer it; must all or just some of the conditions in comment 19 be present--comment 44 relates somewhat to this comment, but not entirely.	5	32				<Important (MINORITY) >Reliable
	4		9			
52. Author of an item (but not others) should be able to substitute a modified item. Anyone else should be able to restore the original item. Modified items should be coded to originals.	3			31		>Slightly Undesirable (SPLIT) 19 = Possibly Feasible
	2				19	
57. Some items will comprise parts I want to consider separately (e. g. , this one). Monitor should break such statements into appropriate components.	1			10		>Desirable >Possibly Feasible
	1				18	
58. It should be possible to replace several items by one summarizing item. If they agreed with the summary, respondents would vote to reject the items summarized.	2			13		>Desirable 26 = Possibly Feasible
	1				26	
81. The problems of communication and interpretation of choices (particularly for Importance and Confidence) should be summarized by the monitor. Proposals and comments on these topics should then be reconsidered by the same respondent group.	1			6		>Desirable 13 >Possibly Feasible
	1				13	

DISCUSSION ITEM	No JV	RANK ORDER				AVERAGE JUDGEMENT
		I	C	D	F	
40- 48- 90. A professional editor would be the ideal monitor when systems of this sort are applied to peer groups.	3	29				<Important (MINORITY) <Reliable (MINORITY)
	4		34			
98. The monitor should input summary items of accepted related groups of items, much as a chairman of a committee attempts to summarize the sense of the committee. Once a summary item is accepted, the accepted items it summarizes should be deleted.	1			2		<Very Desirable <Definitely Feasible
	1				10	

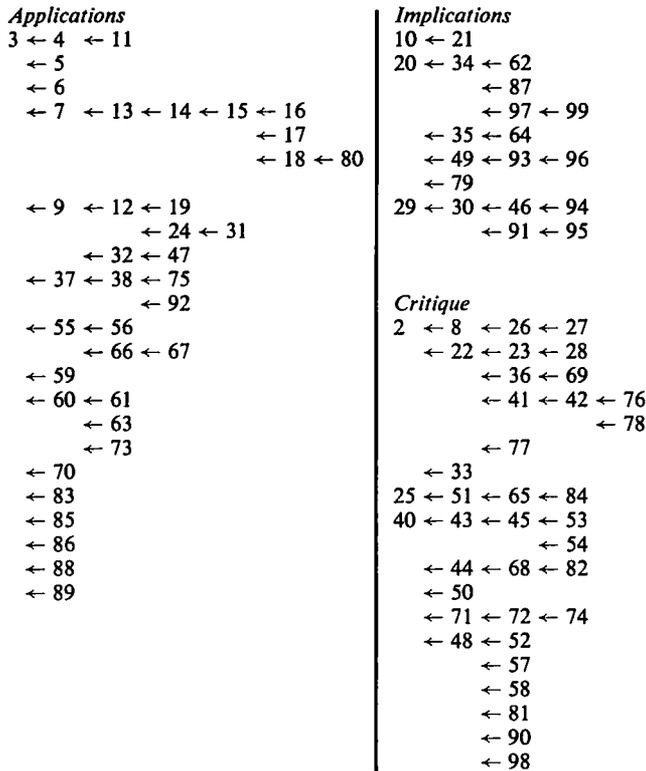


Fig. 1. Association map.

For designers, the Association Map appears to indicate that five levels removed from the starting discussion item was the largest deviation that occurred (i.e., Items 7, 13, 14, 15, 16, and 80 in the Applications section, note Item 3 was more of a reference point than a direct discussion association). Usually four levels removed seemed to suffice.

The items were entered in numerical order but could be associated with earlier items. The presentation of the discussion is broken into three parts, reflecting the discussion threads which developed. The Association Map (Fig. 1) will be useful in finding an item you might wish to reference by number, since there is some cross-referencing in the text of the items among the three discussion segments. The primary associations are indicated from right to left (outline form). The items as presented in Table 2 are also indented in the same outline form to indicate the associations. The symbol ← on the Association Map is used to designate association: i.e., the association of Item 5 with Item 3 is designated by 3 ← 5.

There are a considerable number of ordering choices for presentation of the discussion items. The use of the association order is to allow the reader to follow the discussion of each subtopic taken as a separate grouping. It also highlights the fact that dialogues took place among members of the group even though they did not occur on a time-coincident basis. It is suggested that reading the discussion items first is helpful to interpreting the author's comments on them.

Applications

The conference produced a surprisingly broad spectrum of possible uses for this type of group communication facility, certainly a much wider set of alternatives than had

occurred to the author. Many of these alternatives deserve more detailed exploration, since their desirability or feasibility was often dependent on more specific details than could be considered in this particular exercise.

A good example of this was the idea to set up communications among the referees and the author of a professional paper (Item 70). The particular individual who generated this idea had a negative attitude toward the utility of the system until this application occurred to him. Since this item had a potential direct impact upon what he considered a major problem in his discipline (the long delays between writing and publishing), his outlook on this conferencing system shifted completely. The item itself received mixed results from the group because many respondents tended to view this item with respect to the journals with which they were familiar. Because the system represented a new experience, there was a general tendency for respondents to attempt to relate it directly to their own environment and to somewhat ignore the differing backgrounds of other respondents when it involved discussions of particular applications.

The author had not thought of mailing hard-copy summaries until Item 24 was entered, suggesting just that. This proved to be an invaluable aid to the respondents in maintaining their interaction over the thirteen weeks of the conference. Three summaries were mailed out at about three- to four-week intervals.

It is interesting to note how humans dealing with a deficient system can find ways to adapt it to their requirements. This is aptly demonstrated in Items 13 through 18 and Item 59 where the lack of facility to obtain numeric estimates from the group led to difficulties for the respondents. The new design eliminates this problem.

Item 80 sets an important precedent with respect to the subject of Delphi designing. To the best of the author's knowledge it is the first time an item in a Delphi has been signed by its author. The high vote for feasibility it received is probably due to this. Had it been anonymous or signed by another member of this exercise, it would not have had the same credibility, as is apparent from the pessimism expressed in the related Items 16 to 18. The author of Item 80 represented the only organization in the exercise which had an unquestioned ability to carry out the proposal contained in the item. Most controlled experiments with Delphi exercises tend to support the position that one cannot rely on individuals to judge their own expertise. The author feels that the only feasible method of establishing an expert in a Delphi exercise is to allow the author of an item to sign his name to it if he wishes. Since the vote on the item is still anonymous, only two types of individuals are likely to exercise this option—experts and fools; hopefully the respondent group will be able to make the distinction by their vote. This is an extremely critical question for some of the more comprehensive and detailed Delphis being designed today, where only one or two individuals in the group may be qualified to express a judgment on a particular subissue.

The other item that was signed (Item 85) had a somewhat negative reaction from the group. This appears to have resulted from a feeling on the part of many that if one allows job advertisements to be entered in this type of system, a good many organizations would not allow, or finance, participation in systems created to augment professional communication. This is perhaps a real, though hypocritical, worry, since this is normal behavior at any professional meeting.

By the time the conference was over, at least ten of the respondents were using secretaries (Item 31) or junior staff to obtain the latest items and put in responses as directed. The success of this alternative is extremely important in obtaining the

participation of any busy individual. Being able to treat the system as one would treat the news wire service is probably beneficial to its potential application.

While some individuals were able to react on-line to new items, others were not. For some, the teletype, which is an unfortunate instrument to have to use, was just too noisy to allow normal thought process. For others, there was a typical reaction that occurs in any on-line system: some humans do not like to think on a terminal because of a sub-conscious feeling of pressure to react or to do something.

The attempt by the author of Item 38 to gain better acceptance by rewording the issue as Item 92 is a good demonstration of the effect of allowing rewording. A significant gain in desirability was obtained. The new version of the conference system will allow authors to reword an item as long as it is pending.

The new version also will incorporate the suggestion in Item 89 which will allow the exercise to be used as a general purpose scenario simulator for use in tests, exercises, and games.

The only correlations by background that were evident in this segment of the discussion were: (1) The individuals with experience in conducting Delphis tended to be slightly more enthusiastic about potential applications of the system (Item 3). (2) The Delphi design group also scored consistently higher with respect to the desirability of this system for improving citizen government or labor management relations (Item 73). (3) The government and nonprofit group in the exercise tended to vote that the use of this system for rapid-response policy research and planning by government (Item 83) was feasible. The dissenters (six of them) were, with one exception, members of the industry and university groups.

Implications

This segment of the discussion covers a deliberate attempt by the author (acting as monitor) to direct the exercise into areas outside the basic critique of and utility of the system. Table 3 summarizes Implications. In picking the respondent group the author wanted to mix the communities of Delphi designers and computer specialists because of his belief in the validity of Item 34 concerning the benefits of incorporating Delphi design techniques into interactive computer systems.

The author entered Items 29, 30, 34, 62, 64, and 79 in an attempt to widen the scope of the discussion. From verbal discussions with many of the respondents, it is not apparent that the group was aware of the extent to which the monitor engaged in the discussion. Since the monitor in this case was the user of the results and since the user of a Delphi can be expected to interject those items he wishes the group to consider, there does not appear to be an abuse here of monitor powers. For most Delphis, it is probably preferable that the user be a member of the group and not act as monitor.

The issue of whether the system is a poll or a conference (Item 20) is, in the author's mind, crucial to the long-term success of such systems. A "valid" Delphi, in any form should be designed in such a manner that the respondent feels he is exchanging information with a peer group as opposed to responding to a poll. In follow-up discussions with some of the respondents who considered the current exercise a poll, one reason given was that all comments required a vote. The next version of the system allows the use of messages that do not require a vote, but may be associated with discussion items that do require a vote.

The high percentage of No Judgment votes on Item 30, which asks whether this

sort of system is a communication system in the government regulatory sense,⁵ is highly significant in that this item is probably crucial in determining how widely available systems of this sort will be in the near future. It is not clear that the manufacturers have recognized the need for on-line conferencing to the extent of providing well-designed software (from a user standpoint) for this purpose. The Time-Sharing Services, which in some cases have the software capability to do on-line conferencing, have been reluctant because of possible regulations as a communication system.

A system of this sort is really a mixture of a conference, a Delphi, and a communication system. In the author's view, it combines some of the best features of each. The fact that it is in part a communication technique has, because of the regulatory uncertainty, held back availability of such systems to potential user communities. The technology for such systems has been in existence for five years and probably has become economically feasible with the introduction of the third-generation-computer hardware.

There are several interesting correlations on the voting in this section: (1) All the individuals who were not Delphi designers or computer specialists thought Item 34 (on the beneficial effect of the merger of these two disciplines) to be reliable. The seven dissenters were from these two disciplines. (2) For Item 79 there were six individuals who felt the system was more of a poll than a conference. As in the preceding all these were from the Delphi design or computer specialist groups. Also, in checking the vote on Item 79 with some of the earlier items (e.g., 20), it was quite evident that not everyone took the time to make his earlier votes consistent with his later votes. Persuading individuals to go back and update earlier items duplicated in part by later items will probably be impractical in most exercises of this type. (3) With respect to basing an exercise of this sort on a suitable hypothetical issue (with a predetermined optimum outcome) so that the decisions reached can be checked (Item 49), the individuals from the nonprofits tended to feel this was a pretty good idea while those in government tended toward the opposite view.

The paradox brought up under Items 10 and 21 results in essence from the basic concept of trying to conduct a *Delphi on a Delphi*, which is an apt description of this particular exercise. While the paradox may logically be valid, it may just as readily be applied to any human communication process where the question of improving the communication procedure is introduced. In this vein, all human communication techniques would also be paradoxical. This, however, does not and should not inhibit their use for this purpose.

Critique

This section (see Table 4) speaks well for the excellent set of suggestions made by the respondents and the author's resulting acceptance of them in the new design (see Appendix). A few suggestions were not accepted by the author and an explanation follows:

Item 23: The users may specify multiple association in their item contents and the instructions in the new version mention this. However, asking the computer to keep track of more than one primary association does not have any real pay off and adds what seems to be an unnecessary complication.

Item 33: It would be very nice to be able to signal the console operator for help. However, the system software available on the UNIVAC 1108 Computer makes this difficult to do without expecting to teach the user a multi-step process unrelated to the conference system and perhaps more complicated than a separate phone call.

Item 40: Allowing more than two evaluation scales per item would lead to a nightmare in trying to

⁵ The author has mentioned this problem earlier; see his paper in *Datamation*, May 1969.

evaluate the group results. Many people prefer to limit themselves to two variables and the result would be some voting on one set of variables and others on another set with respect to the same item so that the real group judgment may be very difficult to interpret.

Many of the suggestions made for improvement in the system appeared, once stated, so obviously beneficial that this part of the discussion was not always rewarding to the designer's ego. Behind this observation is one of the difficulties in getting decision-makers to risk Delphi exercises.

The author entered Items 41, 42, 76, 77, and 78 in order to get some indication on the effect of anonymity. It was quite evident in the early part of the exercise that a number of respondents were not sure about whether they were involved with a reasonable peer group and therefore were taking a somewhat casual approach to the exercise. In a Delphi dealing with professionals on a topic related to their profession, it appears to be significant to the success of the exercise that each respondent be aware the group is in fact a peer group. This can be accomplished indirectly by their respect for the sponsor of the Delphi or directly by letting them know who is participating. The author, in opposition to some schools of Delphi philosophy, does not feel the potential resulting cross-talk among the Delphi participants is undesirable during the exercise except when it is known that disagreement is severe enough to evoke emotional responses among the group members.

With respect to the benefits of knowing who is participating in the Delphi Conference (Item 41), all the government and university people thought this was an important issue while the industry people did not. However, there was no correlation on the validity of the proposition. This was also true of Items 76 and 78. A few individuals were a bit inconsistent when it came to this particular exercise (Item 42) and raised their belief in the validity of the proposition as applied to this case. The industry people did tend to shift to more importance on the issue of actual discussions with other respondents causing a shift in the vote (Item 77).

Some of the items in this part of the discussion can be better understood by scanning the original design in the Appendix. No one using the system was provided the description of the system in the Appendix until some three weeks after the conference started. Knowledge of the log-in procedure and the appropriate phone number was provided over the phone and everyone was expected to learn the system on the terminal, and succeeded in doing so. The short form of the program (no explanation) on-line was provided later on, when a number of individuals got tired of all the explanation that was provided on the terminal. The introduction of the short form for the terminal interaction occurred at Item 36. However, a number of users, especially secretaries, did continue to utilize the long explanatory form of the terminal interaction throughout the exercise. It is probably mandatory to have a long and a short form of any such system if one wants to satisfy a diversity of user types.

There is a short learning curve (two or three times on the terminal) for a user to gain proficiency with the system. Also, for some individuals there is a separate learning curve associated with the rate of feedback from the group as to how to write concise and clear discussion items.

Statistics

The conference occurred over a span of thirteen weeks. Fourteen conferees were active in the first week and an additional five came on the second week. One conferee could not get on until the sixth week because he was tied up with jury duty most of the first five

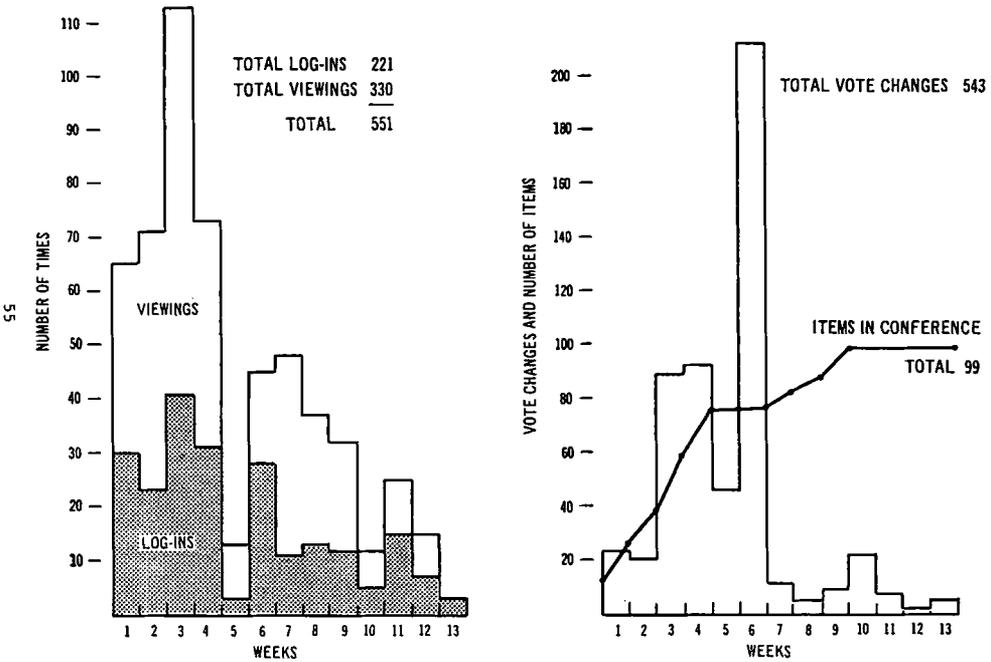


Fig. 2. Conference activity.

VOTE CHANGES BY DISCUSSION ITEMS AND CONFEREES
ITEMS ADDED BY CONFEREES

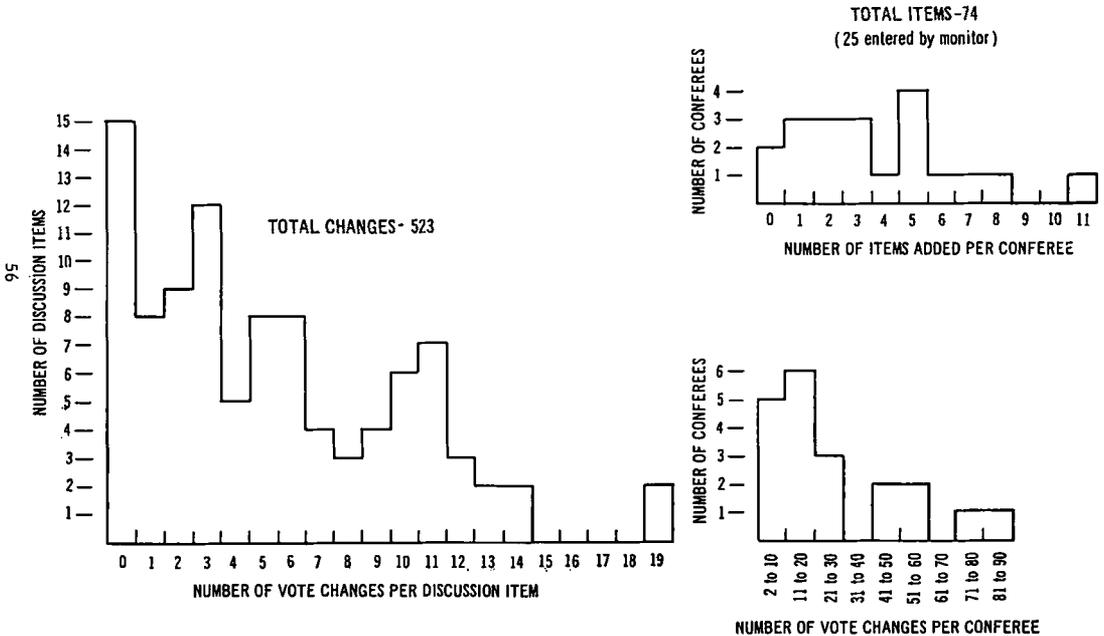


Fig. 3. Vote changes by discussion items and conferees. Items added by conferees.

weeks. Figures 2 and 3 provide a record of the activity and the resulting distribution of the more significant parameters.

The number of log-ins indicates how often the conferees entered their code word. They had to do this once during their terminal interaction in order to be able to vote or add an item. This is a minimum measure of the conferee's activity.

The number of viewings is the number of times someone interrogated the conference to view the results without voting or adding an item. Since the conference did have about eight active viewers who were not members (could not vote or add item), somewhere between fifty and one hundred of the viewings did not reflect the activity of the conferees. A separate set of code words for viewers will be used in the new version so that more accurate activity records may be kept.

The curve for the number of discussion items in the proceedings reflects a temporary stop on allowing the addition of new items which was placed at the 75-item point. In the fifth week, a listing of the proceedings by mail was sent to all conferees and they were asked to review their votes thoroughly before the conference was reopened for a final addition of twenty summary items, one from each conferee. This is reflected in the peak of vote changes that occurred in the sixth week before the conference was reopened.

Roughly the conferees averaged a range of one to three interactions a week during the first four weeks. This dropped off to once every one or two weeks in the last part of the conference. When adding items was unrestricted (the first four weeks), the average was one new item every second or third time. However, averages can be misleading in this type of activity as is demonstrated by the distribution of vote changes with respect to items and the number of conferees as well as the number of items added per conferee.

Conferees individually varied greatly in their response from very active (every few days) to once every three weeks. Some wanted to add a great many items and others did not feel motivated to add one even when they supplied their votes regularly. Only one conferee did not supply all his votes. He told the monitor he wanted to see what would happen to the results if he refused to evaluate the last twenty-five items. The monitor put in a No Judgment vote for this individual on the last twenty-five items so that the group was not aware during the remainder of the conference that one member had effectively dropped out. The artificial shifting of the group's view or generation of an artificial consensus because of dropouts has always been a serious problem with Delphi exercise. This case, the loss of one respondent on the last twenty-five items, is not considered serious by the author. However, Delphi exercises are probably past the point where novelty is sufficient incentive to obtain good response. Unless the Delphi participation is part of the job mission or the members receive adequate compensation for their time, the dropout problem will probably be significant for most future exercises.

The new version of the system will distinguish between vote changes from an initial No Judgment position and changes from an actual position. About sixty of the vote changes recorded are not meaningful because two of the respondents got into a logic loop on the terminal where they were required to vote without having previously seen the statement of the item. This defect is corrected in the next version by allowing a restart option at any point in the terminal interaction. In the vote-change statistics, even with possible other errors of this type of which the author is not aware, one can assume that all vote changes from the third week on are real, because the respondents had learned the system by that time. Under this assumption, there were still about four hundred vote changes, or 20 percent of the possible votes.

Initially, respondents were on the terminal for about a half-hour per interaction. Once the novelty of the terminal and the exercise wore off, ten minutes was a more common interaction time for the purpose of seeing new discussion items and adding or changing some votes. Because of long-distance communication costs, the introduction of commercial versions of this type of system is likely to depend on the capability for short but effective interactions on the terminal.

Reflections

In recent years the Delphi technique has received increasing application in a wide number of areas. Its major use has been in technological forecasting, but it has begun to receive attention as both an operations-research and a direct-management tool. This is possibly due to a number of factors which tend to reinforce one another:

1. A Delphi exercise demands a minimum amount of time (compared to other group-communication methods) from the responding individuals, thereby allowing the use of larger groups or of individuals with minimum time availability.
2. A growing concern with risks or secondary effects of potential decisions has led decision-makers to seek a wider range of expert judgment, cutting across organizational and disciplinary lines and involving individuals who normally do not communicate on a professional level.
3. Technologists have become disenchanted with the use of analytical and financial modeling techniques of operations research to support the decision-making process. These models often short change considerations of technical detail felt to be crucial by specialists in technology.
4. It has been recognized that many of the problems now facing organizations require joint consideration by groups with no history of talking to one another and require a refereed communication structure to ensure that each group understands the views of the others.

As a result of these pressures, the Delphi technique has received wider application than is perhaps justified by the limited number of controlled studies conducted on the technique. Because of an almost bandwagon effect, many inadequate Delphis have been conducted by individuals who have not realized that great care and effort are required to design a system tailored to a specific problem. What is perhaps not well understood, even by some Delphi practitioners, is that the design of Delphis appears to be an emerging discipline devoted to the study and development of group communication structures for the purpose of exploring complex problems. Many of the designs that have been structured to date may receive more attention in the future for their contribution to human communication techniques than for their original objective or application.

Delphis today are being applied to complex and meaningful problems, and are staffed with the individuals who deal with these subjects. When psychologists have attempted to investigate group-communication structures, they have usually been severely hampered by the lack of opportunity to conduct meaningful exercises on meaningful groups. While the Delphi designers may be accused of ignoring scientific rigor in applying techniques without sufficient experimentation, they are meeting a demand that cannot be met otherwise. In the process they are developing a body of useful knowledge on design techniques, both good and bad.

It should be obvious that once we can define an explicit group-communication structure, it can be automated on a modern computer-communication system. One significant contribution of the computer to the communication process is elimination of

the normal round structure of the Delphi with accompanying weeks of delay in feedback to the group. Therefore, one has essentially a real-time communication structure for the group interaction.

Computers to date have reached the level of acting as a tool for an individual or an organization; they remember data and they do calculations on that data as required. However, the computer has by no means attained its forecasted achievement as a direct extension of human intellect. In part, this is owing to the fact that the average computer today does not communicate well with the average man. Also, the historically high costs of computers have forced a development philosophy where the power of the computer is unavailable directly to the user, whose access to it can be only through other humans trained in efficient use of computers (e.g., programmers, software designers, systems analysts, etc.). The tradeoffs have often been made in terms of optimizing computer efficiency as opposed to human efficiency. In addition, research and development efforts in the area of computer systems have overemphasized attempts to use the computer to simulate intelligence and underemphasized efforts to reduce the interface difficulty in allowing humans to supply the intelligence. The decreasing costs of computers, coupled with an increasing recognition of the full meaning of the information problem facing society, promise to reverse this trend in the future.

The incorporation of Delphi techniques into computer systems appears to be a first step in making the computer a true extension of man's intellectual capability. Because of this, there very well could be a fruitful marriage of Delphi and computer techniques. In essence, this philosophy of the design for interactive computer systems would be to maximize the ability of humans, who are the primary source of the information, to supply it directly to the computer for accumulation, correlation, analyses, and dissemination.

The computer industry appears to be just beginning to adopt this philosophy as an answer to the problems of developing and updating data files for information systems. Delphis, on the other hand, are rapidly becoming standard tools for the gathering of unpublished or estimated (empirical) data. This is particularly true in the medical profession where highly critical data on performance are often unavailable. Also, Delphis are being used to gather information on the structure or proposed structure of models to be used for simulation purposes. There appears, therefore, to be a number of significant areas where those involved in Delphis and those involved in computers are undertaking at least complementary efforts.

If one examines the richness of the design effort occurring in the Delphi area, then it becomes obvious that the general discussion format used in the system reported here is only one of a host of conference designs tailored to various classes of problems. By coupling this general design to specialized conference designs dealing with areas such as resource allocation, economic or technological forecasting, and cross-impact analyses, one can visualize a system which can readily adapt to an environment of change and the resulting need for rapid planning and analyses. This concept, the author believes, should be the definition of a management information system.⁶

Hardware, Software, and Cost Considerations

Cost

Since this exercise represented an experiment with a new technique, all the respondents

⁶ A further discussion of this subject is found in Murray Turoff's paper in *Proceedings of the Joint Computer Conference*, Fall 1971.

were willing to find their own terminal and absorb their own communication costs, as well as donate their own time. Since a government-owned computer was used, there is some difficulty in establishing a real cost for the exercise. However, published commercial rates⁷ for a time-sharing cost on a UNIVAC 1108 can be used to give an upper bound on costs: *Nineteen cents* a second for central processing time. *Five dollars* for an hour terminal time. *One dollar and twenty cents* a month for 10,000 characters of storage.

The conference over the thirteen weeks utilized approximately: *One hour* of central-processing time. *One hundred hours* of terminal time. *Less than 100,000 characters* of storage. This represents a resulting commercial computer cost of about \$1,500 for the conference. If we estimate that the conferees spent one additional hour thinking about the issues for every hour on the terminal, we have about twenty-five days of effort donated by the conferees. Since one cannot usually get a consultant for more than three days on a single consulting trip, the twenty-five days represent a minimum of eight consulting trips. If travel and living expenses for each trip exceed two hundred dollars, then the computer use is justified on a pure cost basis. However, if one has to pay standard long-distance telephone charges for the one hundred hours, there is another \$1,500 communication cost (assuming twenty-five cents a minute), which raises the tradeoff travel and expense costs to \$400.

One factor that is difficult to price is that the use of eight separate consultants, one consultant eight times, or twenty consultants in a mutual conference mode each has certain advantages or disadvantages as the particular application dictates. In this exercise, each conferee probably contributed, on the average, between one and two days' time over a thirteen-week period. Bringing twenty people together for one to two days would have had to average less than \$75 (\$150 with communication costs) for travel and expenses per individual to be less expensive than the computer mode.

Secretarial and clerical costs required to carry through the same exercise manually would easily exceed the \$1,500 figure and would not provide the real-time communication capability of the on-line conference mode.

Total Consulting Effort Held Constant	No Communication Cost	Communication Cost Included at 25 Cents/Minute Average
Twenty consultants once or one consultant twenty times	\$75	\$150
Eight consultants once or one consultant eight times	\$200	\$400

Fig. 4. Upper limit on average travel and Expense costs per individual for making computer conference mode less expensive.

The cost figures in Fig. 4 can be considered conservative with respect to justifying the computer utilization and do not include any value for time delays or resulting lost opportunity costs pertinent to the particular application. Furthermore, in those cases where use of the computer or communication lines take up otherwise unused capability in owned or leased equipment, the cost would be considerably less if figured on a margin basis.

⁷ See "Shopping for a Time-Sharing Service," *Physics Today*, July 1970.

Hardware

Most of the conferees utilized teletype terminals operating at the normal speed for these instruments. Both higher speed and quieter terminals would be better suited to the man-machine interface for this type of application. Display terminals are particularly pleasant to use and conducive to thinking on-line if hard-copy summaries are provided every few weeks.

Overall system reliability varied over the thirteen weeks. Reliability averages are meaningless in the sense that these types of systems suffer from periods of high reliability and of low reliability. Since there was no time urgency concerned with the execution of the conference, the reliability was not a severe problem. When respondents were not obtaining a good response, they could leave the system for a day or two, until the system improved. Full duplexing, as opposed to the half duplex mode of operation, would have made the handling of errors less confusing for those on the terminals.

The major problem was with communication lines. Nongovernment users had to go through a manual switchboard at the computer end of the line and if they also had a switchboard at their end, the chance of noise interference was much higher. A few respondents appeared to be at locations where the probability of getting a clear communication line was extremely low. In one particular case, the average time an individual could maintain his connection was less than ten minutes. It seemed as if either he was always routed through noisy switches or operators were always breaking into the line to check it. Many of this individual's votes were entered via a verbal phone message to the monitor.

The primary effect of the less than ideal reliability was that the program was constructed to log each vote into the common file as it occurred and not to save up a set of votes to be logged when the user had finished his interaction. This ensured that if a break occurred, he would not lose more than the last vote entered. From the standpoint of hardware utilization, this means less efficient use of the computer and poorer response time for the user. This is the common tradeoff that must be made to compensate for low system reliability.

Software

It is quite obvious that the executive software (i.e., the software management of time sharing or multiple users on the computer) on the 1108 was not carefully designed for making interaction easy for the person without computer experience. The log-in procedure is illogical, the computer console operator cannot be communicated within a simple manner from the terminal, interruption of the program is not straightforward and no information on status can be easily obtained if the system is unresponsive. Most of these shortcomings lead to difficulties only when the system is heavily loaded, so that the conferees were advised to interact in the early morning, late afternoon, or evening hours.

The conferencing system was written in an extended form of the BASIC language called XBASIC⁸. Essentially this involved the concept of writing one user system in another user system. For those who are very concerned with the most efficient possible use of a piece of computer hardware, this is an extremely foreign concept. For those concerned with the ability to change and modify a system quickly so it can be finely tuned to a particular application, this is a fairly common concept. The actual writing

⁸ Developed by Language and Systems Development, Inc., Silver Spring, Maryland.

and debugging of the system took three man-months of effort by the author, who is not a professional programmer. The new version is being written in three months' time by a professional programmer who has at the same time generated a special version of XBASIC for running fully debugged programs. This version promises to come very close in efficiency of operation to a system written in machine language. The time to write such a conferencing system in machine language would probably be a man-year and the delay between changes considerably longer than with the BASIC version. A growing number of software companies have extended versions of such user languages as BASIC or JOSS for the sole purpose of writing Management Information Systems for their customers. Sometimes the customer is completely unaware that the system was not created in machine language. Even if he is aware, any slight reduction in computer efficiency is usually completely compensated for by the fact that the system gets on the air quickly and is easily and quickly modified as the users refine their requirements.

There are a number of crucial capabilities that must be present in a user language such as BASIC for the writing of a conferencing type system. These are:

1. *Compatibility of BASIC program input and output data with Executive-level files.* This is merely the ability to have a BASIC program read data from or read data into a file which has been defined at the Executive level, so that it may be stored on-line for the conference users to share on a common basis.

2. *Execution of Executive-level commands by a BASIC program.* In the past, it was easy to write machine language programs as an integral part of a FORTRAN program, such as on the IBM 704 or CDC 1604. As Executives have become more complex, the manufacturers have done their best to prevent users of languages such as FORTRAN or BASIC from doing this, lest they damage the Executive program. When a user of the conference system has added an item or a vote, it is necessary to lock out all other users from the common file for the short instant of time the file is updated. This is an Executive-level operation that the BASIC program must be able to perform. This allows the conferees or any portion of them to interact simultaneously through the terminals without any chance of errors in assigning the same storage space to two different items.

3. *Storage of string variables.* The discussion items (string or non-numeric variables) must be stored and addressed by the BASIC program.

4. *String manipulation.* The need for this is not immediately apparent even to experienced computer people, if they have not dealt with on-line systems operating for noncomputer people. The conference was designed so that the user had only to supply a number to indicate his choice at that point in the interaction. However, each number was read as a string (non-numeric) and decoded by the BASIC program. Therefore, if an error occurred because the user punched the wrong key or there was noise on the telephone line (a common occurrence), the program could recognize the error and ask the user to repeat. Without this feature, certain errors could cause the conferee to find himself interacting with the BASIC or EXECUTIVE monitor because the conference program had been terminated. For the nonprogrammer this can be frustrating. A computer conference system which must involve nonprogrammers, and especially secretaries, must be extremely forgiving in nature when it comes to handling errors. The conference program itself must do the error checking, and not the BASIC monitor or Executive software. In terms of error recognition, such systems would be preferable in full-duplex modes as opposed to the half-duplex mode on the 1108. The nonprogrammer user sometimes finds it disconcerting to be told the number 3 printed on his teletype does not fall between 1 and 5.

5. *Form or format Control*. The ability to generate neat, easily readable output for the various summaries is mandatory in this type of system. Most user languages have recently added this in one form or another.

While the foregoing items are critical for doing the job at all, certain additional features can contribute to writing a more efficient package. *Matrix type commands* shorten the program itself. A few specialized *string functions* make decoding trivial. Since the vote totals and records are never more than two digits, the ability to *pack* more than one variable in a storage word can significantly cut storage requirements and consequently improve response time. *Selective unlocking or locking* of a segment of a file and a *random read-write capability* to the conference storage file represents an improvement in response time.

It should be pointed out that a conference package actually represents a significant number of different programs:

1. A creation or destruction program to set up the file, subject, and control codes or clean out the conference after it has been completed.
2. A tutorial or explanation program for the beginning user.
3. An interaction program for the conferee providing both a long- and a short-form option.
4. A monitor control program to edit items, purge items, or drop respondents from the exercise if necessary.
5. An analyses program to provide correlation data if, for example, one wanted to check if certain classified subsets of the respondents had certain distinctive patterns to their voting.
6. A summary program to provide off-line listings of the proceedings, including older material which may be stored on tape.

The total software package of the original version amounted to about 1600 lines of X BASIC code. The new version, though more powerful, will probably utilize significantly less code because of some modifications to the X BASIC and the use of a professional programmer in the writing of the system. The main interaction program, for example, was about 650 lines of X BASIC code on the original version and approximately 500 on the new version. Further details on the implementation of the new system may be found in Thomas W. Hall's paper in *Proceedings* of the Joint Computer Conference, Spring 1971, in Atlantic City, New Jersey.

Appendix I: Original Design

The following pages provide a complete description of what the user of the on-line conference system saw on the terminal. Each "Display" presents what the user would see on the terminal if he had previously made the numeric choice to generate that display. The user always supplies his choice after the question mark, and the table following each display indicates to the reader which display would occur next.

As one can see, there is an option of choosing a lengthy explanation in the first few displays. Also there is an example at the end of using the short interaction form, where it is assumed the user remembers or has previously written down the numeric choices necessary to carry out his interaction and no explanation for a particular choice is printed out. This type of coded communication with the computer is completely analogous to the coding that occurs between policemen or cab drivers and their dispatcher.

It is unfortunate, with systems of this sort, that they are easier to learn on the terminal than from the comprehensive description that follows in this appendix.

AN AUTOMATED CONTINUOUS DELPHI

Display I

THE SUBJECT OF THIS DELPHI IS:
IS THIS A USEFUL, WELL DESIGNED, FOOL PROOF
SYSTEM FOR CONDUCTING A DELPHI EXERCISE OR
A SMALL GROUP CONFERENCE ON PROPOSAL OR
COMMENT TYPE STATEMENTS. (THIS A DELPHI
ON A DELPHI WITH A RESPONDENT GROUP
COMPOSED OF ABOUT ONE HALF DELPHI
DESIGNERS, ONE QUARTER COMPUTER
SPECIALISTS, AND ONE QUARTER USERS.)

Replaceable Subject

IF YOU WISH AN INTRODUCTORY EXPLANATION,
TYPE A NUMERIC ONE AFTER THE QUESTION
MARK AND HIT THE RETURN KEY

IF YOU DO NOT WISH AN EXPLANATION,TYPE
A NUMERIC TWO AND HIT THE RETURN KEY
CHOICE: ? 1

If Then go to
2 Display III
1 Continue

IF YOU ARE A RESPONDENT YOU MAY:
VIEW OR VOTE ON ANY OR ALL ITEMS
CHANGE YOUR EARLIER VOTE
ADD A NEW ITEM

AN ITEM IS EITHER A PROPOSED ACTION
EVALUATED FOR DESIRABILITY AND
FEASIBILITY, OR A DISCUSSION POINT
EVALUATED FOR IMPORTANCE AND
CONFIDENCE (VALIDITY AND/OR TRUTH)

IF YOU ARE NOT A RESPONDENT, YOU MAY
STILL VIEW THE GROUP RESULTS AS THEY
STAND AT THIS TIME. ITEMS WHICH HAVE
BEEN REJECTED BY THE GROUP ARE NO
LONGER AVAILABLE FOR VIEWING OR VOTING

WHEN ASKED TO MAKE A CHOICE, TYPE
(FOLLOWING THE QUESTION MARK) THE
NUMBER WHICH INDICATES YOUR CHOICE
THEN HIT THE RETURN KEY
THE NUMBER TO INDICATE YOUR CHOICE IS
ALWAYS EXHIBITED IN PARENTHESES
EXAMPLE: YES (1) OR NO (2)

PLEASE DO NOT PRESS ANY KEYS UNLESS
INSTRUCTED TO DO SO

PLEASE DO NOT TERMINATE YOUR INTERACTION
WITHOUT ACTUALLY FIRST CHOOSING THE
FINISH CHOICE PROVIDED IN THE EXERCISE
IF YOU MUST TERMINATE DURING THE
PROGRAM, TYPE A NEGATIVE SIGN (-)
INSTEAD OF A NUMERIC CHOICE AND
PROCEED WITH THE NORMAL SIGN OFF

DO YOU WISH TO CONTINUE EXPLANATION (1)
DO YOU WISH TO SKIP EXPLANATION (2)
CHOICE: ? 1

If Then go to
1 Display II
2 Display III

A COMMENT OR DISCUSSION POINT MAY BE
JUDGED FOR BOTH THE IMPORTANCE YOU
ASCRIBE TO IT AND THE CONFIDENCE YOU
HAVE IN ITS VALIDITY AND/OR TRUTH
YOU MAY CONSIDER A COMMENT TO HAVE LOW
CONFIDENCE FROM YOUR VIEW BUT HIGH
IMPORTANCE BECAUSE OF HOW OTHERS VIEW IT
THE JUDGMENT SCALES ARE:

Display II

FOR IMPORTANCE CODE
VERY IMPORTANT (1)
IMPORTANT (2)
SLIGHTLY IMPORTANT (3)
UNIMPORTANT (4)
NO JUDGMENT (5)

FOR CONFIDENCE CODE
CERTAIN (1)
RELIABLE (2)
RISKY (3)
UNRELIABLE (4)
NO JUDGMENT (5)

A PROPOSED ACTION OR PROGRAM MAY BE
JUDGED FOR BOTH THE DESIRABILITY YOU
BELIEVE IT TO HAVE AND THE DEGREE OF
FEASIBILITY FOR THE ACTION TO ACTUALLY
OCCUR OR BE IMPLEMENTED
YOU MAY CONSIDER AN ITEM TO BE DESIRABLE
BUT INFEASIBLE AND VICE VERSA
THE JUDGMENT SCALES ARE:

FOR DESIRABILITY CODE
VERY DESIRABLE (1)
DESIRABLE (2)
UNDESIRABLE (3)
VERY UNDESIRABLE (4)
NO JUDGMENT (5)

FOR FEASIBILITY	CODE
DEFINITELY FEASIBLE	(1)
POSSIBLY FEASIBLE	(2)
POSSIBLY INFEASIBLE	(3)
DEFINITELY INFEASIBLE	(4)
NO JUDGMENT	(5)

ONCE 80 PERCENT OF THE RESPONDENTS
HAVE JUDGED AN ITEM AND THE RESULTING
AVERAGE VOTE IS EITHER:
DESIRABLE OR BETTER
IMPORTANT OR BETTER
THEN THE ITEM IS CONSIDERED ACCEPTED

IF, HOWEVER, THE AVERAGE VOTE IS EITHER:
UNDESIRABLE OR WORSE
SLIGHTLY IMPORTANT OR WORSE
THEN THE ITEM IS CONSIDERED REJECTED

ALL ITEMS NOT FULFILLING THE ABOVE
CONDITIONS ARE CONSIDERED PENDING
NO JUDGMENT VOTES DO NOT CONTRIBUTE
TO THE 80 PERCENT CALCULATION

THE DETAILED VOTE ON AN ITEM IS NOT
DISPLAYED UNTIL 50 PERCENT OF THE
RESPONDENTS HAVE VOTED (INCLUDING THE
NO JUDGMENT CHOICE) ON THE ITEM

THIS SYSTEM WILL ALLOW THE CONSIDERATION
OF 99 ITEMS (INCLUDING THOSE REJECTED)
BY UP TO 20 RESPONDENTS

AN ITEM ADDED SHOULD BE RELEVANT TO THE
SUBJECT OF THIS DELPHI EXERCISE AND THE
MONITOR HAS THE ABILITY TO REMOVE ITEMS
SHOULD IT BE NECESSARY.

A NEW ITEM MAY BE CONSIDERED NOT DIRECTLY
RELATED TO OTHER ITEMS. OR IT MAY BE
DIRECTLY ASSOCIATED WITH AN EARLIER ITEM
BY USE OF THE ASSOCIATION OPTION

THE QUICK MODE OPTION DOES NOT DISPLAY
THE ITEM OR ALLOW A CONTINUE CHOICE.
IT IS USEFUL FOR A RAPID VOTE, OR VIEW
OF THE VOTE, WHEN YOU KNOW THE ITEM
CONTENTS BY NUMBER AND HAVE HAD SOME
PRACTICE WITH THIS DELPHI SYSTEM

THE LITTLE OR NO VOTE DISPLAY MODE, IF
USED IN THE VIEW MODE, LISTS THE ITEMS
WHICH HAVE NOT REACHED THE 50 PERCENT
VOTE LEVEL. IF USED IN THE VOTE MODE,
IT PRODUCES THE ITEMS YOU HAVE NOT
VOTED ON

RETAIN THE ABOVE MATERIAL FOR REFERENCE
TO THE NUMERIC CODES ON THE EVALUATION
SCALES

THE DOUBLE QUOTE SYMBOL HAS THE EFFECT
OF A BACKSPACE BY DELETING THE PREVIOUS
SYMBOL. USE IT IF YOU SHOULD HIT THE WRONG
LETTER OR NUMBER. THE QUESTION MARK
DELETES A LINE OF INPUT AND MAY ALSO BE
USED TO TEST IF THE COMPUTER IS STILL ALIVE
BY CAUSING IT TO EXECUTE A LINE FEED.

IF THE SYSTEM REACTS VERY SLOW, IT MEANS
THERE ARE A LOT OF USERS OR LARGE JOBS
ACTIVE. CONSIDER TRYING LATER

IF THE BREAK SIGNAL GOES ON, YOU HAVE
HAD IT FOR NOW AND THE SYSTEM WILL
PROBABLY BE DOWN FROM FIVE MINUTES
TO A HALF HOUR. TRY LATER

MAIN PORTION OF THE DELPHI BEGINS IN
A MINUTE IT IS HOPED

Go to Display III

DO YOU WISH TO:	
VIEW ACTIVITY SUMMARY	(1)
VIEW CURRENT ITEMS	(2)
VOTE ON ITEMS	(3)
ADD AN ITEM	(4)
FINISH INTERACTION	(5)
CHOICE: ? 1	

Display III

If	Then go to
1	Display V
2	Display VI (View Mode)
3	Display VI (Vote Mode) after going to Display IV once in this run
4	Display XV after going to Display IV once in this run
5	Display XVI

YOUR CODE IS NEEDED FOR THIS CHOICE.
 TYPE ONLY THE SYMBOLS AND HIT RETURN
 ? EMPTY

Display IV

If	Then go to
Invalid	Display III
Valid	Continue as to choice in Display III

ACTIVITY SUMMARY			
NUMBER OF RESPONDENTS	20		
NUMBER OF ACTIVE RESPONDENTS	14		
NUMBER OF ITEMS	28		
NUMBER OF COMMENT ITEMS	14		
NUMBER OF PROPOSAL ITEMS	14		
NUMBER OF ACCEPTED ITEMS	0		
NUMBER OF PENDING ITEMS	28		
NUMBER OF REJECTED ITEMS	0		
NUMBER OF VIEWING ONLY	38		
NUMBER OF VOTE CHANGES FOR:			
IMPORTANCE	5		
CONFIDENCE	7		
DESIRABILITY	6		
FEASIBILITY	7		
CONTINUE CURRENT MODE: YES (1) OR NO (2) CHOICE: ? 1			
ITEM BY ITEM SUMMARY			
ITEM STATUS	ASS.	TYPE	VOTE
1 PENDING	0	COMMENT	12
2 PENDING	0	COMMENT	12
3 PENDING	0	COMMENT	12
4 PENDING	3	PROPOSAL	12
5 PENDING	3	PROPOSAL	12
6 PENDING	3	PROPOSAL	11
7 PENDING	3	COMMENT	11
8 PENDING	2	COMMENT	11
9 PENDING	3	PROPOSAL	11
10 PENDING	0	COMMENT	11
11 PENDING	4	PROPOSAL	10
12 PENDING	9	PROPOSAL	8
13 PENDING	0	COMMENT	6
14 PENDING	13	PROPOSAL	7
15 PENDING	14	PROPOSAL	4
16 PENDING	15	COMMENT	5
17 PENDING	15	COMMENT	5
18 PENDING	15	COMMENT	5
19 PENDING	12	COMMENT	3
20 PENDING	0	COMMENT	3
21 PENDING	0	COMMENT	2
22 PENDING	2	PROPOSAL	2
23 PENDING	22	PROPOSAL	2
24 PENDING	12	PROPOSAL	2
25 PENDING	0	PROPOSAL	2
26 PENDING	8	PROPOSAL	1
27 PENDING	8	PROPOSAL	1
28 PENDING	23	COMMENT	1

Display V

If	Then go to
2	Display III
1	Continue

Go to Display III

DO YOU WISH ITEMS PRESENTED:
 BY NUMERICAL ORDER (1)
 BY ASSOCIATIONS ONLY (2)
 BY ACCEPTED ITEMS ONLY (3)
 BY PENDING ITEMS ONLY (4)
 BY SPECIFYING ITEM NUM. (5)
 BY LITTLE OR NO VOTE (6)
 RESTART (7)
 CHOICE: ? 5

Display VI

If	Then go to
1 to 6	Display VII first then
1	Display VIII
2	Display IX
5	Display X
7	Display III
3, 4, 6	Display XI (View Mode) XII (View Mode, quick mode) XIII (Vote Mode) XIV (Vote Mode, quick mode) as appropriate

QUICK MODE OPTION: YES (1) OR NO (2)
 CHOICE: ? 2

Display VII

If	Then
1	Short forms for view or vote used
2	Long forms used

THERE ARE 1 TO 22 ITEMS
 PICK ITEM NUMBER TO BEGIN DISPLAY WITH
 CHOOSE ITEM NUMBER: ? 1
 PICK ITEM NUMBER TO END DISPLAY WITH
 CHOOSE ITEM NUMBER: ? 3

Display VIII

Go to Display XI, XII, XIII, or XIV as appropriate

SUPPLY ITEM NUMBER FOR WHICH YOU
 WISH TO SEE ASSOCIATED ITEMS
 CHOOSE ITEM NUMBER: ? 1

Display IX

Display all the items associated with the above choice and return to Display III at the completion unless the continue option (1) is chosen to bring back Display IX.

CHOOSE ITEM NUMBER: ? 4

Display X

After display of the item, the continue option (1) brings back Display X, otherwise Display III.

CONTINUE CURRENT MODE: YES (1) OR NO (2)
 CHOICE: ? XYZ
 INVALID CHOICE, 1 TO 2 ONLY, AGAIN
 CHOICE: ? 0
 INVALID CHOICE, 1 TO 2 ONLY, AGAIN
 CHOICE: ? 3
 INVALID CHOICE, 1 TO 2 ONLY, AGAIN
 CHOICE: ? 1

TYPICAL
 ERROR
 MESSAGES

SUPPLY ITEM NUMBER FOR WHICH YOU
 WISH TO SEE ASSOCIATED ITEMS
 CHOOSE ITEM NUMBER: ? 25
 INVALID CHOICE 1 TO 22 ONLY, AGAIN
 CHOOSE ITEM NUMBER: ? 0
 INVALID CHOICE 1 TO 22 ONLY, AGAIN
 CHOOSE ITEM NUMBER: ? XYZ
 INVALID CHOICE 1 TO 22 ONLY, AGAIN
 CHOOSE ITEM NUMBER: ? 3

ITEM NUMBER: 7 COMMENT
 WITHIN THE NEXT DECADE IT WILL BECOME
 COMMON FOR GROUPS OF INDIVIDUALS
 ENGAGED IN COMMON ENDEAVORS TO
 MAINTAIN CONTINUOUS CONTACT THROUGH
 SYSTEMS OF THIS SORT FOR THE EXCHANGE
 AND EVALUATION OF INFORMATION AND
 IDEAS.
 THIS IS ASSOCIATED WITH ITEM: 3
 ITEMS ASSOCIATED WITH THIS ONE:
 NONE

IMPORTANCE	VOTE	CONFIDENCE	VOTE	CODE
VERY IMP.	4	CERTAIN	3	(1)
IMPORTANT	4	RELIABLE	4	(2)
SLIGHT IMP.	2	RISKY	3	(3)
UNIMPORTANT	1	UNRELIABLE	1	(4)
NO JUDGMENT	0	NO JUDGMENT	0	(5)

NO ANSWER YET BY 9 RESPONDENTS
 CONTINUE CURRENT MODE: YES (1) OR NO (2)
 CHOICE: ? 1

Display XI

Vote displayed only if 50 percent of respondents have voted.

If	Then
1	Continue to view next item as chosen through Display VI
2	Display III

ITEM NUMBER: 7C
 CODE IMP CON
 (1) 4 3
 (2) 4 4
 (3) 2 3
 (4) 1 1
 (5) 0 0
 NO VOTE: 9

Display XII
 View Short Form
 (Quick Mode)

Continue to display vote results for items according to choice in Display VI

When items are exhausted return to Display III

ITEM NUMBER: 2 COMMENT
 THIS SYSTEM CAN BE USED BY INDIVIDUALS WITH NO EXPERIENCE ON COMPUTERS OR TERMINALS IF TEN MINUTES OF TERMINAL INSTRUCTION IS PROVIDED.
 (ASSOCIATE WITH THIS ITEM ANY SUGGESTIONS WHICH WOULD RAISE YOUR CONFIDENCE IN THIS STATEMENT).

IMPORTANCE	VOTE	CONFIDENCE	VOTE	CODE
VERY IMP.	6	CERTAIN	3	(1)
IMPORTANT	4	RELIABLE	4	(2)
SLIGHT IMP.	1	RISKY	4	(3)
UNIMPORTANT	0	UNRELIABLE	0	(4)
NO JUDGMENT	1	NO JUDGMENT	1	(5)

NO ANSWER YET BY 8 RESPONDENTS
 YOUR LAST CHOICE FOR IMPORTANCE: 2
 YOUR JUDGMENT NOW, CHOICE: ? 1
 YOUR LAST CHOICE FOR CONFIDENCE: 2
 YOUR JUDGMENT NOW, CHOICE: ? 2
 CONTINUE CURRENT MODE: YES (1) OR NO (2)
 CHOICE: ? 2

Display XIII
 Vote Long Form

Vote displayed only if 50 percent of respondents have voted.

If	Then
1	Continue to view next item as chosen through Display VI
2	Display III

ITEM NUMBER: 2 C
 IMP. LAST VOTE: 1 PRESENT CHOICE: ? 2
 CON. LAST VOTE: 2 PRESENT CHOICE: ? 2

Display XIV
 Vote Short Form
 (Quick Mode)

Continue to request vote for items according to choice in Display VI.

When items are exhausted return to Display III

NEW ITEM MUST FIT IN FIVE LINES OF 50 CHARACTERS. HIT RETURN KEY WHEN EACH LINE IS COMPLETED AND WAIT FOR QUESTION MARK BEFORE BEGINNING NEW LINE. YOU MUST SUPPLY FIVE LINES EVEN IF THEY ARE PUT IN BLANK BY HITTING RETURN KEY AT THE BEGINNING OF THE LINE.

..... ADD ITEM IN NEXT FIVE LINES..... 50

? THIS SYSTEM SHOULD ALLOW FOR A THIRD TYPE OF ITEM WHICH WOULD REQUEST FROM THE RESPONDENT A NUMERIC ESTIMATION (WITHIN SPECIFIED LIMITS) OF A QUANTITY ? 8" (COST, YEAR, ETC.) AND HIS CONFIDENCE (USING THE ? CURRENT SCALE) IN THE ESTIMATE.

THIS SYSTEM SHOULD ALLOW FOR A THIRD TYPE OF ITEM WHICH WOULD REQUEST FROM THE RESPONDENT A NUMERIC ESTIMATION (WITHIN SPECIFIED LIMITS) OF A QUANTITY (COST, YEAR, ETC.) AND HIS CONFIDENCE (USING THE CURRENT SCALE) IN THE ESTIMATE.
 IS ITEM CORRECT AS STATED: YES (1) NO (2)
 CHOICE: ? 1
 DO YOU WISH TO ASSOCIATE THIS ITEM
 IF YES PROVIDE ITEM NUMBER
 IF NO ENTER ZERO (0)
 CHOOSE ASSOCIATED ITEM NUMBER: ? 13
 DO YOU WISH THIS ITEM EVALUATED FOR:
 IMPORTANCE AND CONFIDENCE (1)
 DESIRABILITY AND FEASIBILITY (2)
 CHOICE: ? 2

ITEM NUMBER: 14 PROPOSAL
 THIS SYSTEM SHOULD ALLOW FOR A THIRD TYPE OF ITEM WHICH WOULD REQUEST FROM THE RESPONDENT A NUMERIC ESTIMATION (WITHIN SPECIFIED LIMITS) OF A QUANTITY (COST, YEAR, ETC.) AND HIS CONFIDENCE (USING THE CURRENT SCALE) IN THE ESTIMATE.

ADD ANOTHER ITEM: YES (1) OR NO (2)

Display XV

If	Then
2	Continue

If	Then
1	
2	Display III

THANK YOU FOR YOUR COOPERATION
GOODBYE FOR NOW, COME AGAIN.

AFTER TIME. . . PRINTOUT HOLD CTRL
KEY DOWN AND PRESS THE D KEY
AFTER BREAK SIGNAL HANG UP.

TIME: 2.454

↑
Computer Processing Time (Seconds)

Display XVI

Finish Message

ITEM NUMBER: 1 COMMENT,
THIS EXERCISE SHOULD STOP NOW.
(WHEN THE AVERAGE CONFIDENCE RATING ON THIS ITEM
BECOMES HIGH, THE MONITOR WILL TERMINATE THE
EXERCISE, VOTE NO JUDGMENT ON IMPORTANCE (5) FOR
THIS ITEM.

Exercise
terminated by
use of this item.

SHORT FORM OF DELPHI

MODE CHOICE: ? 2
ORDER CHOICE: ? 5
QUICK CHOICE: ? 2

ITEM NUMBER: ? 30

ITEM NUMBER: 30 C
SYSTEMS OF THIS SORT SHOULD NOT BE CONSIDERED
COMMUNICATION SYSTEMS IN THE REGULATORY SENSE
OF THE WORD (SUBJECT TO FCC REGULATION AS A
COMMUNICATION SYSTEM IF OFFERED COMMERCIALY).

ASSOCIATED WITH: 29

ITEMS ASSOCIATED:

46
CODE IMP CON
(1) 4 1
(2) 2 4
(3) 1 0
(4) 0 0
(5) 4 6

NO VOTE: 9

CONTINUE CHOICE: ? 1

ITEM NUMBER: ? 46

ITEM NUMBER: 46 C
CONCEPT OF THIS SYSTEM SHOULD STRONGLY EMPHASIZE
ITS ASPECT AS COLLECTIVE PROBLEM-SOLVING OR
EVALUATION AND STRONGLY DEEMPHASIZE COMMUNICATION
ASPECT. CONSIDER 5, 7, 29, 30, 34 AND THIS REMARK.

ASSOCIATED WITH: 30

ITEMS ASSOCIATED:

NONE
CONTINUE CHOICE: ? 2

MODE CHOICE: ? 5
THANK YOU FOR YOUR COOPERATION
GOODBYE FOR NOW, COME AGAIN

AFTER TIME. . . PRINTOUT HOLD CTRL
KEY DOWN AND PRESS THE D KEY
AFTER BREAK SIGNAL HANG UP

TIME: 3.405

Example:

Abbreviated form
of the program
for use by exper-
ienced users.
(Same logic, no
explanation and
no continued
option after each
item printout on
a list of items.)

APPENDIX II: New Design

There are some extremely significant changes in this new version of the conference system:

1. The system will allow only 50 discussion items (to be voted upon) but adds 100 messages that do not require a vote.
2. The system is continuous in that if the 50 items or 100 messages are full, the oldest gets pushed out to make room for a new one.
3. An author can reword an item (canceling the current vote) if he feels he can improve on it.
4. There are additional item types including one which allows the entering of numeric estimates.
5. The author of an item may choose one of the voting scales from a set of six alternatives.
6. The judgment scales have been augmented to eliminate the semantic problem brought out by the conferees in the original Delphi Conference.

All these changes taken together should make the system particularly useful as an adjunct to a working committee that has need to confer more often than physical and time limitations will normally permit. The system is also useful for the introduction of temporary members into committee deliberations to consider specialized subtopics. In this mode, one would have a continuous operation of the committee conference with a portion of the membership being changed regularly. The main benefit will, in most cases, probably be the establishment of the agenda and the determination of areas of agreement, uncertainty, and disagreement in order to focus the face-to-face deliberations.

(continued on p. 196)

DELPHI CONFERENCING

PLEASE SUPPLY YOUR CODE: ?

Display I

If	Then Display
Valid	II (VI if first time)
Invalid	III

DO YOU WISH

AN EXPLANATION (1)

SUBJECT DEFINITION (2)

LONG FORM (3)

SHORT FORM (4)

CHOICE: ?

Display II

If	Then Display
1	V
2	IV
3	XIII
4	XIII

INVALID CODE; TYPE ONLY THE SYMBOLS AND HIT THE RETURN KEY. IF YOU ARE STILL HAVING PROBLEMS, TYPE A MINUS SIGN INSTEAD OF THE CODE AND CONTACT THE MONITOR AFTER SIGN OFF.

Display III

Go to Display I

THE SUBJECT OF THIS CONFERENCE IS:

XXXXXX

XXXXXX

XXXXXX

Display IV

Go to Display II

DO YOU WISH:

ALL THE FOLLOWING - 8 PAGES (1)

INTRODUCTION - 2 PAGES (2)

ALL THE FOLLOWING - 6 PAGES (3)

GENERAL EXPLANATION - 2 PAGES (4)

EVALUATION OF ITEMS - 1 (5)

ITEM TYPES - 1 (6)

PRIMARY EVALUATION SCALES - 1 (7)

SECONDARY EVALUATION SCALES - 1 (8)

SUBJECT DEFINITION (9)

PROCEED TO INTERACTION (+)

TERMINATE (-)

EXPLANATION CHOICE: ?

Display V

Short Form

If	Then Display
1	VII, VIII, IX, X, XI, XII
2	VII
3	VIII, IX, X, XI, XII
4	VIII
5	IX
6	X
7	XI
8	XII
9	IV
+	XIII
-	XXXII

SINCE THIS IS YOUR FIRST TIME ON THE SYSTEM, THE FOLLOWING INFORMATION IS PRESENTED FOR YOUR BENEFIT:

Display VI

INTRODUCTION

FOR QUESTIONS ON THE CONFERENCE, CONTACT THE MONITOR: (NAME AND TELEPHONE).

FOR QUESTIONS ON THE TERMINAL OPERATION OR COMPUTER RESPONSE CONTACT COMPUTER CONSOLE OPERATOR: (TELEPHONE).

Display VII

SPECIAL SYMBOLS OR KEYS

DOUBLE QUOTE (")	IS USED TO EFFECT A BACKSPACE BY DELETING THE PREVIOUS SYMBOL. USE IT IF YOU SHOULD HIT THE WRONG LETTER OR NUMBER.
RETURN KEY	SIGNALS THE COMPUTER THAT YOU HAVE PROVIDED A LINE OR LESS OF INPUT AND ARE READY FOR THE NEXT LINE.
QUESTION MARK (?)	IS USED TO DELETE A LINE OR LESS OF INPUT SO IT MAY BE RETYPED. MUST BE USED BEFORE THE RETURN KEY. MAY ALSO BE USED TO TEST IF COMPUTER IS STILL ALIVE WHILE WAITING FOR RESPONSE; IT SHOULD IMMEDIATELY FORCE COMPUTER TO EXECUTE A LINE FEED.
PLUS SIGN (+)	YOU MAY USE THIS AT ANY TIME INSTEAD OF A NUMERIC CHOICE TO DISCONTINUE YOUR CURRENT MODE ACTIVITY AND RETURN TO THE MAIN LOGIC CHOICE IN THE SYSTEM.
MINUS SIGN (-)	YOU MAY USE THIS AT ANY TIME INSTEAD OF A NUMERIC CHOICE TO DISCONTINUE YOUR CURRENT INTERACTION AT THE TERMINAL.

WHEN ASKED TO MAKE A CHOICE, TYPE (FOLLOWING THE QUESTION MARK) THE NUMBER WHICH INDICATES YOUR CHOICE AND THEN HIT THE RETURN KEY. THE NUMBER TO INDICATE YOUR CHOICE (IN THE LONG FORM OF THE PROGRAM) IS ALWAYS EXHIBITED IN PARENTHESES, EXAMPLE: YES (1) OR NO (2)

THE LONG FORM ALWAYS EXPLAINS ALL CHOICES AVAILABLE WHILE THE SHORT FORM ELIMINATES THIS EXPLANATION FOR THE BENEFIT OF THE USER WHO IS FAMILIAR WITH THE OPTIONS AND WISHES QUICKER INTERACTION.

NORMALLY YOU ARE ASKED TO SUPPLY ONE NUMBER AT A TIME. THE EXCEPTION IS THE LIST ORDER CHOICE FOR PRESENTING ITEMS BY THEIR NUMBER. YOU MAY EXPRESS ON ONE LINE A SET OF ITEMS TO BE DISPLAYED SUCH AS:

2, 35, 8, 16 TO 20, 32, 45 TO 51, 13

THE ITEM NUMBERS MUST BE SEPARATED BY COMMAS EXCEPT WHEN THE WORD TO IS USED TO EXPRESS A SET OF ITEMS IN NUMERIC ORDER FOR PRESENTATION.

YOU MAY ENTER THE WORD: DISPLAY, IN PLACE OF A NUMERIC CHOICE AT ANY TIME TO INDICATE YOU ARE OPERATING AT A DISPLAY TERMINAL. THIS CAUSES A CONTINUE CHOICE TO APPEAR OFTEN ENOUGH TO PAGE THE OUTPUT. MERELY HIT THE RETURN KEY TO GO TO THE NEXT PAGE WHEN THIS OCCURS. THE + AND - OPTIONS MAY ALSO BE USED FOR THIS CHOICE.

IF THE SYSTEM REACTS VERY SLOWLY, IT MAY BE ANY COMBINATION OF HEAVY USE OR COMPUTER PROBLEMS. IF THIS OR A COMPLETE BREAK (NO RESPONSE TO QUESTION MARK) OCCURS, CONTACT THE COMPUTER CONSOLE OPERATOR.

Go to Display V
(Short Form)

Display VIII

GENERAL EXPLANATION

IF YOU ARE A MEMBER OF THIS CONFERENCE YOU MAY:
VIEW THE MESSAGES OR DISCUSSION ITEMS
ADD MESSAGES OR DISCUSSION ITEMS
VOTE ON ANY DISCUSSION ITEM
CHANGE YOUR EARLIER VOTE ON ANY ITEM
VIEWERS (ALSO REQUIRING AN ACCESS CODE) MAY
VIEW THE CONFERENCE BUT NORMALLY DO NOT
VOTE OR ADD ITEMS. FOR SPECIAL CIRCUMSTANCES
THE SYSTEM CAN BE SET TO ALLOW CERTAIN
INDIVIDUALS TO ONLY ADD MESSAGES AND/OR
DISCUSSION ITEMS OR ONLY VOTE.

A DISCUSSION ITEM HAS VOTING SCALES ASSOCIATED WITH IT WHILE A MESSAGE DOES NOT.

A DISCUSSION ITEM OR MESSAGE MAY BE ASSOCIATED OR REFERENCED TO AN EARLIER DISCUSSION ITEM (NOT MESSAGE) BY THE AUTHOR OF THE ITEM. IF THE AUTHOR WISHES TO INDICATE MORE THAN ONE ASSOCIATION FOR HIS ITEM, THESE SECONDARY ASSOCIATIONS SHOULD BE INCLUDED IN THE CONTENTS OF THE ITEM OR MESSAGE, EXAMPLE: (213, 235)

IF A DISCUSSION ITEM CONTAINS MORE THAN ONE PROPOSITION, YOU SHOULD SUPPLY, IF VOTING, THE LOWER VOTE OF THE TWO JUDGMENTS YOU MAKE. AUTHORS SHOULD, HOWEVER, BE CAREFUL ABOUT MULTIPLE PROPOSITIONS IN ITEMS. IF THE AUTHOR WISHES TO INCLUDE A COMMENT WITHIN THE ITEM WHICH IS NOT TO BE CONSIDERED IN THE VOTING, HE MAY ENCLOSE THE COMMENT IN PARENTHESES: (. . .). DO NOT JUDGE FOR VOTING ANYTHING WITHIN PARENTHESES.

THE SYSTEM WILL HAVE AVAILABLE ON THE TERMINAL THE LATEST 50 DISCUSSION ITEMS AND 100 MESSAGES. THE OLDEST MESSAGE IS DROPPED WHENEVER ANYONE ADDS A NEW ONE. THE OLDEST ITEM IS DROPPED ONLY WHEN 90 PERCENT OF THE VOTES ON THE ITEM HAVE BEEN GATHERED. OTHERWISE THE ADDING OF NEW ITEMS IS INHIBITED UNTIL THE NECESSARY VOTES ARE IN. SUMMARIES OF DROPPED ITEMS AND MESSAGES WILL BE AVAILABLE OFF LINE.

SINCE A RECORD OF THE DATE AND TIME OF YOUR LAST LOG-IN IS KEPT, THE PROGRAM PROVIDES AN ABILITY FOR PRINTING OUT THOSE ITEMS OR MESSAGES ENTERED AFTER YOUR LAST TIME ON: THIS IS THE NEW OPTION IN THE ORDER CHOICE.

THE WAIT MODE OPTION CAUSES THE TERMINAL TO GO INACTIVE UNTIL A NEW ITEM OR MESSAGE HAS BEEN ENTERED FROM ANOTHER TERMINAL, AT WHICH TIME IT IS PRINTED OUT. THIS MODE IS NORMALLY INHIBITED BY THE MONITOR FROM USE. IT IS RESERVED FOR SCENARIO SIMULATION AND GAMING EXERCISES.

Go to Display V
(Short Form)

Display IX

EVALUATION OF ITEMS

WHEN AN ITEM IS ENTERED, IT IS CONSIDERED TO BE PENDING (P). AFTER EIGHTY PERCENT OF THE POTENTIAL VOTES ON THE ITEM HAVE BEEN MADE, IT MAY BE PLACED IN ONE OF THE FOLLOWING CLASSIFICATIONS. THE EIGHTY PERCENT CALCULATION EXCLUDES NO JUDGMENT VOTES.

ACCEPTED (A)	IF IT RECEIVES A HIGH (1 TO 2.4 ON THE VOTING CODE) AVERAGE RATING ON THE PRIMARY AND SECONDARY EVALUATION SCALES FOR THE ITEM.
SIGNIFICANT (S)	IF IT RECEIVES A HIGH RATING ON ONLY THE PRIMARY SCALE.
INSIGNIFICANT (I)	IF IT RECEIVES A LOW (3.6 TO 5 ON THE VOTING CODE) AVERAGE RATING ON THE PRIMARY EVALUATION SCALE.
REJECTED (R)	IF IT RECEIVES A LOW AVERAGE RATING ON BOTH THE PRIMARY AND SECONDARY SCALES OR IF FIFTY PERCENT OR MORE OF THOSE VOTING CHOOSE 5 ON THE PRIMARY SCALE. ONCE REJECTED, NO VOTE CHANGES MAY BE MADE FOR THE ITEM.

IN ALL OTHER CASES THE ITEM REMAINS PENDING UNLESS THE MONITOR CHOOSES TO PURGE AN ITEM, IN WHICH CASE IT CANNOT BE VIEWED.

AS LONG AS THE ITEM IS PENDING, THE AUTHOR MAY MODIFY THE WORDING BUT IN SO DOING WILL ELIMINATE ALL VOTES (OTHER THAN NO JUDGMENT) ON THE ITEM. THE DATE THE ITEM WAS MODIFIED APPEARS IN THE ITEM SUMMARY.

THE VOTE IS AVAILABLE FOR VIEWING AFTER FIFTY PERCENT OF THE POTENTIAL VOTES (INCLUDING NO JUDGMENT) ARE IN AND IF THE VIEWER HAS VOTED (IF ENTITLED TO DO SO).

Go to Display V
(Short Form)

Display X

ITEM TYPES

THIS SYSTEM PROVIDES FOR FOUR TYPES OF DISCUSSION ITEMS. WITH EACH TYPE OF DISCUSSION ITEM, A PARTICULAR PRIMARY EVALUATION SCALE IS ASSOCIATED FOR VOTING BY THE CONFERENCE GROUP. A SECONDARY EVALUATION SCALE MAY ALSO BE ADDED BY THE AUTHOR OF THE ITEM. THE FOUR ITEM TYPES ARE:

PROPOSAL (P)

A PROPOSED ACTION, PROGRAM, OR POLICY WHICH IS JUDGED ON A PRIMARY SCALE OF DESIRABILITY. POSSIBLE SECONDARY SCALES, FOR EXAMPLE, MAY BE FEASIBILITY OR PROBABILITY OF IMPLEMENTATION.

COMMENT (C)

A COMMENT OR DISCUSSION POINT IS JUDGED ON A PRIMARY SCALE OF IMPORTANCE. POSSIBLE SECONDARY SCALES, FOR EXAMPLE, MAY BE AGREEMENT WITH THE COMMENT OR CONFIDENCE IN THE VALIDITY OF THE COMMENT.

FACT (F)

A FACT ITEM MAY BE, FOR EXAMPLE, A HISTORICAL EVENT OR OCCURRENCE OR A QUOTED COST WHICH A MEMBER OF THE CONFERENCE FEELS MAY BE USEFUL TO THE OTHER MEMBERS. IT IS EVALUATED ON A PRIMARY SCALE OF PERTINENCE WITH RESPECT TO THE TOPIC OF THE CONFERENCE. A POSSIBLE SECONDARY SCALE MAY BE THE IMPACT OF THE FACT UPON SOME EARLIER PROPOSAL OR COMMENT ITEM WITH WHICH THE FACT ITEM IS ASSOCIATED.

ESTIMATE (E)

AN ESTIMATE ITEM ALLOWS THE CONFERENCE MEMBERS TO SUPPLY, IF THEY WISH, A NUMERIC ESTIMATE FOR SOME QUANTITY SUCH AS THE COST OF A PROPOSAL OR THE YEAR OF OCCURRENCE OF A POTENTIAL EVENT. THE PRIMARY SCALE IS THE PERTINENCE OF MAKING THE ESTIMATE TO THE CONFERENCE TOPIC AND A SECONDARY SCALE SUCH AS CONFIDENCE IN THE ESTIMATE SUPPLIED MAY BE CHOSEN BY THE ITEM AUTHOR.

Go to Display V
(Short Form)

Display XI

PRIMARY EVALUATION SCALES

DESIRABILITY (DES)	CODE
VERY DESIRABLE	(1)
DESIRABLE	(2)
UNDESIRABLE	(3)
VERY UNDESIRABLE	(4)
NOT PERTINENT	(5)
NO JUDGMENT	(6)
IMPORTANCE (IMP)	CODE
VERY IMPORTANT	(1)
IMPORTANT	(2)
SLIGHTLY IMPORTANT	(3)
UNIMPORTANT	(4)
NOT PERTINENT	(5)
NO JUDGMENT	(6)
PERTINENCE (PER)	CODE
ESSENTIAL	(1)
VERY PERTINENT	(2)
PERTINENT	(3)
SLIGHTLY PERTINENT	(4)
NOT PERTINENT	(5)
NO JUDGMENT	(6)

NUMERIC ESTIMATE

THE AUTHOR OF AN ESTIMATE ITEM WILL SUPPLY AN UPPER AND LOWER BOUND ON THE ESTIMATE RANGE. THE RESULTS OF THE GROUP WILL BE PRESENTED IN TERMS OF THE NUMBER (N) WHO MADE AN ESTIMATE, THE AVERAGE (A), MODE (M), STANDARD DEVIATION (SD), AND THE LOWEST (LE) AND HIGHEST (HE) ESTIMATE MADE.

Go to Display V
(Short Form)

Display XII

SECONDARY EVALUATION SCALES

THE AUTHOR OF AN ITEM MAY CHOOSE ANY ONE OF THE FOLLOWING EVALUATION SCALES TO BE UTILIZED AS A SECOND VOTING SCALE WITH HIS ITEM.

AGREEMENT (AGR)	PROBABILITY (PRO)	CODE
STRONGLY AGREE	VERY PROBABLE	(1)
AGREE	PROBABLE	(2)
NEUTRAL	EITHER WAY	(3)
DISAGREE	IMPROBABLE	(4)
STRONGLY DISAGREE	VERY IMPROBABLE	(5)
NO JUDGMENT	NO JUDGMENT	(6)
CONFIDENCE (COM)	FEASIBILITY (FEA)	
CERTAIN	DEFINITELY FEASIBLE	(1)
RELIABLE	POSSIBLY FEASIBLE	(2)
NOT DETERMINABLE	NOT DETERMINABLE	(3)
RISKY	POSSIBLY INFEASIBLE	(4)
UNRELIABLE	DEFINITELY INFEASIBLE	(5)
NO JUDGMENT	NO JUDGMENT	(6)
IMPACT (IMP)	ARBITRARY (ARB)	
GREAT IMPACT	HIGHLY POSITIVE	(1)
MODERATE IMPACT	POSITIVE	(2)
NOT DETERMINABLE	NEUTRAL	(3)
SLIGHT IMPACT	NEGATIVE	(4)
INSIGNIFICANT IMPACT	HIGHLY NEGATIVE	(5)
NO JUDGMENT	NO JUDGMENT	(6)

THIS SYSTEM WAS DESIGNED BY DR. MURRAY TUOFF OF OEP AND IMPLEMENTED BY MR. THOMAS HALL OF LSD.

Go to Display V
(Short Form)

Display XIII

- DO YOU WISH TO:
- VIEW SUMMARIES (1)
 - VIEW ITEMS (2)
 - VIEW MESSAGES (3)
 - VIEW VOTE (4)
 - VIEW AND VOTE ON ITEMS (5)
 - VOTE (6)
 - ADD AN ITEM OR MESSAGE (7)
 - MODIFY AN ITEM (8)
 - WAIT (INHIBITED) (9)

MODE CHOICE: ?

} Short Form

If	Then Display
1	XVI
2, 4, 5, 6	XIV
3	XV
7	XXVIII
8	XXVII
9	Real Time XXXII

Display XIV

- DO YOU WISH ITEMS PRESENTED BY:
- LIST ORDER (1)
 - SINGLY BY NUMBER (2)
 - ASSOCIATIONS (3)
 - THOSE NEW OR MODIFIED (4)
 - THOSE ACCEPTED (5)
 - THOSE SIGNIFICANT (6)
 - THOSE PENDING (7)
 - THOSE INSIGNIFICANT (8)
 - THOSE REJECTED (9)

ORDER CHOICE: ?

} Short Form

If	Then Display
1	XX
2	XXI
3	XXIII
4 5 6 7 8, 9	XXV as appropriate
+	XIII XXXII

Display XV

DO YOU WISH MESSAGES PRESENTED BY:	
LIST ORDER	(1)
SINGLY BY NUMBER	(2)
ASSOCIATIONS	(3)
THOSE NEW OR MODIFIED	(4)

ORDER CHOICE: ?	Short Form

If	Then Display
1	XX
2	XXII
3	XXIII
4	XXVI
+	XIII
-	XXXII

Display XVI

ACTIVITY SUMMARY	
MESSAGES: 285 TO 384	
ITEMS: 103 TO 152	
TYPES: P: 15 C: 10 F: 15 E: 10	
STATUS: A: 12 S: 13 P: 12 I: 8 R: 4 PURGED: 1	
ACTIVE VOTERS	18
ACTIVE VIEWERS	9
TOTAL LOG-INS	583
TOTAL VOTES	690
TOTAL VOTE CHANGES	225
VOTE CHANGES FROM NO JUDGMENT	105
NO JUDGMENTS	201

DO YOU WISH:	
ASSOCIATION MAP	(1)
ITEM SUMMARY	(2)
YOUR VOTE SUMMARY	(3)
MODE CHOICE	(+)
	} Long Form

SUMMARY CHOICE: ?	

If	Then
1	XVII
2	XVIII
3	XIX

Display XVII

ASSOCIATION MAP	
ITEMS	
91 < 103 < 107 < 131	
< 128	
< 140 < 143	
98 < 104 < 132	
< 119	
105 <	
106 < 117 < 123	
< 140	
etc.	
ITEM < MESSAGES	
103 < 231 234 285	
104 < 209 217	
105 < 218 219	
etc.	

Go to Display XVI
(Short Form)

Display XVIII

ITEM SUMMARY												
PRIMARY VOTE - PV; SECONDARY VOTE - SV; VOTE CHANGES - VC; NO JUDGMENT - NJ												
ITEM:	TYPE	STATUS	ASS	PV	VC	NJ	SES	SV	VC	NJ	DATE	
103	C	A		91	15	5	5	CON	18	2	2	10/13
104	P	S		98	18	2	2	AGR	14	8	6	10/18
105	P		I	0	18	6	2	FEA	19	0	1	10/14
106		E	P	0	19	0	1	CON	20	1	0	10/17
107		F		R	103	20	1	0	NONE			10/19
108	C			PURGED								
.												
etc.												

Go to Display XVI
(Short Form)

Display XXVII

INDICATE NUMBER OF ITEM TO BE MODIFIED: ?
 .
 .
 (Item Display XXV)
 .
 .
 IS THIS ITEM TO BE MODIFIED
 YES (1) }
 NO (2) } Long Form
 NULLIFY (+) }
 CONTINUE CHOICE: ?

If	Then Display
1	XXVIII
2	XXVII
+	XIII

Display XXVIII

ITEM OR MESSAGE MUST FIT IN SIX LINES OF 60 CHARACTERS.
 HIT RETURN KEY WHEN EACH LINE IS COMPLETED AND WAIT
 FOR THE QUESTION MARK BEFORE BEGINNING NEW LINE.
 YOU MUST SUPPLY SIX LINES EVEN IF THEY ARE PUT IN
 BLANK BY HITTING THE RETURN KEY AT THE BEGINNING OF
 THE LINE.

... ADD ITEM OR MESSAGE IN NEXT SIX LINES. 60
 ? XXX XXX
 ? XXX XXX
 ? XXX (Initial Input By User) XXX
 ? XXX XXX
 ? XXX XXX
 ? XXX XXX

XXX XXX
 XXX XXX
 XXX (Printed Back By Computer For XXX
 XXX Confirmation) XXX
 XXX XXX
 XXX XXX

IS THE ABOVE CORRECT AS STATED:
 YES (1) }
 NO (2) } Long Form
 NULLIFY (+) }
 CONTINUE CHOICE: ?

If Modification
of Item then
Display XXXI

Display XXIX

INDICATE ASSOCIATION WITH EXISTING ITEM (NOT
MESSAGE) BY SUPPLYING EXISTING ITEM NUMBER.
IF NO ASSOCIATION, ENTER ZERO (0).
ASSOCIATION CHOICE: ?

INDICATE TYPE:
PROPOSAL (1)
COMMENT (2)
FACT (3)
ESTIMATE (4)
MESSAGE (5)
TYPE CHOICE: ?

If Message, then Display XXXI
If not Message, then Display XXX

Display XXX

INDICATE SECONDARY EVALUATION SCALE
NO SECOND SCALE (0)
CONFIDENCE (1)
ACREEMENT (2)
FEASIBILITY (3)
IMPACT (4)
PROBABILITY (5)
ARBITRARY (6)
SCALE CHOICE: ?

TYPE: C SEC. SCALE: AGR ITEM >137

ARE YOU SATISFIED WITH THE ABOVE CHOICES:
YES (1) }
NO (2) } Long Form
NULLIFY (+) }
CONTINUE CHOICE: ?

If	Then Display
1	XXXI
2	XXIX

```

ITEM OR MESSAGE ENTERED: (DATE) (TIME)

143P XXX . . . . .XXX
    123 < 143P

DO YOU WISH TO ADD OR MODIFY ANOTHER ITEM OR
MESSAGE:
    YES      (1)
    NO       (2) } Long Form
    NULLIFY  (+)
CONTINUE CHOICE: ?
    
```

```

If | Then Display
1 | XXVIII without introductory paragraph
2 | XIII
    
```

```

HOLD DOWN CTRL KEY AND
HIT D KEY AFTER TIME PRINTOUT
    
```

Typical Error Messages

ONLY A CHOICE OF 1 TO 9 ALLOWED, TRY AGAIN.

YOU ARE NOT THE AUTHOR OF THIS ITEM
AND CANNOT THEREFORE MODIFY IT.

CONFERENCE PROCEEDINGS NOT AVAILABLE
CONTACT CONSOLE OPERATOR AND THEN MONITOR

USER REFERENCE CHART

Primary Evaluation Scales (PES); Not Pertinent (5); No Judgment (6)				
<u>Desirability (P)</u>	<u>Importance (C)</u>	<u>Pertinence (EF)</u>	<u>Code</u>	
Very Desirable	Very Important	Essential	(1)	
Desirable	Important	Very Pertinent	(2)	
Undesirable	Slightly Important	Pertinent	(3)	
Very Undesirable	Unimportant	Slightly Pertinent	(4)	
Secondary Evaluation (SES); No Judgment (6)				
<u>Confidence</u>	<u>Impact</u>	<u>Probability</u>	<u>Code</u>	
Certain	Great Impact	Very Probable	(1)	
Reliable	Moderate Impact	Probable	(2)	
Not Determinable	Not Determinable	Either Way	(3)	
Risky	Slight Impact	Improbable	(4)	
Unreliable	Insignificant Impact	Very Improbable	(5)	
<u>Feasibility</u>	<u>Agreement</u>	<u>Arbitrary</u>		
Definitely Feasible	Strongly Agree	Highly Positive	(1)	
Possibly Feasible	Agree	Positive	(2)	
Not Determinable	Neutral	Neutral	(3)	
Possibly Infeasible	Disagree	Negative	(4)	
Definitely Infeasible	Strongly Disagree	Highly Negative	(5)	
Logic Options				
<u>Mode Choice</u>	<u>Order Choice</u>	<u>Code</u>	<u>Continue Choice</u>	<u>Code</u>
View Summaries	List Order	(1)	Yes	(1)
	Singly by		No	(2)
View Items	Number	(2)	Nullify	(+)
View Messages	Associations	(3)	Terminate	(-)
	New or			
View Vote	modified	(4)		
View and Vote on Items	Accepted	(5)	<u>Summary Choice</u>	<u>Code</u>
Vote	Significant	(6)	Association Map	(1)
Add an Item or Message	Pending	(7)	Item Summary	(2)
Modify an Item	Insignificant	(8)	Your Vote Summary	(3)
Wait	Rejected	(9)	<u>Special Symbols</u>	<u>Code</u>
Terminate	Terminate	(-)	Backspace	(")
	Mode Choice	(+)	Line Delete	(?)

Abbreviations

Proposal (P)	Accepted (A)	Desirability(DES)	Confidence(CON)
Comment (C)	Significant (S)	Importance(IMP)	Impact(IMP)
Fact (F)	Pending (P)	Pertinence(PER)	Probability(PRO)
Estimate (E)	Insignificant (I)	Primary Vote(PV)	Feasibility(FA)
Number (N)	Rejected (R)	Secondary Vote(SV)	Agreement(AGR)
Average (A, AVE)	Standard Deviation(SD)	Vote Changes(VC)	Arbitrary(ARB)
Mode (M)	Lowest Estimate(LE)	No Judgment(NJ)	
	Highest Estimate(HE)	A associated with B (B<A)	