Delphi method

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Historical Background

- The name "Delphi" derives from the Oracle of Delphi.

- it implies "something oracular, something smacking a little of the occult".

- The Delphi method is based on the assumption that group judgments are more valid than individual judgments.

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- **The Delphi method was developed at the beginning of the Cold War to forecast the impact of technology on warfare.**

- **In 1944, General Henry H. Arnold ordered the creation of the report for the U.S. Army Air Corps on the future technological capabilities that might be used by the military.**

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- Different approaches were tried, but the shortcomings of traditional **forecasting** methods,

- such as **theoretical approach**, or trend extrapolation

- where precise scientific laws have not been established

- To combat these shortcomings, the Delphi method was developed by **Project RAND** during the 1950-1960s (1959) by **Olaf Helmer**, Norman Dalkey, and **Nicholas Rescher**.

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- It has been used ever since, together with various modifications and reformulations, such as the procedure.

- Experts were asked to give their opinion on the probability, frequency and intensity of possible enemy attacks.

- This process was repeated several times until a consensus emerged.

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- The **Delphi method** is a systematic, interactive forecasting method which relies on a panel of experts.

- The experts answer questionnaires in two or more rounds.

- After each round, a facilitator provides an anonymous summary of the experts' forecasts from the previous round as well as the reasons they provided for their judgments.

- Thus, experts are encouraged to revise their earlier answers in light of the replies of other members of their panel.

- It is believed that during this process the range of the answers will decrease and the group will converge towards the "correct" answer.

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- Finally, the process is stopped after a pre-defined stop criterion (e.g. number of rounds, achievement of consensus, stability of results) and the mean or median scores of the final rounds determine the results.

- Delphi is based on the principle that forecasts from a structured group of experts are more accurate than those from unstructured groups or individuals.

- The technique can be adapted for use in face-to-face meetings, and is then called mini-Delphi or Estimate-Talk-Estimate (ETE).

- Delphi has been widely used for business forecasting and has certain advantages over another structured forecasting approach, prediction markets.

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"Delphi may be characterized as a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem"

Key characteristics

Structuring of information flow

- The initial contributions from the experts are collected in the form of answers to questionnaires and their comments to these answers.

- The panel director controls the interactions among the participants by processing the information and filtering out irrelevant content.

- This avoids the negative effects of face-to-face panel discussions and solves the usual problems of group dynamics.

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Regular feedback

- Participants comment on their own forecasts, the responses of others and on the progress of the panel as a whole.

- At any moment they can revise their earlier statements.

- While in regular group meetings participants tend to stick to previously stated opinions and often conform too much to group leader, the Delphi method prevents it.

Anonymity of the participants

- Usually all participants maintain anonymity.
- Their identity is not revealed even after the completion of the final report.
- This stops them from dominating others in the process using their authority or personality,
- frees them to some extent from their personal biases,
- allows them to freely express their opinions, encourages open critique and admitting errors by revising earlier judgments.

Role of the facilitator

- The person coordinating the Delphi method can be known as a *facilitator*, and facilitates the responses of their *panel of experts*,

- who are selected for a reason, usually that they hold knowledge on an opinion or view.

- The facilitator sends out questionnaires, surveys etc. and if the panel of experts accept, they follow instructions and present their views.

- Responses are collected and analyzed, then common and conflicting viewpoints are identified.

- If consensus is not reached, the process continues through thesis and antithesis, to gradually work towards synthesis, and building consensus.

Use in forecasting

- First applications of the Delphi method were in the field of science and technology forecasting.

- The objective of the method was to combine expert opinions on likelihood and expected development time, of the particular technology, in a single indicator.

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- One of the first such reports, prepared in 1964 by Gordon and Helmer, assessed the direction of long-term trends in science and technology development, covering such topics as scientific breakthroughs, population control, automation, space progress, war prevention and weapon systems.

- Other forecasts of technology were dealing with vehicle-highway systems, industrial robots, intelligent internet, broadband connections, and technology in education.

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- Later the Delphi method was applied in other areas, especially those related to public policy issues, such as economic trends, health and education.

- It was also applied successfully and with high accuracy in business forecasting. For example, in one case reported by Basu and Schroeder (1977),

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- the Delphi method predicted the sales of a new product during the first two years with inaccuracy of 3–4% compared with actual sales.

- Quantitative methods produced errors of 10–15%, and traditional unstructured forecast methods had errors of about 20%.

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- The Delphi method has also been used as a tool to implement multi-stakeholder approaches for participative policy-making in developing countries.

- The governments of Latin America and the Caribbean have successfully used the Delphi method as an open-ended public-private sector approach to identify the most urgent challenges for their regional ICT-for-development eLAC Action Plans.

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- Delphi, especially in a field of rapid change, such as technology policies.

- In this sense, the Delphi method can contribute to a general appreciation of participative policy-making.

Acceptance

- Overall the track record of the Delphi method is mixed.

- It must also be realized that in areas such as science and technology forecasting the degree of uncertainty is so great that exact and always correct predictions are impossible, so a high degree of error is to be expected.

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- Another particular weakness of the Delphi method is that future developments are not always predicted correctly by consensus of experts.

- Firstly, the issue of ignorance is important.

- If panelists are misinformed about a topic, the use of Delphi may add only confidence to their ignorance.

- Secondly, sometimes unconventional thinking of amateur outsiders may be superior to expert thinking.

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- One of the initial problems of the method was its inability to make complex forecasts with multiple factors.

- Potential future outcomes were usually considered as if they had no effect on each other.

- Later on, several extensions to the Delphi method were developed to address this problem, such as , that takes into consideration the possibility that the occurrence of one event may change probabilities of other events covered in the survey.

- Still the Delphi method can be used most successfully in forecasting single scalar indicators.

- a widely accepted forecasting tool and has been used successfully for thousands of studies in areas varying from technology forecasting to drug abuse

Delphi applications not aiming at consensus

- Traditionally the Delphi method has aimed at a consensus of the most probable future by iteration.

- The Policy Delphi launched by Murray Turoff instead is a decision support method aiming at structuring and discussing the diverse views of the preferred future.

- The Argument Delphi developed by Osmo Kuusi focuses on ongoing discussion and finding relevant arguments rather than focusing on the output.

- The Disaggregative Policy Delphi developed by Petri Tapio uses cluster analysis as a systematic tool to construct various scenarios of the future in the latest Delphi round.

- The respondent's view on the probable and the preferable future are dealt with as separate cases.

basic steps of the Delphi process were outlined by Pfeiffer (1968):

- The first questionnaire which is sent to the panel of experts may ask for a list of opinions involving experiences and judgments, a list of predictions, and a list of recommended activities.

- On the second round, a copy of the collective list is sent to each expert and the expert is asked to rate or evaluate each item by some criterion of importance.

- The third questionnaire includes the list, the ratings indicated, and the consensus, if any. The experts are asked to either revise their opinions or discuss their reasons for not coming to consensus with the group.

Scheele (1975)

- Identify the group members whose consensus opinions are sought.

- If the study goes beyond an intact group such that representatives must be selected, care must be taken to insure that all the various publics or positions are proportionately sampled.

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- 2. Questionnaire One.
- Have each member generate a list of goals, concerns, or issues toward which consensus opinions are desired.
- Edit the results to a manageable summary of items presented in random order.
- Prepare the second questionnaire in an appropriate format for rating or ranking

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- 3. Questionnaire Two. Have each member rate or rank the resulting items.

  4. Questionnaire Three.

- Present the results of Questionnaire Two in the form of Questionnaire Three, showing the preliminary level of group consensus to each item.

- Where the individual differs substantially from the group, and chooses to remain so on Questionnaire Three, the respondent should provide a brief reason or explanation.

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- 5. Questionnaire Four. The results of Questionnaire
- Three are presented in the form of Questionnaire Four, showing the new level of group consensus for each item and repeating the member's latest rating or ranking, along with a listing by item of the major reasons members had for dissent from the prevailing group position.
- Each member rates or ranks each item for the third and final time, in light of the emerging pattern of group consensus and the reasons for dissent.

  6. The results of Questionnaire Four are tabulated and presented as the final statement of group consensus.

Brooks (1979), are involved in using the Delphi Technique:

- 1. Identifying the panel of experts.
2. Determining the willingness of individuals to serve on the panel.
3. Gathering individual input on the specific issue and then compiling it into basic statements.
4. Analyzing data from the panel.
5. Compiling information on a new questionnaire and sending to each panel member for review.

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- 6. Analyzing the new input and returning to the panel members the distribution of the responses.

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    7. Asking each panel member to study the data and evaluate their own position based on the responses from the group.

- When individual responses vary significantly from that of the group norm, the individual is asked to provide a rationale for their differing viewpoint while limitations are placed on the length of the remarks in order to keep responses brief.

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    8. Analyzing the input, and sharing the minority supporting statements with the panel. Panel members are again asked to review their position and if not within a specified range, to justify the position with a brief statement.

Strengths.

- 1. The problem does not lend itself to precise analytical techniques but can benefit from subjective judgments on a collective basis.
2. The individuals needed to contribute to the examination of a broad or complex problem have no history of adequate communication and may represent diverse backgrounds with respect to experience and expertise.
3. More individuals are needed than can effectively interact in a face-to-face exchange.

- 4. Time and cost make frequent group meetings infeasible.
  5. The efficiency of face-to-face meetings can be increased by a supplemental group communication process.
  6. Disagreements among individuals are so severe or politically unpalatable that the communication process must be refereed and/or anonymity assured.
  7. The heterogeneity of the participants must be preserved to assure validity of the results, i.e., avoidance of domination by quantity or by strength of personality ("bandwagon effect"). (Linstone & Turoff, 1975)

Limitation

- Linstone and Turoff (1976) suggested that there are five common reasons for Delphi to fail:

  1. Imposing monitor views and preconceptions of a problem upon the respondent group by over specifying the structure of the Delphi and not allowing for contribution of other perspectives related to the problem.
  2. Assuming that Delphi can be a surrogate for all other human communications in a given situation.

- 3. Poor techniques of summarizing and presenting the group response and ensuring common interpretations of the evaluation scales utilized in the exercise.
  4. Ignoring and not exploring disagreement so that discouraged dissenters drop out and an artificial consensus is generated
  5. Understanding the demanding nature of a Delphi and the fact that the respondents should be recognized as consultants and properly compensated for their time if the Delphi is not an integral part of their job function.