The Delphi technique: characteristics and sequence model

The Delphi Technique is gaining popularity in the health care field, although no model has been presented to capture its sequential process. An attempt was made to trace its characteristics and to design such a model in order to clarify the process and to assist users of this technique.

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THE DELPHI TECHNIQUE is a group process method developed originally by Dalkey and associates at the Rand Corporation. They used it in planning how to achieve objectives and how to forecast technological developments.[1] Even though Delphi means oracle, the Delphi Technique is neither oracular nor prophetic. Rather, information is obtained from current knowledge of participants relevant to the issue being considered[1] than from literature review. Informed or refined majority opinion, rather than expert opinion, results in a forecast.[2] It assumes that two or more heads are better than one.

The usual procedure for combining individual opinions or for arguing individual stands on issues is by face-to-face discussion.[3] In the original Delphi, the group members never met but were asked to provide information about an issue being considered and to comment or argue for or against each other's point of view by mail. The statistical group response and the summary of their individual comments

were relayed back to the group, also by mail. This cycle was repeated until the group reached a consensus, which was then used in forecasting.

The original Delphi Technique process was modified in several ways by subsequent users: (1) specific rather than open-ended questions were used; (2) questions were submitted to a much larger number of respondents; (3) respondents who had relevant information, rather than expertise, on the issue under consideration were asked to participate; (4) respondents were brought together, although the anonymity of their responses was maintained by use of electronic recording devices, where wires connecting each respondent's button and the display board were crossed; and (5) feedback was restricted to statistical group responses, excluding the summary of comments.

In spite of these modifications, present users of the Delphi Technique adhere to traditional terminology. For instance, the terms *experimenter, director,*[4,5] and *staff group* refer to the investigator or to the person or agency responsible for designing the initial questionnaire, collecting panel responses, summarizing returns, and redesigning follow-up questionnaires.

The *questionnaire* not only asks questions, but also provides information to the participants about the degree of respondent consensus and their arguments or opinions.[4] The word *group,* borrowed from psychology, is frequently referred to as the *panel*[4,5] or the *respondent group.*[1] They are the participants in the study. Each successive submission of a questionnaire to the respondent group is referred to as a *round.*[4,5] *Dunning*[1] refers to follow-up activities by letter, telephone calls, or other means to encourage participants to respond.

CHARACTERISTICS

The three features that characterize the basic Delphi procedure are anonymity, iteration with controlled feedback, and statistical group response.[4,5] These features distinguish the Delphi from other types of group interaction, such as nominal group technique,[1] face-to-face interview, or group meeting.

Anonymity

Anonymity means that individual responses are not matched with the identity of the individual respondent. Reactions to each other's opinions, arguments, and the consensus reached are given independently to each panel member. This approach provides each participant with an equal opportunity to express an opinion to the others without feeling pressured psychologically by the more influential participants. Therefore, each independent response is given equal importance in the final analysis and receives equal weight.

Iteration with controlled feedback

Part of the Delphi sequence is iteration with controlled feedback. It uses successive questionnaires in which information relevant to the issue being considered is incorporated. This information, extracted from responses to previous questionnaires, is sent to panel members. This informs them of the current status of the group's collective opinion and the arguments for or against each point of view.[4]

The advantage of iteration is that, in successive rounds, the participants can change their opinions, support them further, agree or disagree with the other arguments presented. Feedback from the other panel members can persuade them to also consider items they might have missed or thought unimportant. The original forecast of the group improves because of this interaction, and the group members gain a better understanding of what is going on.[4]

Statistical group response

The statistical group response includes the opinions of the entire group on a single question. For feedback purposes, the question response may be rated on a Likert-type scale from which the mean or median is obtained. Together with their previous rating, the mean or median response and the comments to each question are fed back to the panel members. This enables each individual to see where his or her response stands in relation to that of the group. The group median is improved by the anonymous feedback.[4]

Other characteristics

Other features that should be considered are the design of the initial questionnaire, the number of questions to be included, the number of participants, the number of rounds, and the projected time of the forecast. The process could begin with either a broad question or a predetermined list of questions or events. If the initial questionnaire asks a very broad question, the participants might have difficulty in knowing where to start. It may or may not result in events or questions pertinent to the issue under consideration. Also there is no guarantee that the forecast produced from this first round will be relevant to the needs of the director. Panel members may find that they have no more knowledge than a layperson, yet are required to give expert advice. Thus, starting with a list of questions or events, which is equivalent to the second round in the original Delphi, may be more advantageous in the long run.[4]

Generally, 25 questions is a practical number for the initial questionnaire.[4] It is feasible to use a large number of questions if they are easy to answer, if the arguments are succinctly summarized so they are easy to follow, and if there is ample space for writing comments and arguments. All these considerations should improve the quality of the responses.[4,5]

The number of participants required to constitute a representative sample can vary from ten to several hundred. Reliability of the respondent group increases as the size of the group increases. Sample selection depends upon the nature of the respondent group and the analytical skills of the director. A small number from a homogeneous group or a large number from a heterogeneous group who possess relevant information about the issue under consideration could constitute a representative sample.[1] Heterogeneous groups produce forecasts that are highly consistent.[4] With computerized coding and analysis of data, data can be analyzed efficiently, thus facilitating large numbers of participants. Naturally, the more people involved the more work required in the analysis of the data.

As many as 25 rounds of the Delphi questionnaire have been reported. However, 2 to 4 rounds may be sufficient to reach an agreement or consensus and pro-

duce a forecast.[4,5] The number of rounds depends upon the time available and whether the experimenter initiated the Delphi sequence with one broad question or with a list of questions or events.

The projected time for which a forecast is being made should not be too distant. Studies have demonstrated the existence of a definite relationship between the distance of the forecast and the degree of uncertainty felt by the respondent group. Uncertainty increases as distance of forecast increases and events become more remote.[2,4]

SEQUENCE MODEL

Although the Delphi Technique has been widely used, no model has yet captured the sequential process. An attempt is made here to design such a model in order to clarify the method and to assist users. This model (Fig 1) was designed with the characteristics previously described.

To understand the use of the model, the step-by-step process in Table 1 should be followed. It is assumed at this point that the experimenter has already determined the issues to be considered, specified the

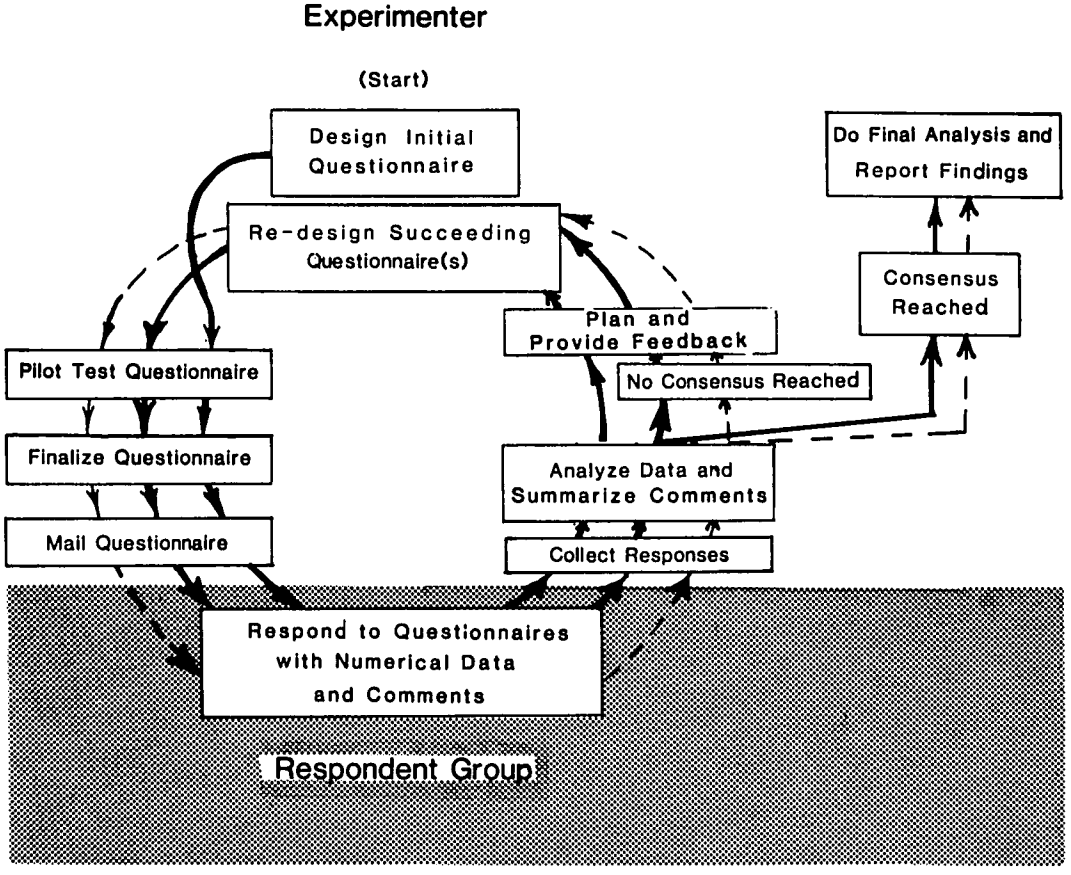

Fig 1. The Delphi technique sequence model.

Table 1. Sequence in Delphi technique

I. Initial round
- A. Experimenter (or director, staff group moderator)
  1. Design initial questionnaire and instructions
  2. Pilot test initial questionnaire and instructions
  3. Revise and reprint final version of questionnaire and instructions
  4. Mail questionnaire and instructions to respondent group
  5. Send dunning letters or make telephone calls to encourage more responses
- B. Respondent group (or participants, panel, group)
  1. Respond to questionnaire (by numerical response, comments, opinions, arguments, or other response requested by experimenter)
  2. Return completed questionnaire to experimenter
- C. Experimenter
  1. Collect responses
  2. Analyze data
  3. Summarize comments

II. Succeeding rounds
- A. Experimenter
  1. Provide feedback to respondent group
  2. Redesign questionnaire and instructions
  3. Incorporate the following information in this questionnaire
     a) appropriate items from initial questionnaire
     b) additional items from initial questionnaire supplied by respondent group
     c) group mean, median, or quartiles
     d) summary of comments, arguments, points of view for each question in the previous questionnaire
     e) previous rating, voting, ranking made by each respondent (given only to that respondent)
  4. Pilot test questionnaire and instructions
  5. Revise and reprint final version of questionnaire and instructions
  6. Mail questionnaire and instructions to respondent group
  7. Send dunning letters or make telephone calls to encourage more responses
- B. Respondent group
  1. Respond to questionnaire in the following manner
     a) rerate, revote, or rerank items or make other response requested by experimenter, whether or not affected by feedback
     b) provide additional comments or arguments in support of or in opposition to both his or her previous views and those of the other respondents
  2. Send completed questionnaire to experimenter
- C. Experimenter
  1. Collect responses
  2. Analyze data, summarize comments, arguments, other responses
  3. Then respond in the following manner:
     a) if consensus is not reached, repeat the process of Succeeding Rounds above, from A to C. 3. a), or
     b) if consensus is reached, do a final analysis of data, and report the study findings, conclusions, and recommendations

purpose of the study, identified the target population, selected the sample population, and decided on the format of the questionnaire.

By studying the sequence in Fig 1 and by following the steps in Table 1, users of the Delphi Technique will find that the model facilitates the process application in a variety of settings. It will also enable them to further refine relevant dimensions of the process depending upon the purpose of their study.

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