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ABSTRACT

When evaluating alternative designs of subscriber terminals that have been proposed for two-way cable television (CATV) systems we need to use political as well as economic criteria. The political objective a two-way communication system should serve is making government more responsive to feedback from citizens. At the national and state level this means better education about public issues and more effective exchange of information between citizens and their representatives. At the community level this means helping the discussion of public issues, aiding community decision-making, and connecting members of the community with their officials. At the group level this means helping improve decision-making and helping new groups to form and express new interests. Subscriber terminals that have been proposed for CATV systems vary widely, from a simple four-button pad to a full keyboard and printer with display screen and microphone. When political criteria are used the optimum design looks different from the economically ideal terminal. (MG)

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DESIGN ANALYSIS OF A HOME TERMINAL FOR TWO WAY COMMUNICATIONS

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Mr. Lemelshtrich is an interdepartmental doctoral candidate in the Departments of Mechanical Engineering and Political Science at the Massachusetts Institute of Technology.

While you and I have lips and voices which
Are for kissing and to sing with
Who cares if some oneeyed son of a bitch
Invents an instrument to measure Spring with?

e. e cummings[1]

Would e. e. cummings say "who cares" realizing the new potentials the "oneeyed son of a bitch" has created which makes the control of weather feasible? Would he and she have the "lips and voices" to kiss and sing if the air they breathe is saturated with technological pollution? Or would he change his poem to read:

You and I shall have lips and voices with which
To kiss and sing if only
Our and the son of a bitch visions
Together will preserve the Spring.

This combined vision must be required of those who invent and by those who desire to limit the evils of these inventions. This vision is especially needed in technological communications research. Technological advance in this vital area for the first time will allow new channels of communications which may challenge long-held theories, such as the popular conception and misleading actuality of democratic idea. These channels will allow citizens to participate directly in the political decision-making processes which they have considered since childhood the goal of democracy. Many social scientists are aware of the dangers this participation may stimulate. But will the public listen to these social scientists, once these channels are installed, when told that democracy works better

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[1] The future planners/ Andrew Kopkind

if it limits its participation?

A survey of the literature which accompanies the development of home terminals for two-way communications shows that the scientists who design these devices have only a vague idea for uses of these terminals. All list some of the possibilities for the usage of such terminals yet it is clear that the guiding principles are mainly economic.

The home terminal is a vital part of two-way communications and will put constraints on the communications between the home and the broadcasting center. Although it is difficult to establish guidelines for a design of a home terminal without knowing the features of the entire system, I believe that such a study can be useful to determine what weights should be given to different features of the design. Establishing such guidelines for the design of a home terminal through examination of the broad picture of two-way communications can help the designer answer such questions as: how important is it to enable the listener to state specific requests? and, would the optimal terminal be the one which is most versatile and yet the cheapest?

All of these questions involve economic trade-offs and the values depend on the weight a society puts on the different goals of two-way communications. The problem of designing an optimal home terminal is analogous to a linear programming problem where the objective is to maximize (or minimize) value function subject to a set of constraints.

Here the value function we wish to maximize is the social utility of two-way communications. The operational boundaries are constrained by: technological advance (available channels for communications); human nature (attitudes toward interaction with machines, rate of information

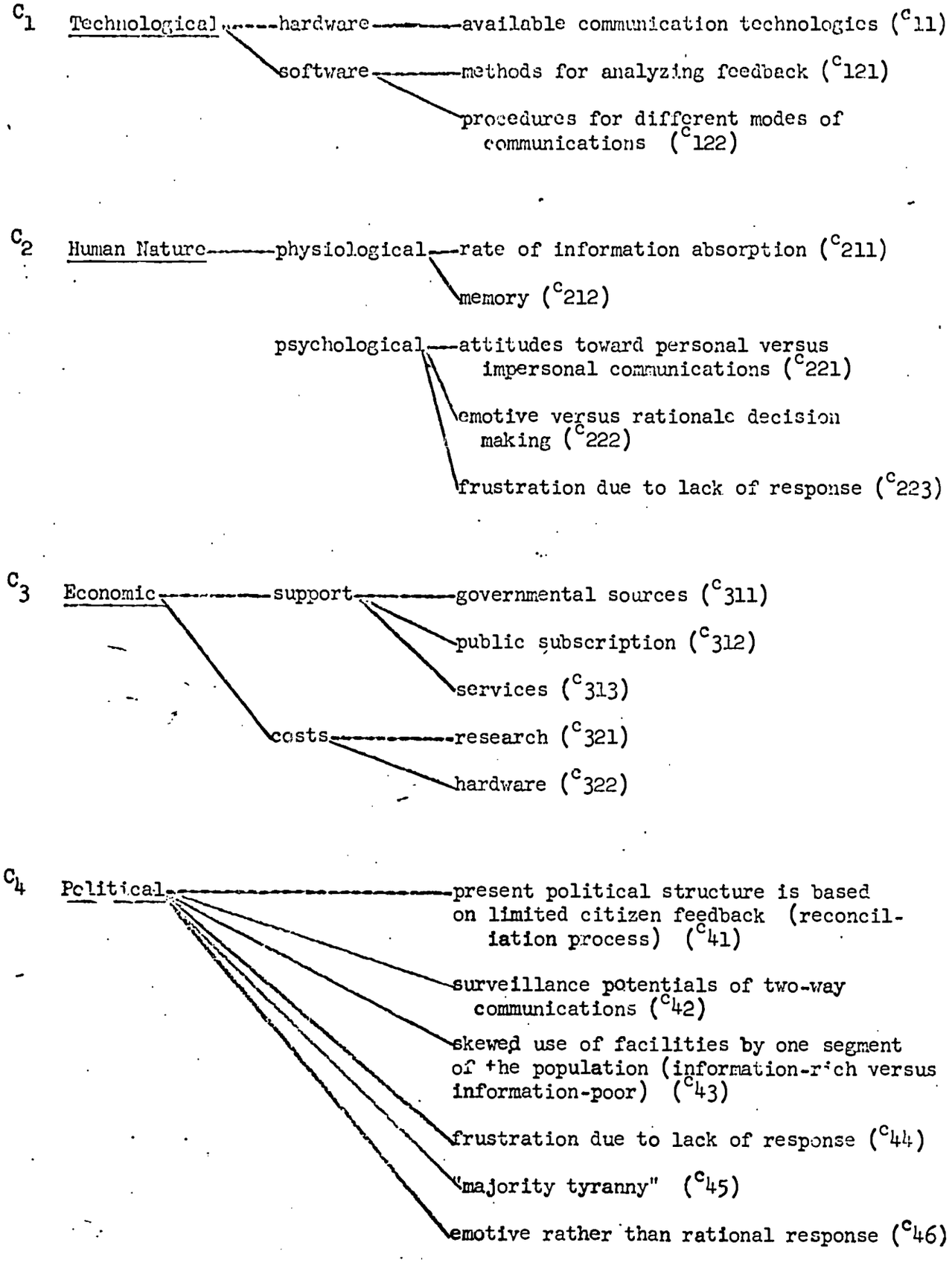
absorbtion, memory); economic resources (costs); political and social implications.

Utility theory is not sufficiently yet advanced to allow the transfer of non-tangible constraints and objectives into graphs whose intersections define the parameters of the optimal terminal. In order to use such a utilitarian approach, we must find some common denominator to translate all the objectives and constraints, and to determine what weights to assign each objective (priorities). The first part can be partially achieved by describing the objectives of two-way communications in terms of the technical features required. This information is necessary to determine the costs of such objectives. Establishing the weights is a difficult task which should be undertaken by society. It is however, the responsibility of science to supply society with guidelines to determine these weights. This can be achieved by exploring the benefits and the social and economic costs that could result from accomplishing the objectives.

In this paper I will attempt to provide a framework for conducting such an analysis. I will concentrate on a political objective-constraint analysis and try to link the possible political uses to the electrical design of a home terminal. I have chosen to limit my discussion to the political aspects since it is in the field of politics that two-way communications poses the most serious threats.

Major Constraints on Two-way Communications

Table 1

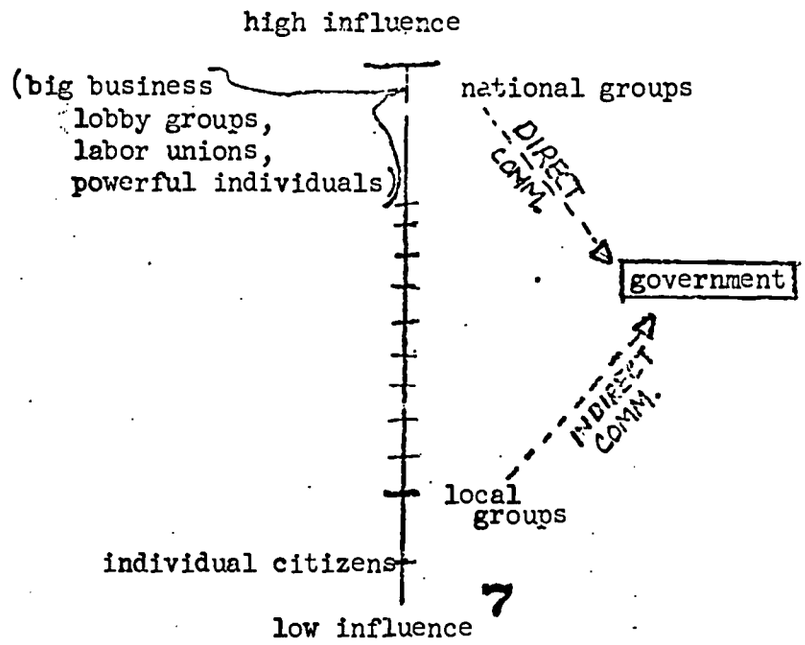


Major Objectives for Two-way Communications (see table 2)(p.8)

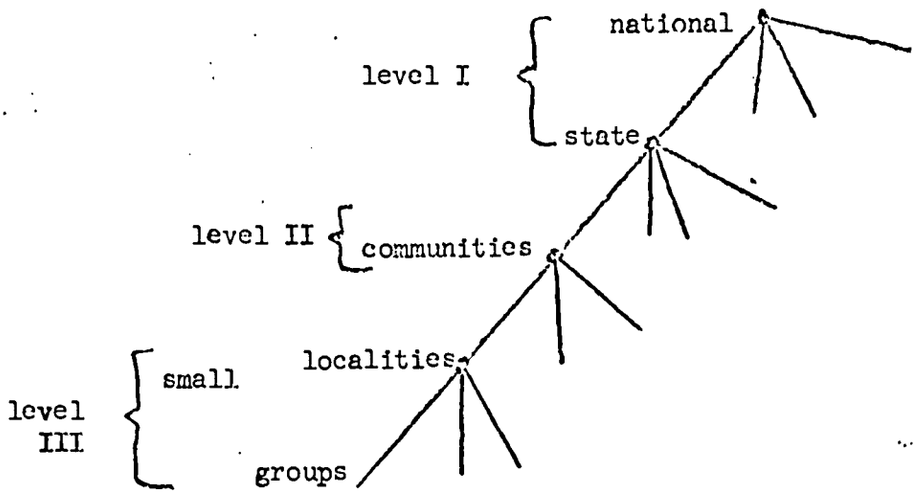
Table 2 lists some of the major objectives for two-way communications. These objectives can be divided into four major areas: politics, education, social, and services.

In politics, the major objective is to make government more responsive and improve its decision-making by improving the communications channels for feedback from the citizenry. The broad objective has different implications and constraints at different societal levels. For purposes of analysis, I will examine these implications at these levels: group, community, and state. At each of these levels, the broad objective--making government more responsive--has different sub-objectives which are outlined in table 2.

There are two main denominators which can be used to divide society for purposes of analysis: a) use as a base the relative power of groups and their communications with the decision makers (i.e. divide society into levels of relative influence for the purpose of analyzing the effects of two-way communication on decision-making at all levels of government (see figure below).



b) use as a base a geographical location and community size (e.g., divide society into levels according to community size and geographical location for studying the effects of two-way communication on politics at these levels (see figure below).



I have chosen the second division for the reason that cable TV two-way potential is predicted[2] to be used for political purposes on a local level (e.g., community discussion with elected officials, local origination of programs, etc.). A division into levels according to relative influence on political decision-making should be done for the purposes of an objective-constraint analysis. Present decision-making processes are one of the major constraints on the use of cable TV for two-way communications. Any radical change in these processes could cause social instability. Such an analysis should focus on how changes in decision-making processes on local level will affect the present decision-making processes which are often independent of geographical locations (i.e., study how will the power of an interest group such as the labor unions be affected by changes in local decision-making processes).

[2] Pool, Ithiel de Sola and Alexander, Herbert E., "Politics in a Wired Nation", MIT, June 1971.

A second major objective of two-way communications is education. The potential for interaction with the TV and the new developments in man-computer interaction and computer memories make this objective very attractive. Computer computations, books from libraries (stored in computer memories) and computer graphics (making actual design on the TV screen) can be transmitted to the home TV. Individual self-teaching of skills and trades can be made possible.

In table 2, the objectives of education were selected according to presently developing research areas.

A third major objective of two-way communications is to improve social relations within a community. The selection of the objectives are based on my own predictions.

The fourth major objective of two-way communications and which will probably be the main reason for its introduction is services. The objectives listed in table 2 are partially based on prediction of which services will yield most profit (entertainment, shopping, games) and others are predicted according to presently developing research (medical, computer interaction).

Major Objectives for Two-Way Communications

Table 2

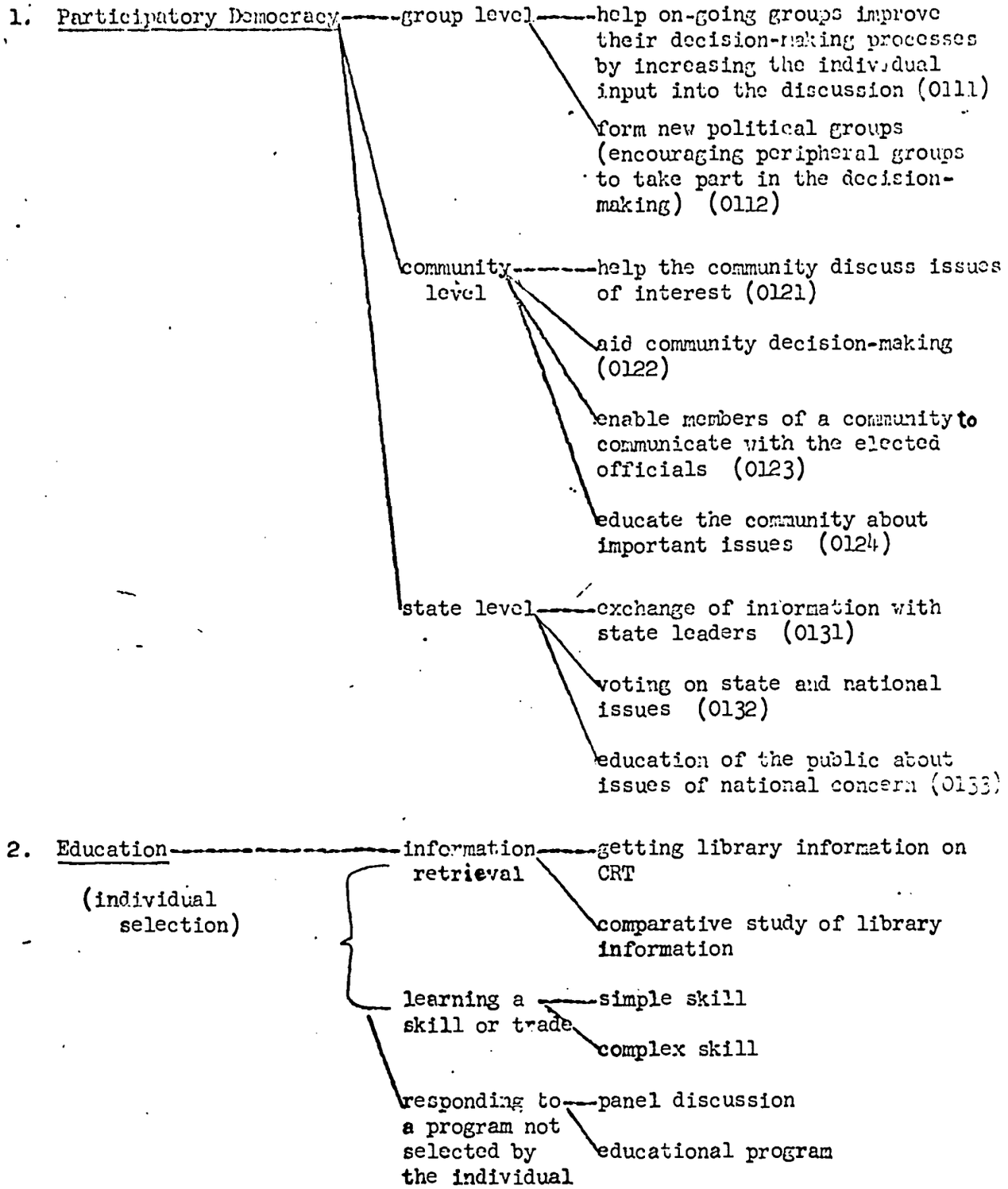
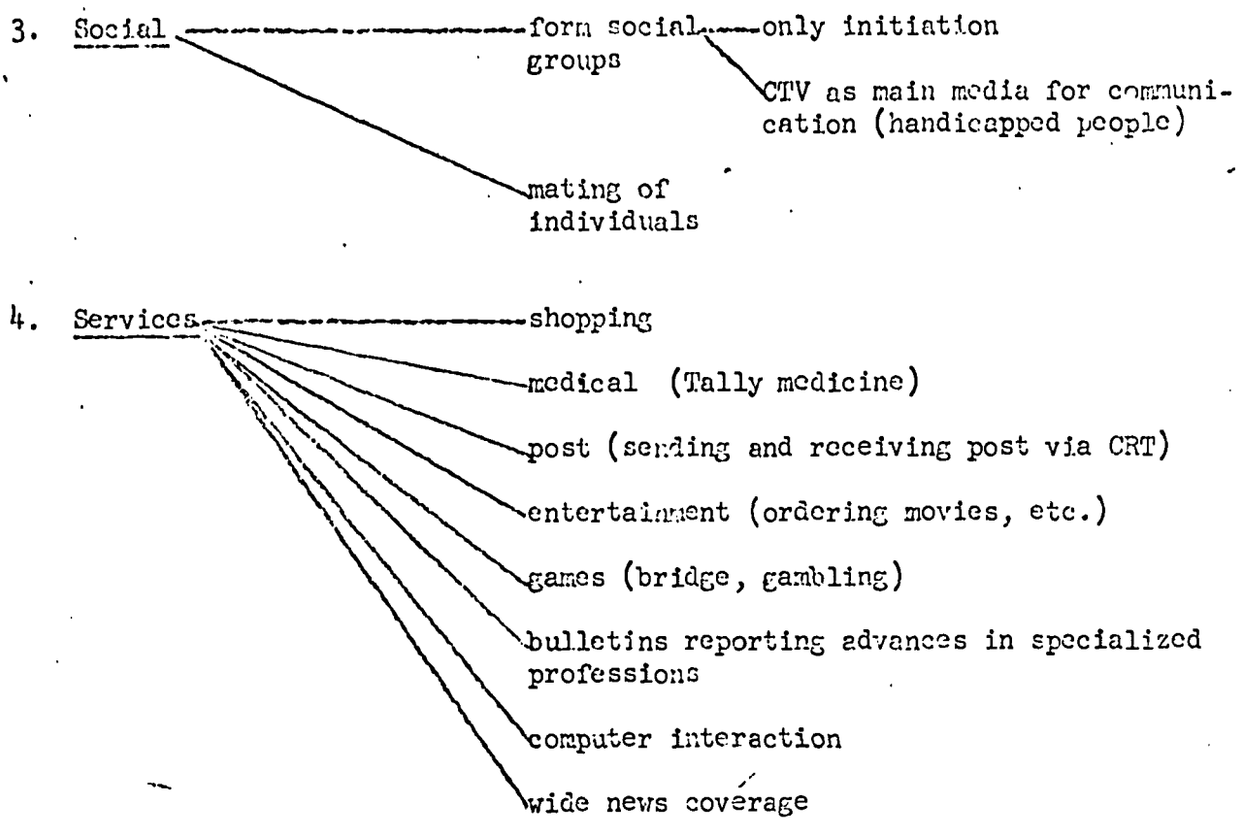


Table 2 (continued)



Possible Technological Channels for Communications

Table 3*

STUDIO TO HOME (down stream)

B \ A	∅	one-way audio	one-way video	one-way print	one-way signal
∅	1) no communications	2) a) voice through TV b) voice through telephone	3) a) continuous picture 1) individual 2) public channel b) stationary 1) channel sharing (frame grabbing)	4) a) xerox copy via cable b) strip printers c) screen photos d) regular mail	5) a) simple--transmi numbers and video messages b) complex-- computer graphics
one-way audio	6) a) telephone b) microphone in home terminal	7) H→S audio S→H audio	8) H→S audio S→H video	9) H→S audio S→H print	10) H→S audio S→H signal
one-way video	11) 1) home camera a) direct transmission b) indirect transmission (video tape)	12) H→S video S→H audio	13) H→S video S→H video	14) H→S video S→H print	15) H→S video S→H signal
one-way print	16) 1) signal sent from home is interpreted by a computer & printed as computer output	17) H→S print S→H audio	18) H→S print S→H video	19) H→S print S→H print	20) H→S print S→H signal
one-way signal	21) S) Simple-less than 12 buttons to respond with C) Complex-use of entire screen for feedback	22) H→S signal S→H audio	23) H→S signal S→H video	24) H→S signal S→H print	25) H→S signal S→H signal

HOME TO STUDIO up stream

∅=no communications S=studio H=home

* please see guide in following page

Technologies Table Guide (for self-explanation of the technologies, see Appendix C.)

Table 3 contains a description of the technologies available for transmitting information from the broadcasting centers to the home receivers and in the other directions. For obtaining any two-way communications objective, a combination of these technological features will be needed. For example, present one-way TV broadcasting is a combination of boxes 2/1 and 3/1a (studio and to home audio and video).

This table enables an evaluation of the versatility of presently developing home terminals in terms of the communications objectives. The technological evaluation can be done in two steps: a) once an objective is selected, the table can help establish the necessary technological features needed to achieve this objective; b) the home terminal can then be evaluated on the basis of the technological requirements (to what extent these requirements are satisfied).

Following are a few examples which demonstrate how to interpret the boxes in table 3:

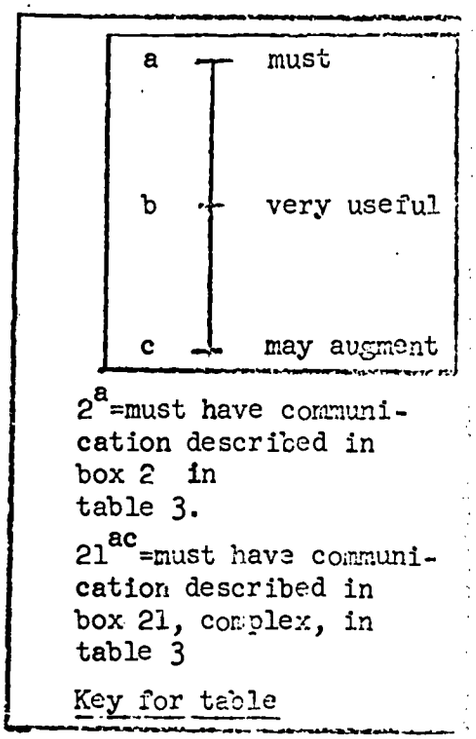
Box 2: The only transmission channels available are one-way audio communication from the studio to the home. Two channels can be used for this purpose: a) the telephone; b) the TV set.

Box 11: The only transmission available is one-way video from home to the studio. There are two alternatives for this transmission: a) use of home light camera for live transmission (examination by a doctor); b) use of video tape for indirect transmission (home origination of a program). (See table 4 for actual use of this table.)

Breakdown of Objectives into Technological Components

Table 4

Objective	Technological Features Needed* (boxes in table 3)
Participatory Democracy	
Group level:	
1) group discussion	$2^a 6^a 11^b 21^{bs}$
2) forming action groups	$2^a 3^a 7^a 13^c 21^{bs}$
Community level:	
1) comm. discussion issues	$2^a 3^a 7\ 21^{ac}$
2) comm. decision-making	$2^a 3^a 7^b 21^{ac}$
3) comm. education	$2^a 3^a 7\ 21^{ac}$
State level:	
1) respond to a speech	$2^a 3^a 21^{ac}$
2) voting	$2^a 3^a 21^{as}$
3) education	$2^a 3^a 21^{ac}$
Education	
Information retrieval:	
1) obtaining library information	$3^a 4^c 7^c 21^{as}$
2) analysis of information	$3^a 4^c 7^c 21^{ac}$
Learning a skill:	
1) complex skill	$2^b 3^a 4^b 21^{ac} 16^c$
2) simple skill	$2^b 3^a 4^b 21^{as}$
Responding to a program:	
1) panel discussion	$2^a 3^a 6^a 21^{ac}$



2^a=must have communication described in box 2 in table 3.

21^{ac}=must have communication described in box 21, complex, in table 3

Key for table

* The choice of these technological features is based on a prediction as to how these objectives will be achieved. A final choice of these features will depend on utility-cost tradeoffs and experimentation.

Table 4 (continued)

2) educational program	$2^{a}3^{a}6^{c}21^{as}$
Objective	Channels Needed
Services:	
1) shopping	$2^{c}3^{a}5^{b}13^{c}21^{as}$ or c
2) tally medicine	$7^{a}13^{a}21^{ac}$
3) post	$4^{al}21^{ac}$
4) entertainment	$2^{a}3^{a}21^{as}$
5) computing	$3^{a}4^{a2}5^{a2}21^{ac}25$
6) games—with others	$13^{a}7^{a}$
with studio	$2^{a}3^{a}21^{as}$ or c

Analysis

A cross variable analysis of the objectives and constraints of two-way communications could be very useful in expanding our knowledge of the applications and limitations of two-way communications. This analysis will uncover many areas for research such as the effect of attitude towards two-way non-personal communications on willingness of humans to use it.

Tables 1 and 2 list some of the important objectives and constraints of two-way communications.

Table 3 describes the complete set of communications channels between the home and the broadcasting center.

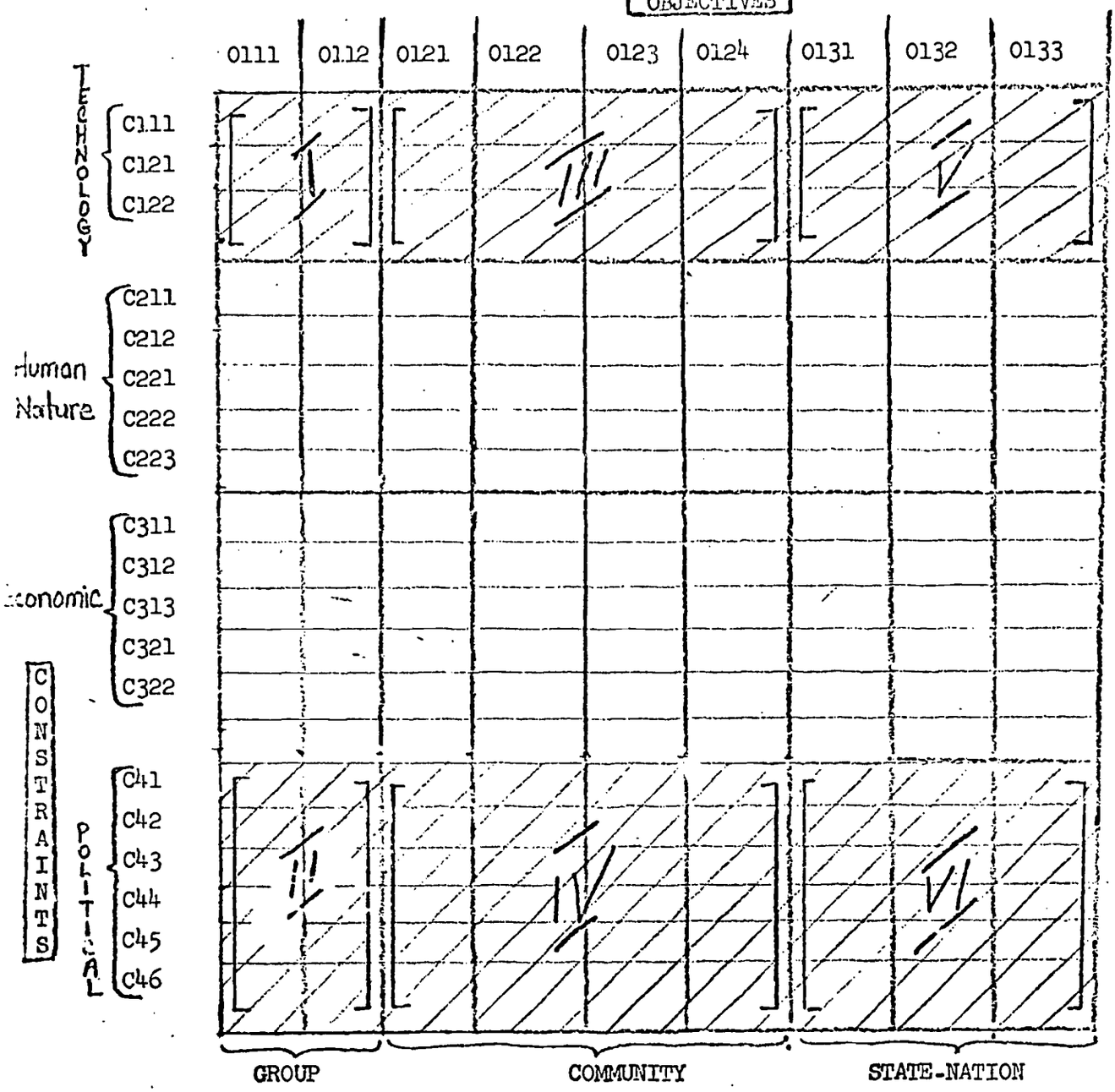
Table 4 summarizes the breakdown of the objectives into the communication channels required to achieve them.

A cross variable analysis of tables 1 and 2 will provide the guidelines for determining the weights to be assigned to the different objectives. Tables 3 and 4 provide the information for establishing guidelines describing specific technological features needed in order to obtain a certain objective, the first step toward determining its costs.

Table 5 is the cross variable matrix of the constraints and the political objectives. In this paper, only the shaded areas will be discussed. I will not discuss the design variables which relate to the human nature and economic constraints having an effect on both the complexity of the terminal and the possible financial sources available for support. (Both relate to a political use of two-way communications). This is too broad a task. A complete analysis of all the objective-constraint cross variables is a large task involving such disciplines as psychology, sociology, and economics. Tables 1 and 2 offer researchers from the different

Cross tabulation--Two-way Communication Constraints and Political Objectives

Table 5



disciplines some guidance as to which variables should be included in a cross variable analysis. To construct a cross variable analysis, one has to select the issues of interest from the tables of objectives and construct a table similar to table 5 for developing a cross variable matrix.

Use of two-way communications for "Participatory Democracy".

Two-way communications can be applied in three societal levels: group, community and state-national. The objective of such citizen feedback is to increase the individual input into the political decision-making processes and make the citizen more knowledgeable about society.

On a group level, the objectives of two-way communications could be the following: a) help on-going groups improve their decision-making processes by increasing the individual input into the discussion; b) form new political groups, making access to the media easier and thus encouraging peripheral groups to take part in decision-making (e.g., neighborhood political groups, PTA, welfare mothers, etc.).

On the community level, the objectives of two-way communications could be the following: a) help the community discuss issues of interest by enabling citizens to bring issues to the attention of the community and educate its members on these issues; b) aid community decision-making by having a series of discussions about some issues of concern followed by voting--analagous to town meetings; c) enable the members of a community to communicate with the elected officials (school board, city council, congressmen), educate the community about important issues (giving the background and rationale for decisions regarding welfare, zoning rules, taxes, etc.).

On state-national level, two-way communications could be used to

exchange information with state leaders (congressmen, senators, executive branch); to vote on state and national issues; educating the public about issues of state or national concern (desegregation, senate hearing, etc.).

Following is the discussion of the shaded areas in table 5.

I. Group Objectives and Technological Constraints

The main technological constraint on achieving the group level goals pertain to software characteristics. For an effective small group discussion direct face-to-face interaction is necessary. Members of the group should be able to express verbally their opinions and be able to affect the direction of the discussion. It is possible technologically to carry such group discussions via cable TV, but the expense of the technological features (see table 4) may be prohibitive.* The limited communications channels of studio to home audio and video, and home to studio audio or digital feedback (using buttons) can be used by cable TV both to spawn and measure an interest group's reaction to an issue. Community centers could be established for group meetings. In these centers (special studios designed for community use) a limited two-way feedback mechanism can supplement the group discussion. A procedure for carrying such group discussion in the centers is being currently developed and tested (see Appendix A).

II. Group Objectives and Political Constraints

The major political constraint on group objectives (helping on-going groups improve their decision-making processes and form new interest groups) is that the present political process is based on limited citizen feedback

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* Whether these potentials are desirable will be discussed in the cross variable analysis.

from both direct and indirect sources. Most of the direct feedback comes from organized interest groups (such as business, labor unions, religious groups). The indirect feedback comes from the population through communication channels such as elections, public polling, social unrest, talk shows, etc. The use of cable TV for the purpose of forming new interest groups could be expected to extend the socio-economic bounds in the social pyramid from which pressures will be exerted on the political structure. The groups which presently control the decision-making powers may feel threatened by this process, thus leading to social tensions or social repression. If the present political system is not flexible enough to allow new groups to share in the decision-making, social instability may result. Frustration of these new groups due to the lack of positive response from the system could sway them to social apathy or social outbreaks. Both are dangerous.

An additional political constraint is a skewed use of the facilities by a few dominant groups. This could widen the gap between on-going powerful political groups and groups that do not have equal access to the facilities. Legislative channels could properly deal with this constraint.

In deciding what weights to assign the group objectives, society must be aware of these constraints and provide the proper guards to prevent social instability and misuse if a decision is being made to use CTV for achieving the goals on the group level.

III. Community Objectives and Technological Constraints

The community objectives listed in table 2 involve discussion of issues between a large group of people and few decision-makers, speakers, or discussion moderators. As in the group level discussions, the main techno-

logical constraints lie in the software area. There are no techniques as yet that allow instant analysis of mass-verbal comments. An additional constraint develops as all the members of the community make verbal input to the speakers--no complex discussion can ensue. Guidelines to avoid such disturbances yet allow meaningful group feedback must be developed (see Appendix B). The computer technology can be a useful tool in analyzing a non-verbal digital feedback. The use of the computer will enable instant analysis of the group feedback, an essential for a meaningful feedback during a discussion. It is important to allow group response during the entire discussion and not only at the request of the moderator. Limiting the community feedback to instances when the moderator decides to pool opinions will lower the validity of feedback for the following reasons: a) the moderator can limit the feedback to issues of interest to him; b) there will be no data at the community level of understanding of the issues; c) the community can have very limited effect on the discussion; d) no meaningful education of the community about issues will be possible without enabling the listeners to elicit such responses as "do not understand", "give more information", or "move to another topic". The listeners should be able to elicit these responses during the entire discussion. Without these capabilities it is doubtful that cable TV two-way potential can be used effectively for political purposes.

Table 4 shows that for the four objectives on the community level, a complex one-way (home to studio) signal transmission will be needed to allow for the feedback discussed above.

Another software constraint is the absence of a discussion procedure for the different communications objectives. These procedures (meshing

technological capacity with discussion goals), are essential for the successful use of two-way communications for political purposes.

Additional constraint is the lack of statistical tools that will enable a community and its elected officials to measure the degree to which a given feedback represents the community sentiment. The scientific method used in public polling cannot be directly applied to such citizen feedback due to the biases of the group participating in the discussion. It is reasonable to expect that the development of such statistical tools should be more reliable as feedback through cable TV becomes more widespread.

It is technologically feasible to build a system which will allow the complex one-way signal transmission necessary to achieve objectives on the community level. In a future paper (published end of January 1972), I will propose a device for a home terminal that will provide such a capability. This terminal will allow the listeners to respond to the media on their initiative, not only on invitation of the moderator (or speaker).

IV. Community Objectives and Political Constraints

The technological feasibility of two-way communications on the community level is shaded by the political constraints. The commercial attractiveness of two-way communications for commercial purposes may make the technological development inevitable (see table 4). The scientists who develop these channels must be aware of the possible social consequences. The scientist's intentions may not necessarily parallel the guidelines of the politican who decides to use these channels for political purposes. It is therefore very important to project possible political implications of a technology which seems at first glance a-political, yet may result in social instability if proper measures

to prevent its evils are not considered in advance.

As at the group level, the main political constraint is that the present political system is based on limited citizen feedback. Organizing communities around issues will increase feedback such that failing modification of the present decision making processes which incorporate feedback, social instability is inevitable. This increased feedback may limit the decision making powers of the community elected officials (or increase their power if they are able to manipulate the system) making reconciliation of issues more difficult. Some scientists see such citizen participation as a "participatory nightmare".[3] For a political system whose decision making methodology is based on the reconciliation processes, this is a real threat. Although town meetings demonstrate the plausibility of community decision making, town meetings take place in relatively few communities and involve face to face interaction. Research must be done to answer such questions as: a) how will impersonal communications affect the community voting behavior? b) will the technological channels improve communications between people (in similar situations) rather than restrain it? c) can findings from a study of few communities be projected to other communities? d) how effective is the town meeting decision making process in comparison to city council decision making?

A second constraint is the frustration due to lack of response. Assuming proper statistical tools are developed for this purpose, the communities will have, for the first time, a clear idea of what they want. A lack of response from the elected official may stimulate social instability.

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[3] Heinz Eulau, "Some Potential Effects of Information Utility on Political Decision Makers", in Harold Sackman and Norman Nie (eds.), The Information Utility and Social Change, Montvale, New Jersey: AFIPS Press, p. 187.

The "silent majority" support often claimed by politicians will no longer be "silent"; the politician will be forced to act according to the will of the community, a frequent impossibility. He may be forced to explain and educate the community on his decision making rationale, but even then, the threat of social instability is real.

A third constraint is that as participation in community decision making becomes as effortless as pressing some buttons at home, people will react emotionally rather than rationally on issues about which they have insufficient information. At the present, some effort and time from citizens to input feedback into the political system is needed. The people who are willing to give this feedback are usually directly affected by the issues and consequently are more informed.

A fourth constraint involves the concept of "majority tyranny". The democratic concept calls for majority decisions. But is it fair that the votes of those individuals most directly affected by a decision should have an equal weight as the votes of the rest of the community? In the present political system, it is easier to protect such a minority as "majority wants" are rarely clearly defined. Introducing citizen feedback on the community level may make this conceptual problem very real.

Even though the constraints are severe and the dangers real, there is much to gain by the use of cable TV on the community level especially as a tool to educate people on issues. This justifies research towards achieving the community goals. We must be aware that legislative means may be insufficient to deal with all the political constraints since no laws can force an individual to react rationally rather than emotionally.

Guidelines and procedures for decision making must be developed to avoid problems that could arise from emotive and ill-informed decisions.

V. Societal-National Objectives and Technological Constraints

The type of communications channels that are needed for this level of communications are similar to those needed on the community level (see table 4). Similar technological constraints apply to both levels and are discussed in section III.

VI. Societal-National Objectives and Political Constraint

The nature of the political constraints make it prohibitive to experiment with two-way communications on the societal level before a thorough examination of all the problems associated with the use of two-way communications on the group and community levels. Even when all problems associated with the community and group levels are satisfactorily resolved, a careful consideration must be given to the validity of projections from these levels to broader societal levels. Using citizen feedback on national level may require a fundamental restructuring of the entire democratic structure--a huge task indeed. Research in this area called for to expose the dangers involved, to insure the politicians awareness of these dangers.

The nature of the political constraints on the societal level are similar to those on the community level, and are discussed in section IV. It is more difficult and dangerous to experiment on this level. Even when we develop satisfactory knowledge of what happened on the community level, it will be difficult to predict what effects the use of two-way communication at the community level will have on the political structure. These effects could make the use of two-way communications on a national level more

feasible or more prohibitive than is now apparent.

Conclusion

The purpose of this paper is to link the technical design of two-way communications and the possible political consequences. It was demonstrated that a home terminal may be versatile, may be economically and technologically feasible, and still may not be desirable from a societal standpoint. A versatile home terminal could penetrate the market for its commercial value; however, it is important that the designer of such a terminal be aware of the possible social consequences of his design. It is his responsibility to expose the dangers involved in social applications of his design.

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Appendix A

Enclosed is a second draft of my research proposal for studying the effects of two-way communications on discussion dynamics in small groups.

Research proposal title: study of the effects of a feedback mechanism on a group decision making processes in order to make projections on the possible political effects of the use of cable TV for citizen feedback.

For purposes of obtaining research funds the proposal will be modified to focus on the question as to how to obtain citizen feedback for evaluating an interdisciplinary research project mainly in choices which involve the concept of quality of life. This research will be done under the direction of Professor T. B. Sheridan, MIT.

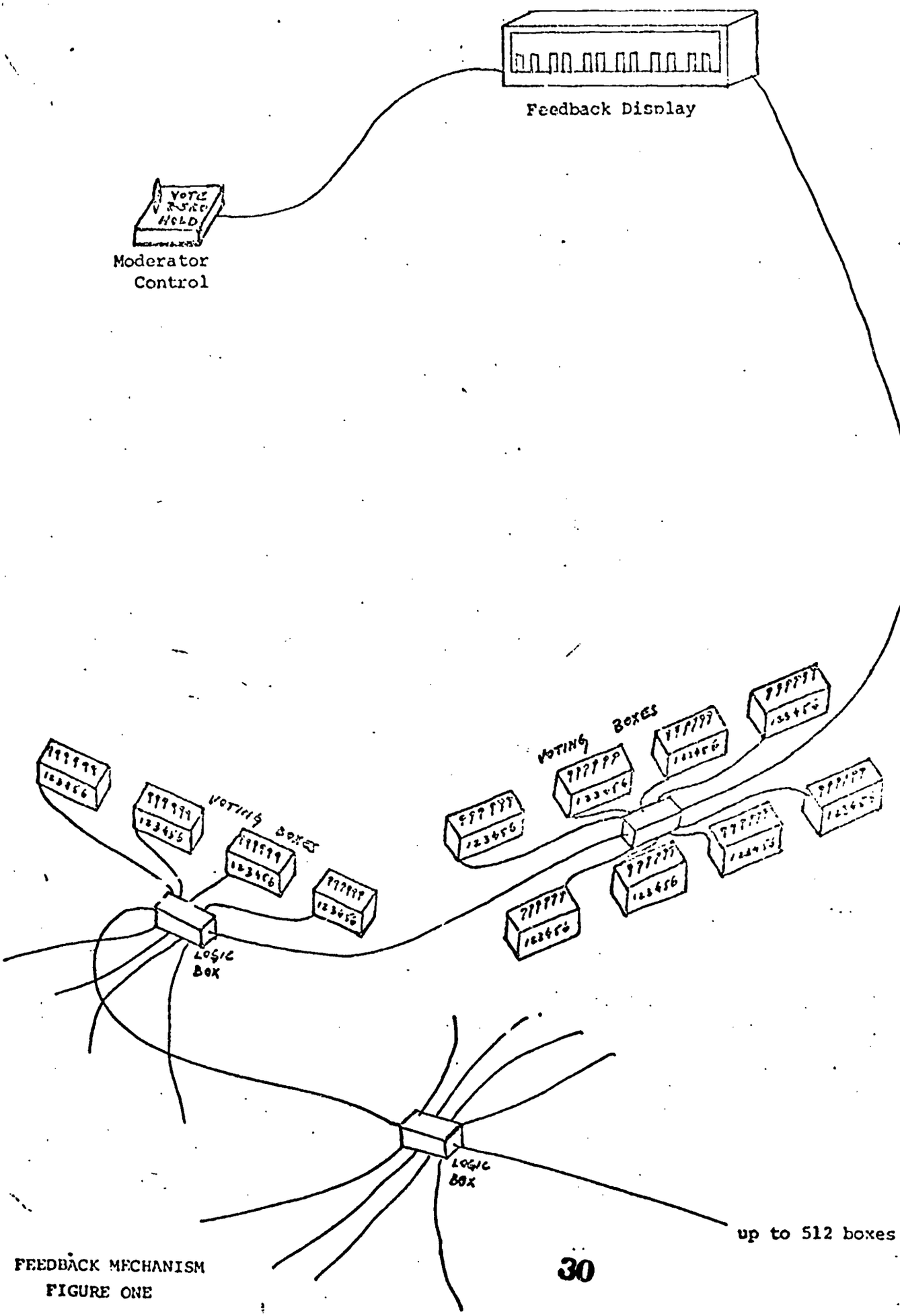
Introduction:

The development of cable T.V. makes the idea of "participatory democracy" more feasible. Citizens will be able to respond to the media through their T. V. sets and indicate preferences among alternatives either in the area of services (such as supermarket shopping) or in the area of politics. The possible political use of cable T.V. gives rise to speculations which range from total negation of this potential ("such participatory democracy will cause participatory nightmare") to praising it ("participatory citizenry . . . the goal of democracy").

The purpose of this research is to test some of these speculations in a laboratory manner. A feedback mechanism was developed by Professor T. B. Sheridan at M.I.T. (see Figure One) which makes such a study possible on a limited social unit from which hypothesis can be formed and possibly projected to larger social units (the validity of making such projections will be examined).

We propose to study the dynamics of such interaction (citizen participation) with small groups. The interpersonal relationships within such groups and the level of cohesiveness (and the elements which are responsible for this cohesiveness) should resemble the interpersonal relationships and level of cohesiveness in larger social units (e.g. community and state) to which we intend to project our findings.

Citizen feedback will create a situation in which a political representative will be constrained to deal with issues of interest to the majority of the crowd with whom he interacts (assuming that people in the crowd would be able to offer alternatives, select among them and observe



FEEDBACK MECHANISM
FIGURE ONE

the feedback statistics). In a group this situation can be created using the feedback mechanism (Figure One). A discussion procedure using this feedback mechanism was developed which forces the vocal members of the group (analogous to the politicians) to address the issues selected by the majority (procedure shown in Figure Two). It is the dynamics of this situation that we intend to study.

Some of the important questions that need to be answered before the introduction of citizen feedback and on which an experiment on a group level can pour some light are the following: How will the vocal members of the group (the usually more influencial members) react in a situation where the majority can restrain them? (Analogous to how will those who seek political leadership react in a situation where they as well as their constituents know what the majority wants--assuming statistical methods will be developed to analyze this feedback); What effect will the feedback mechanism have on the group's ability to make decisions (i.e. will the feedback mechanism cause more group polarization and conflicts)? Will the non-vocal members of the group feel more a part of the group (and to what extent) by being able to feedback responses in such a limited and nonverbal manner?

The question of the attitudes of the nonvocal members toward the feedback mechanism is a very crucial one. Will people feel more a part of a group by interacting with it through a box with switches and without a verbal communication? If so, to what extent? An answer to this question can tell us whether it makes sense at all to use cable T.V. for political purposes. The degree of expectations the nonvocal members will have from such interaction will be a function of the extent to which the feedback

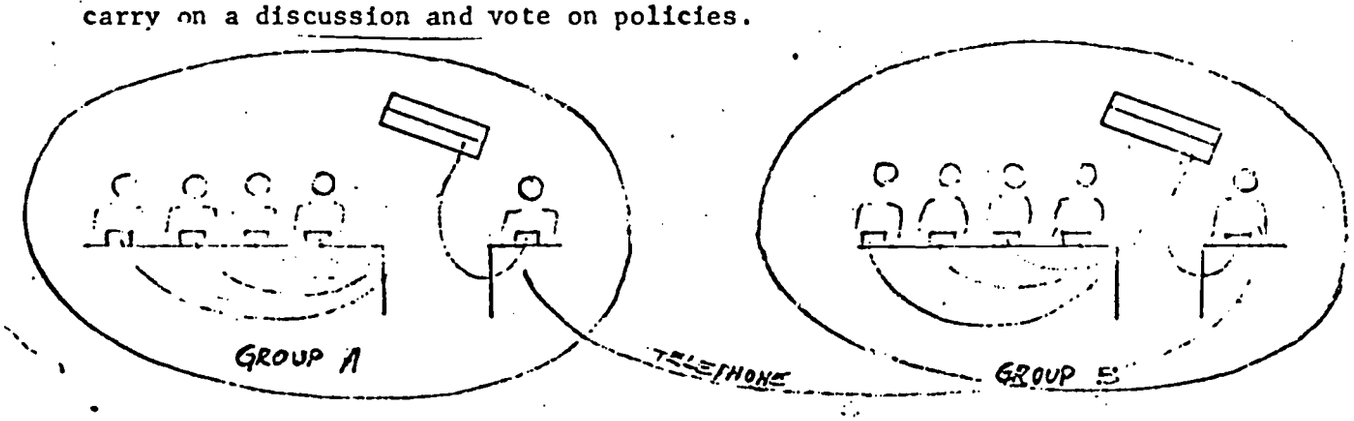
mechanism make them feel a part of the group. These expectations and how they should be dealt with are one of the most important questions that must be studied before the introduction of citizen feedback.

These questions deal with problems on the macro level (group dynamics). In addition to them we intend to examine the effects of the feedback mechanism at the individual level and attempt to answer the following questions: Did the feedback mechanism increase the individual input into the discussion? How effective is the discussion procedure in terms of helping individuals who usually do not participate in group discussions, to participate?

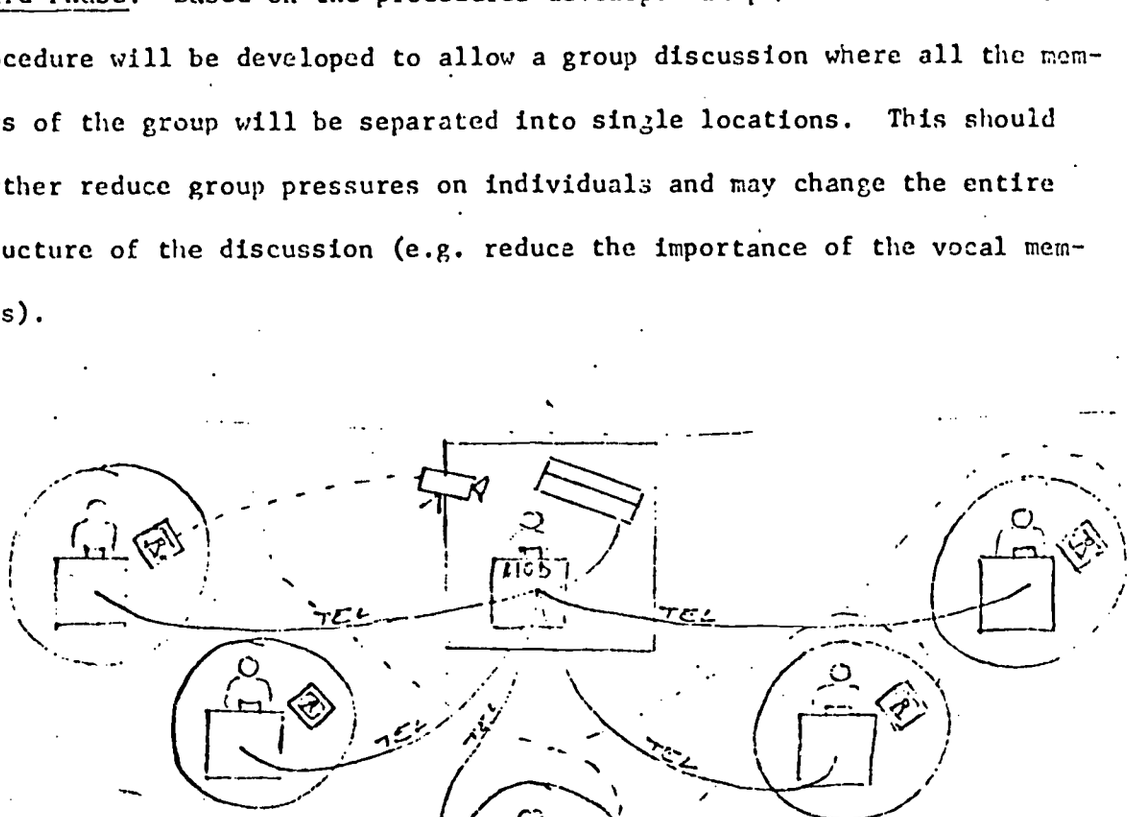
Since people can be expected to behave differently when they respond to the media in their homes and not in a group situation (even though in both, the reaction is anonymous) the study can be extended into three phases:

First Phase: Develop a procedure for a group discussion using the feedback mechanism. All the members of the group will be present in one room together with the moderator. A topic will be selected and the group will discuss it according to the procedure outlined in Figure Two.

Second Phase: Based on the procedure developed in phase one for a group discussion, a procedure will be developed to allow two separated groups to carry on a discussion and vote on policies.



Third Phase: Based on the procedures developed in phases one and two a procedure will be developed to allow a group discussion where all the members of the group will be separated into single locations. This should further reduce group pressures on individuals and may change the entire structure of the discussion (e.g. reduce the importance of the vocal members).



Once the three phases are completed a cross phase analysis can give answers to the following questions:

1) How does the group voting behavior change as a function of going from phase one to phase two and from phase two to phase three?

2) How does individual participation change across phases?

3) Is there an optimal size of a group for the mechanism to be effective?

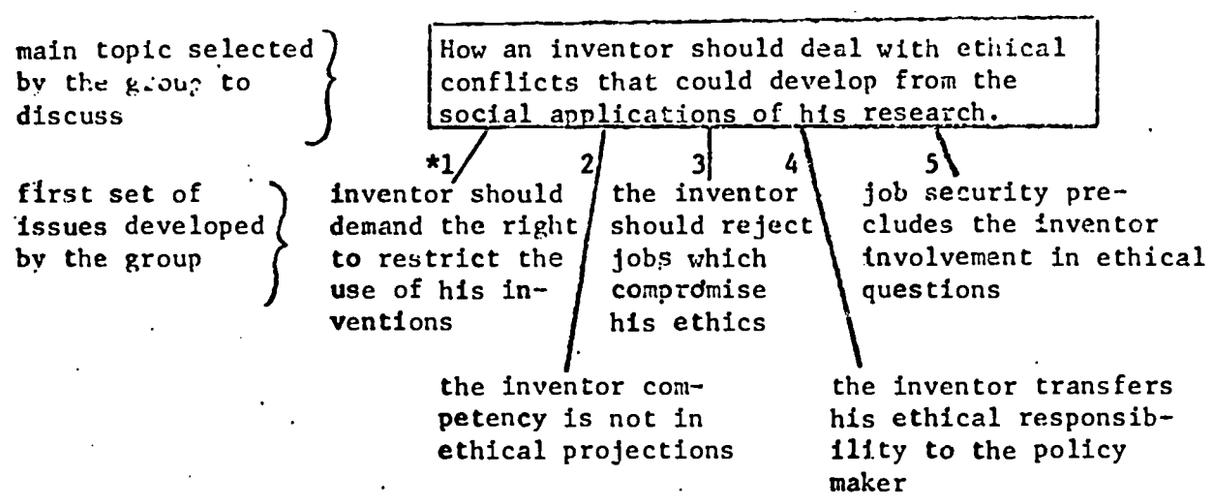
4) How does physical distance between the members affect group behavior?

5) How do the added technological constraints (the different types of communication channels available at each phase) affect group discussion?

Since a group behavior in this type of a discussion (using feedback mechanism) will vary among groups of different backgrounds (socio-economic, educational level, ethnic, etc.) we will attempt to study the affects of some of these important variables on the group behavior.

Description of the Group Discussion Procedure Using the Feedback Mechanism:

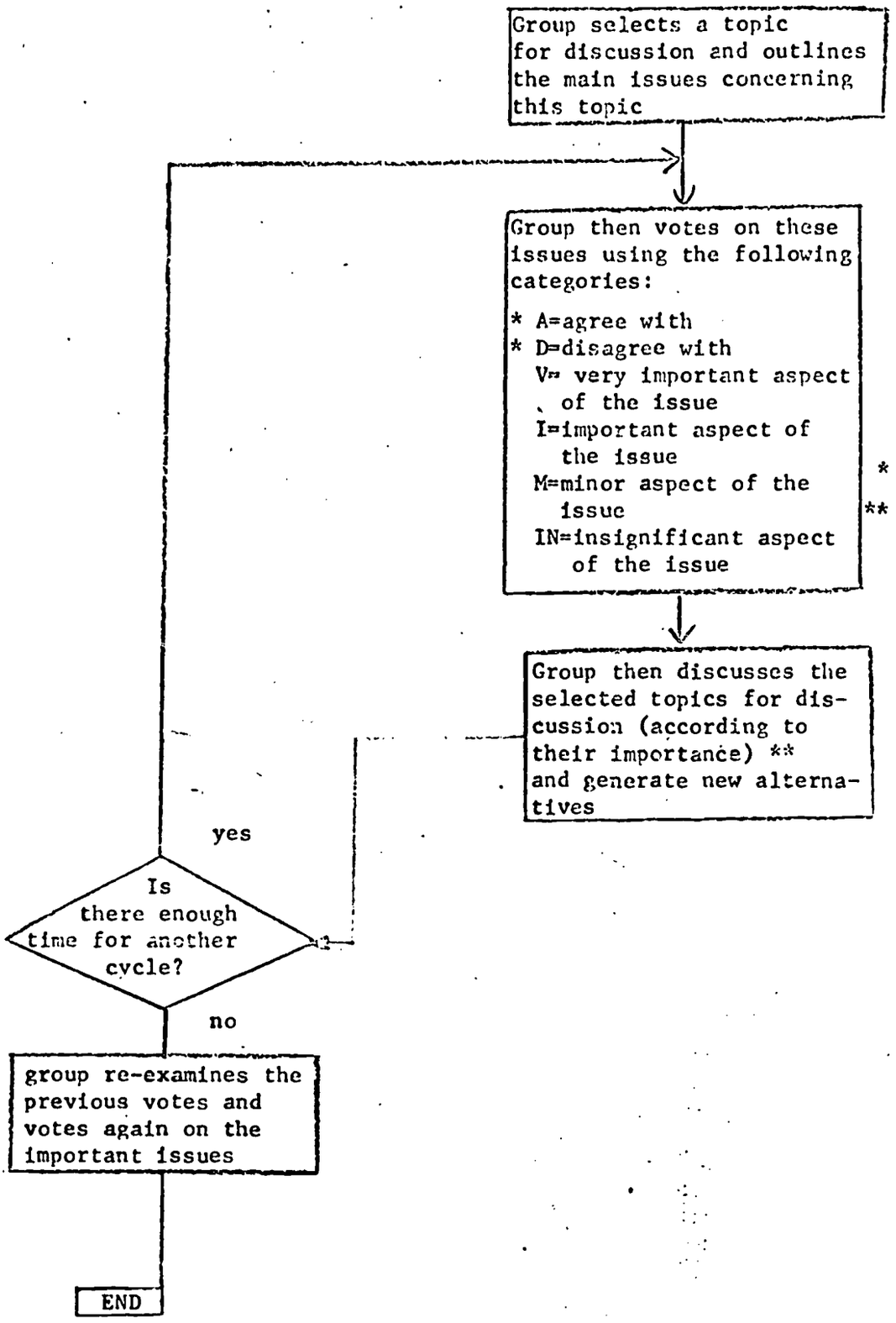
Step One: The group will select a topic for discussion on which it wants to form group statements (or policies). The topics can be political as well as non-political. The group will then proceed to outline the main issues (or opinions) that relate to the topic selected (see Figure 3). Once this set of issues is outlined, the group will vote on which of these issues the majority of the group wishes to discuss at length (more than one issue can be selected if time permits).



*. group decided to discuss this issue at length

EXAMPLE FOR THE USE OF THE PROCEDURE

Figure Three

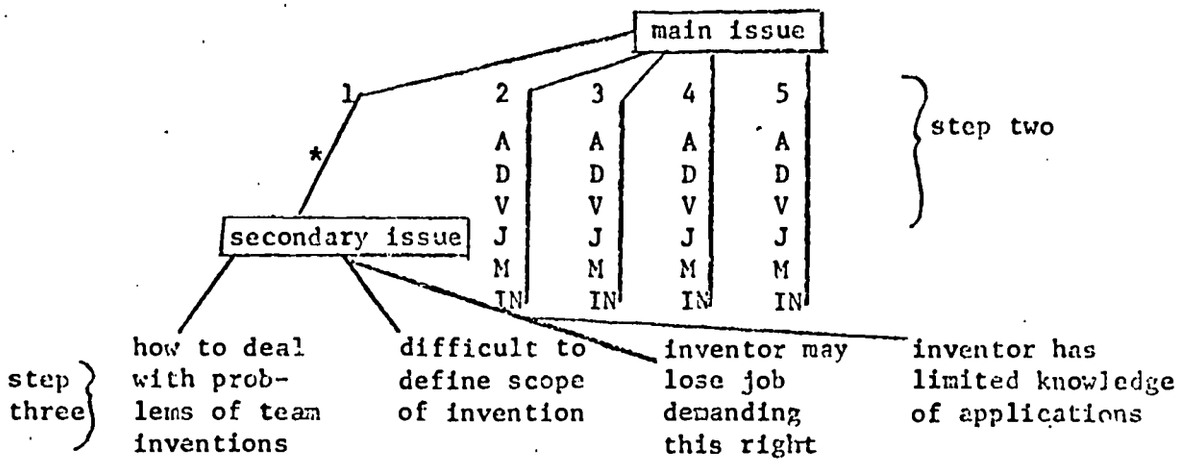


PROCEDURE FOR THE GROUP DISCUSSION

USING FEEDBACK MECHANISM

Figure 2

regarding the issue or ideas and related problems for further discussions (see Figure 4).



EXAMPLE cont.

Figure 4

From now on the group will proceed with the discussion alternating between steps 2 and 3 and generate an idea tree: this process will continue as long as time permits or until the group terminates the discussion on a particular issue and can then return to the first alternatives left undiscussed and start the whole process again.

Since a group discussion does not usually develop in a linear manner the group should be allowed to backtrack to previous issues. This can be done by introducing alternatives that relate to prior issues and which also relate to the issues being discussed. The members of the group then have the opportunity to decide whether they wish to backtrack or not.

The last phase of the discussion should be devoted to examining the results obtained. The group should have the opportunity to vote again on the main issues in order to avoid inconsistencies that could have

developed during the discussion and detect changes in opinions.

This group discussion procedure will allow the group to control the direction of the discussion as well as its content.

The group majority is able to restrain the vocal members and force them to address issues in which the group majority is interested. A situation similar to this could develop if cable T.V. will be used as a channel for citizen feedback where the citizens could restrain the political leaders to deal with issues of interest to the majority among listeners. It is the dynamics of this situation that we intend to investigate on the group level.

Description of the Small Group

Since we intend to study discussion dynamics in small groups for the purpose of projecting the results to larger social units, communications among the people in the group should resemble communications among people in large social units (such as community or state). The group should have the following characteristics:

a) Level of trust among the group members should be low due to their inability to deal with interpersonal relations (as is the case in large groups).

b) The group should be issue oriented. The group objective should be to discuss issues which involve value judgements and policy formations. The interest in the issue is the main source for the group cohesiveness

c) The group leaders should emerge from within the group during the discussion.

The level of trust among the members of the group, the objectives which unify the group and the group power structure (the distributuion of

influence among the members) are important parameters that can be expected to affect both the attitude of groups toward the feedback mechanism and the discussion procedure. We intend to study these effects by experimenting with groups with different levels of trust and various group objectives (these objectives could be self analysis, political organization, etc.) The information which can be gained from such a study could help us to establish the bounds within which feedback mechanism will be effective.

Appendix B

Enclosed is a description and a conclusion of an experiment conducted in 1970 at Stanford University in which I have tested audience response to a panel discussion via pre-selected responses. The design allowed the participants to elicit responses at their own choice of time. The actual technical design of the terminal will be finished by the end of January 1972 on a research project sponsored by Professor Ithiel de Sola Pool at MIT.

THE PARTICIPANTS

The participants, mostly professors and doctoral students at Stanford University, were chosen from the following fields: Sociology, English, Engineering Economic Systems, Industrial Engineering, Business, Communications and City Planning.

DESCRIPTION of the EXPERIMENT

The participants were asked to visualize themselves in a "live" situation. "There is an exciting discussion on your home T.V. about student revolt..(taken from Playboy Magazine 1969)...Thanks to technology, besides your T.V. set there is a terminal through which you can make some responses to the discussion...It is important that while "listening" you imagine yourself in a live situation where your responses will have some effect on the discussion."

On the terminal there was an additional screen (see appendix) on which the words of the speakers appeared 'simultaneously' with their imagined voices. In other words, in this experiment, all that the participants saw was the typed discussion -- not the speakers themselves and they were asked to imagine themselves in a situation where they could see the speakers.

The terminal screen was labeled vertically with letters that corresponded to lines on the screens in order to enable the 'listeners' to locate their responses to the idea expressed in that line. On the terminal were coded responses (see figure 3) and the participants were asked to choose

among them by pressing (making a check on the button) the button that corresponds to the response of their choice.

A questionnaire was included at the end of the discussion in which the participants were asked to evaluate the system both as listeners and as though they were the speakers.

In a real life experiment, listeners (viewers) would be required to switch their attention from the speakers to the printed letters which could be more disturbing than the situation in which they responded to the discussion in the experiment. The results of this experiment showed that the participants did not respond often enough to disturb their 'listening' (reading).

(For further description of the experiment please see appendix.)

THE DEVICE

In order for the viewer to be able to make responses to some specific ideas during the discussion, not only during periodic intervals determined by the discussion moderator, the discussion should appear in print in front of him. This can be done by simultaneously printing what is being said on stage and transmitting it to home T.V. screens. In this experiment the screen was a part of the terminal (Fig. 1), but it will be less costly to use a portion of the T.V. screen on which the discussion is being displayed for this purpose (Fig. 2).

As can be seen in Fig. 2, the lower right portion of the

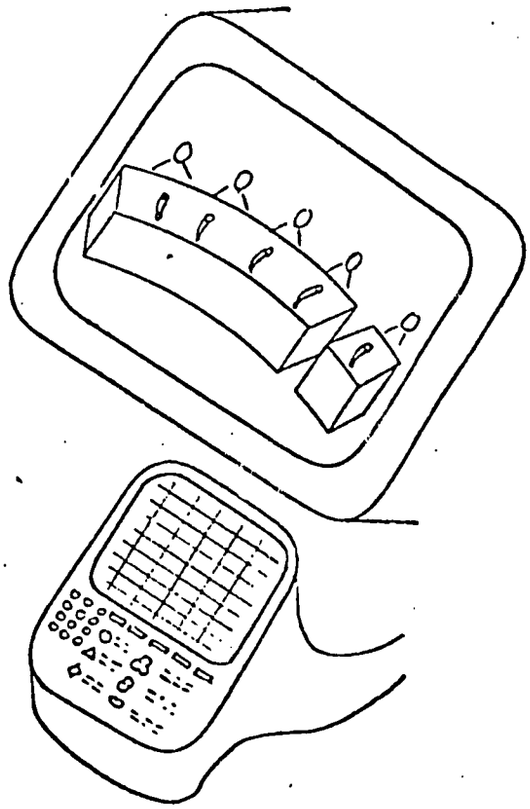


FIG. ONE
TERMINAL USED IN THIS EXPERIMENT

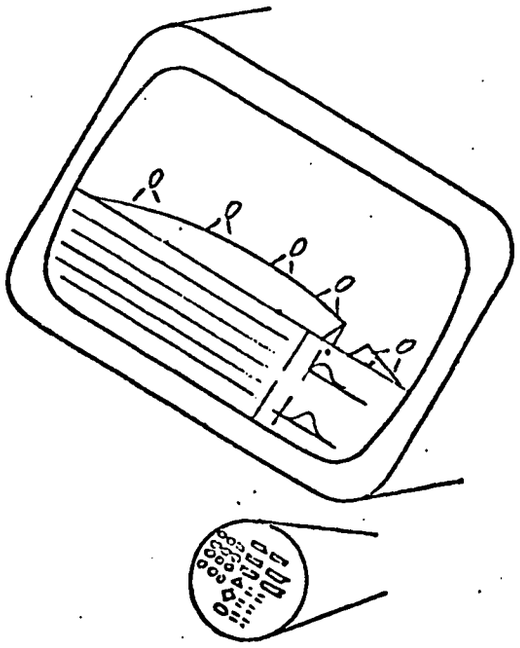


FIG. TWO
AN ALTERNATIVE TERMINAL

screen can be reserved for displaying the feedback statistics. The size of the letters to be displayed and how many lines shall be displayed at a time is a topic for further study. In the experiment, the participants were allowed to refer back to previous pages before they made a response, but were asked to indicate if they did so in the questionnaire. Some indicated that they referred back once or twice, one indicated he did not refer back and the others did not indicate anything. Clearly, no valid conclusion can be drawn from this data with regard to the number of lines to be displayed but it is encouraging that no one had indicated that it was to his advantage to have the entire discussion in front of him for reference, a situation which will not exist in reality. It can be expected that the number of times the participants will refer back to previous lines will vary according to the interest he has in what is being said and the complexity of the discussion.

In order to be able to respond to a specific idea which is expressed in a certain line of the printed screen, vertical letters are assigned to each line and the participants can localize their response by pressing the button marked with the letter that corresponds to that line. The selection of the response will be done in the same way. These responses will be stored in a computer memory.

Figure 3 describes the responses available to the listener. These responses were carefully designed as to

avoid distortion of the listeners opinions and enable them to affect the discussion and its content in some limited way. Of course, there is no optimum set of responses that could enable the listeners to express their opinions free of distortion, and the object of the research is to investigate how to minimize these distortions and study their possible effects on the content of the discussion. This is one of real dangers of the use of preset responses and a topic which should be studied continuously.

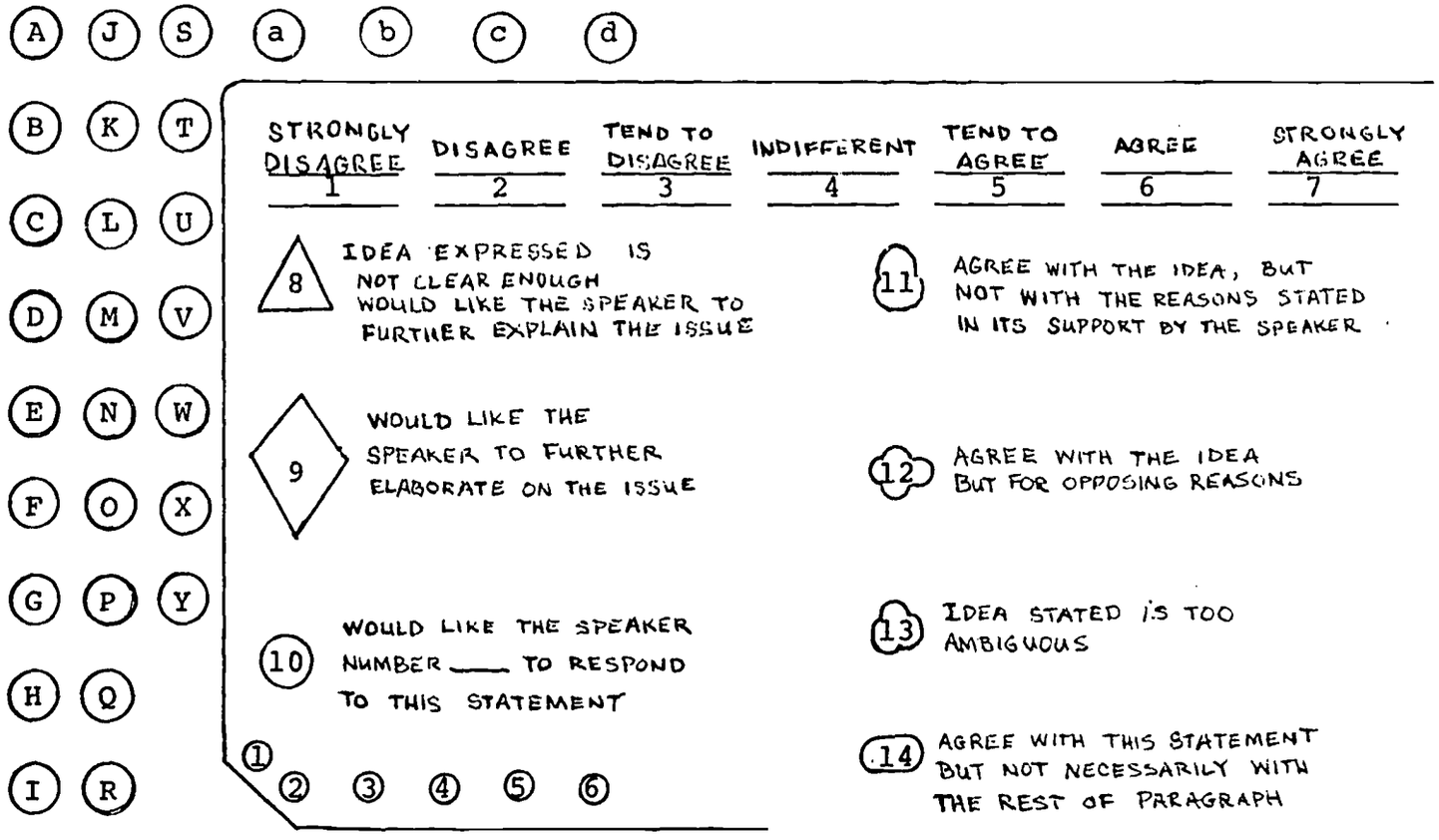


FIGURE THREE

SUMMARY and CONCLUSIONS

Most of the participants in the experiment thought a home terminal with preset responses was useful. The majority of the problems raised by the participants with regard to the actual use of the terminal could be solved by a careful design of the information flow. Following are some guidelines for such a communication system in light of the results obtained in this pilot experiment.

Figure 6 describes the general system. The proposed terminal is presented in Figure 2. It has the following advantages over the terminal presented in Figure 1: a) the viewers do not have to switch their attention from the screen, except for the selection of a response on the terminal and, b) there is no cost of an additional screen. The presentation of the statistics to the listeners will be made on the lower right hand part of the screen which could be blocked from view in case the listener did not want to be disturbed by the statistics during the discussion. Additional responses will be added to the terminal in order to enable emotive responses such as: "I dislike what the speaker said", "this is naive", "the discussion is boring", or "I would like the speakers to move to another topic", etc.

A button will be added to the terminal which allows the listener to respond to a whole paragraph not just to a certain line. For example, in Figure 7 (page 21), the listener strongly agreed with the entire paragraph printed in lines ABCD.

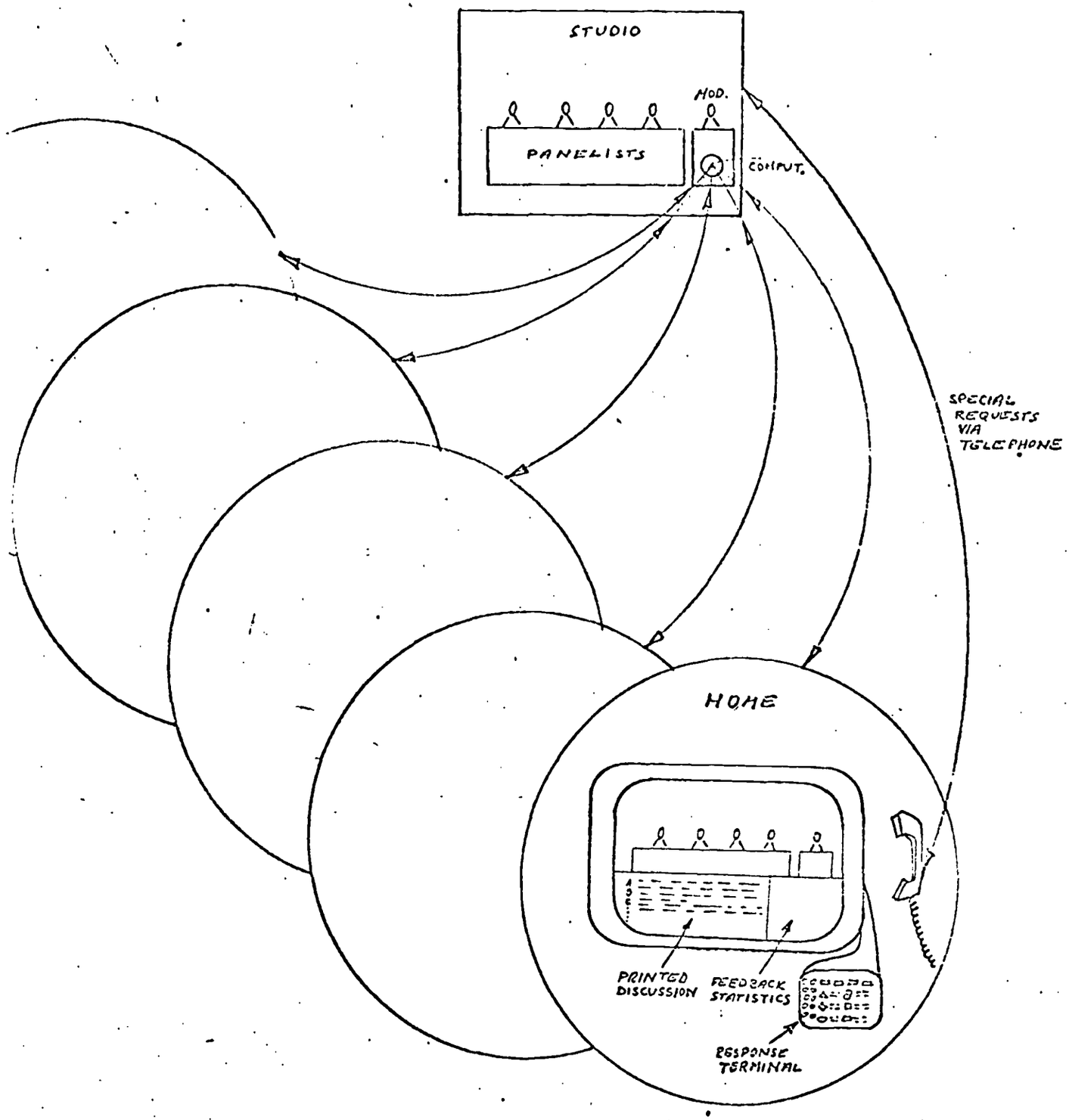


FIG. SIX
THE COMMUNICATIONS SYSTEM

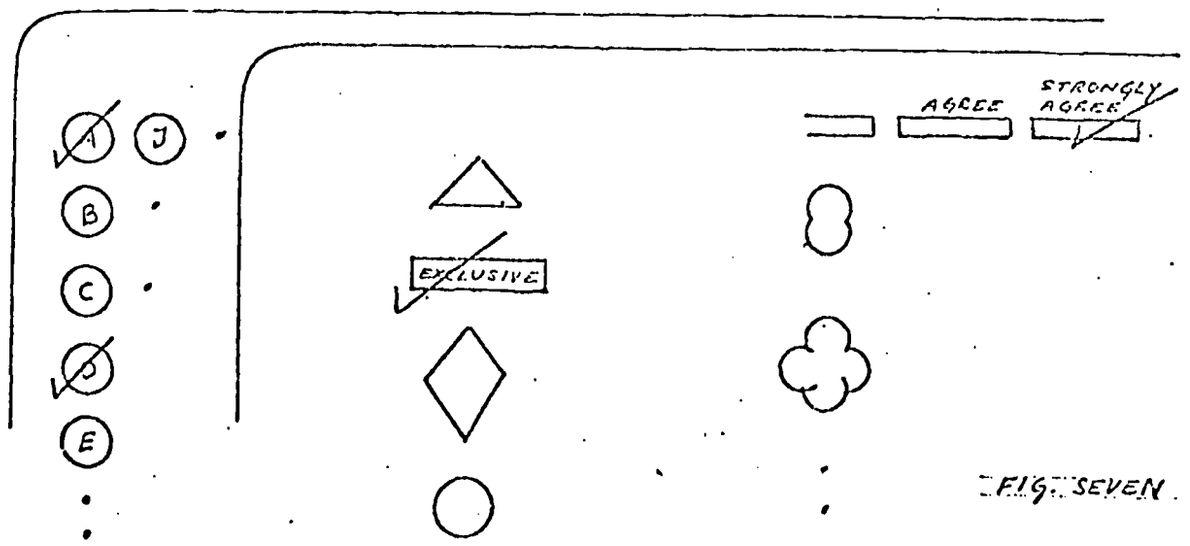


FIG. SEVEN

A button marked "present statistics with regard to" will enable the listeners to ask the moderator to present the feedback statistics with regard to a specific idea. An additional improvement could be the use of a light pen by the viewer to indicate his responses. In this case the terminal itself would be projected on the screen which would save the cost of building the home terminal. (See figure 8)

A comparison between the different alternative terminals should be made on the basis of technological feasibility and costs. If the light pen were used, there would be no need for the letter to localize an address as it could be done by touching with the pen on the specific printed line and then responding to it. There could be a great many uses for a light pen T.V. system (i.e., in advertising) that should reduce the costs of implementing such a system.

The selection of which feedback statistics are appropriate to present to the listeners and which to the speakers,

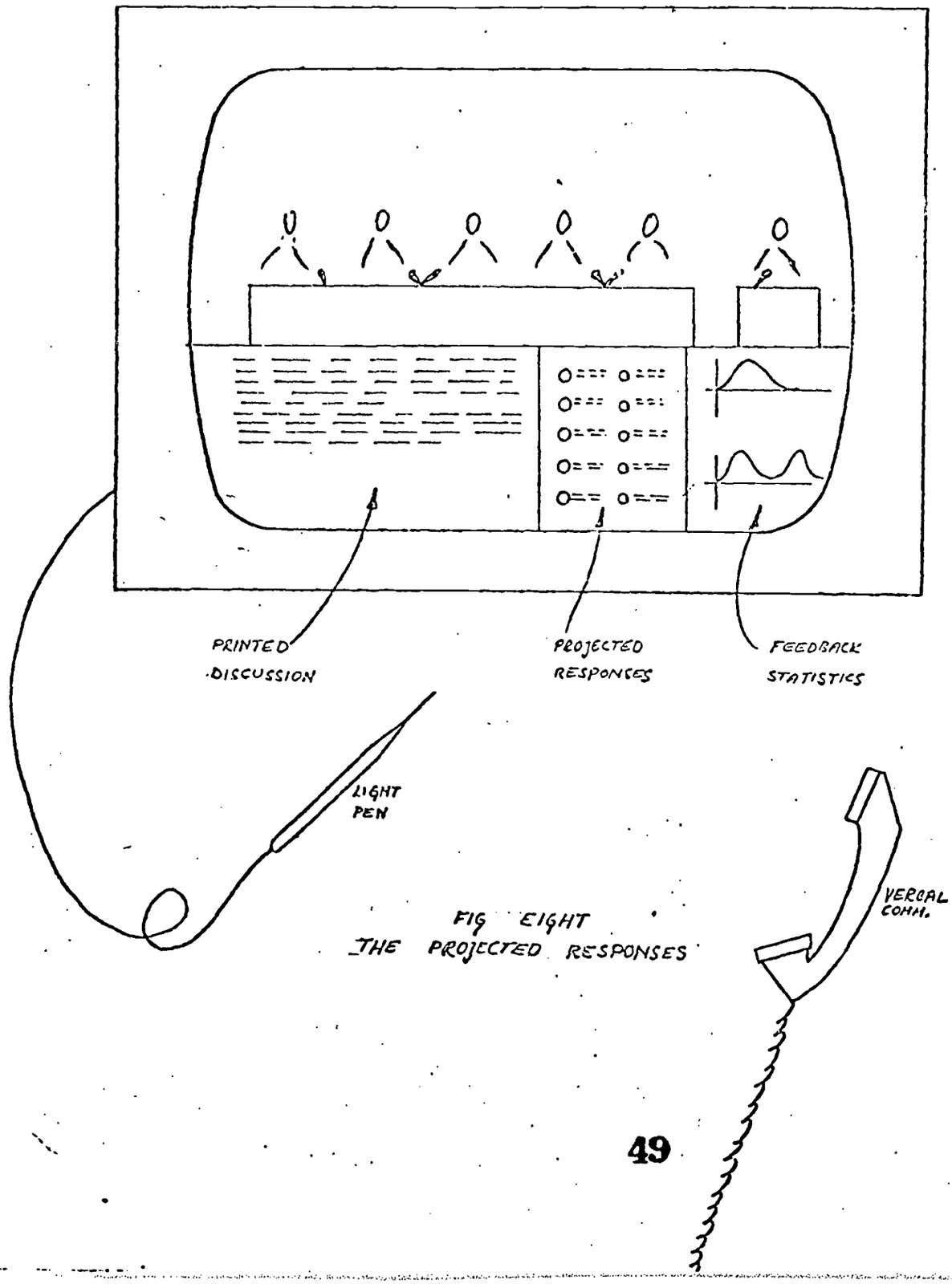


FIG EIGHT
THE PROJECTED RESPONSES

and the timing of these presentations is of great importance. Wrong use of such statistics can disturb both the listeners and the speakers and even distort the content of the discussion which will result in a complete defeat of the purpose of this communication.

To avoid such disturbances, the following guidelines should be adhered to:

1) The speakers should be presented during the discussion only with specific requests from the audience (i.e., a request to respond to another speaker or to further explain an issue), and the statistics which indicate public opinion (i.e., agreement or disagreement) should be kept to the end of the discussion. The reason for this is to avoid the possibility that some of the speakers may be tempted to "fit" their argument to the audience rather than express what they really think at the cost of losing the listeners' support.

2) The frequency of presenting the feedback statistics to the audience should be low enough not to distract the listeners attention from the discussion. These statistics should be simple in their presentation so that no previous knowledge of statistics will be required to interpret them.

3) Not all requests will be presented to the speakers during the discussion. It will be the function of the moderator to set the threshold high enough in order to avoid a frequent disturbance of the discussion.

4) During break periods the moderator can present

questions to the audience at the request of the speakers or by his own initiations. Members of the audience can telephone from their homes to present questions to other listeners at the end of the discussion.

5) All feedback statistics will be shown at the end of the discussion.

The kind of communication system discussed here allows interchange not only between panel members but between various speakers and audience members, and between audience members themselves. Instead of one-way communication with its inevitable frustrations, this system encourages a web of mutual response that makes communication dynamic rather than static. It should not only increase the social awareness of both panelists and audience but it should also make every participant more keenly aware of his responsibilities to the people with whom he is in dialogue.

Appendix C

	Technological Features	Description
3a	Continuous picture, individual	Each home receives a private TV channel which is connected to a central program exchange. (REDIFFUSION SYSTEM)
3b	"Frame grabbing" technique	30 full TV pictures are transmitted per second. A small video tape located in the home terminal can record one full picture in 1/30 of a second and replay it on the screen. If a single picture is shown for 10 seconds, 600 people can get individual pictures using only one channel. A computer is used to locate the different requests (MITRE SYSTEM).
4a	Xerox copy via telephone	Xerox company has developed a device which allows sending xerox copies via telephone lines. This capability can be added to the home terminal (newspapers, printed information can be send via cable in seconds).
4b	Strip Printers	100 words a minute printers are available which print messages on strips of paper.
4c	Screen Photos	Polaroid camera can be used to make "copies" from screen displays.
5b	Complex computer graphics	TV screen connected to a computer can be used for design using a "light pen".
21c	Use of entire screen for feedback	The entire screen can be used for feedback. Two techniques are available for this purpose: light pen and photo-electric light beams. The first will allow feedback by touching the screen with a pen and the second with a finger (a design using these techniques will be completed at the end of January 1972).