Delphi - The Highest Qualitative Forecast Method

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Abstract

Forecasting can play an important role in the decision-making process. The paper emphasizes the role of the Delphi Method to forecast information in different domains (business, technology, science and social activities), the advantages and disadvantages of the method. Using a case study designed for forecasting the educational process in the Petroleum-Gas University, the paper presents the steps that must be followed to realise a Delphi forecast.

Key words: *Delphi Method, forecasting, experts group, rounds, questionnaire, qualitative research, topics, predictions*

Introduction

Forecasting is a systematic study of future and formulation of scientific statements on different variants of development; the subject of forecast can be presented as characteristics of development and changes. Forecasting can play an important role in the decision-making processes. The first role is to reduce the range of uncertainty management faces and the second is to broaden the range of options available to managers.

The forecasting methods can be divided into two categories: quantitative and qualitative. This division is based on the availability of historical time series data.

Quantitative forecasting methods are based on an analysis of historical data concerning the time series of different variable. These methods use statistical analysis of data from the past in various time aspects.

Qualitative methods sometimes called subjective, employ the judgment of experts to make a forecast. They can be applied in the case when historical data are not sufficient or are not available or when forecasted events cannot be described by quantifiable information. From a number of qualitative methods the most important is Delphi forecasting method.

The Concept and the Characteristics of Delphi Method

At the origins of the Delphi Method there lies an order given by US Air Force to draft a report of future technology. The original experiment involved a panel of experts to estimate the hypothetical Soviet attempt to USA's production capacity and its capacity to maintain a war effort [4].Project Delphi was the name given to a RAND Corporation study and was formed to

generate this prediction. The name comes from the Oracle of Delphi, in Greek mythology, who was supposed to have the power to predict the future.

Olaf Helmer and Norman Dalkey, scientists in RAND Corporation, were the first to develop the Delphi method; the objective of the original study was to obtain the most reliable consensus of experts by a series of questionnaires, with controlled opinion feedback.

This was necessary because the existing methods of forecasting were insufficient to generate the report they wanted and because historical data for this subject were unavailable. In such cases, when a reliable forecast must be issued by qualitative means, the Delphi Method is generally preferred.

The Delphi method is a structured technique used to generate forecasting in business, technology, science, education, health and other fields.

The traditional Delphi Method aims to identify a consensus from the experts, on the research problem under consideration. Delphi Method is essentially defined [1] as "a method for measuring consensus among group experts".

The method is a long-range forecasting method of aggregating the forecast of experts on multidisciplinary issues, it is an interactive process for soliciting and collating opinions on a particular topic, through a set of carefully designed sequential questionnaires with a summarized feedback of opinions derived from earlier responses [6].

It is recommended for problems that require qualitative answers rather than quantitative results. Therefore, Delphi is suitable to many situations requiring group's solutions to problems or prognoses about future events. Generally, Delphi Methods are also most useful when assembling groups of experts who would otherwise probably never come into contact.

The method was designed to encourage a true debate, independent of personalities. The results of Delphi procedures depend on the knowledge and cooperation of the experts and persons who are likely to contribute valuable ideas are essential to include.

Because the number of experts is usually small, Delphi Method does not produce statistically significant results; the results represent simply the synthesis of opinion of the experts group [3].

There are several advantages when using the Delphi Method, among which the most significant is versatility. Other advantages are as follows:

o   Rapid consensus;

o   Participant's possibility reside anywhere in the world;

o   Coverage of wide range of expertise;

o   Anonymity of participants helps prevent the halo effects when participants succumb to the opinions of a dominant personality;

o   Participants have the time to carefully consider outcomes and solutions.

However, the method has also some disadvantages:

o   Results are dependent on the quality of the participants;

o   The scientific nature of the method is sometimes questioned;

o   Results can be influenced by the researcher;

o   The top experts may be difficult to recruit.

Organization and Steps of Delphi Method – Case Study: Educational Process Forecast in Petroleum-Gas University Ploieşti

The essence of the Delphi Method is to use the assessment of opinions and predictions made by a number of experts; it is an interactive process used to collect and distil the judgement of experts using a series of questionnaires in a number of stages [5]. The Delphi Method comprises several steps involving participants, who may or may not meet face to face.

Further on we will present the steps of the Delphi Method (fig. 1) applied to realize a forecast of the educational process evolution in Petroleum-Gas University.
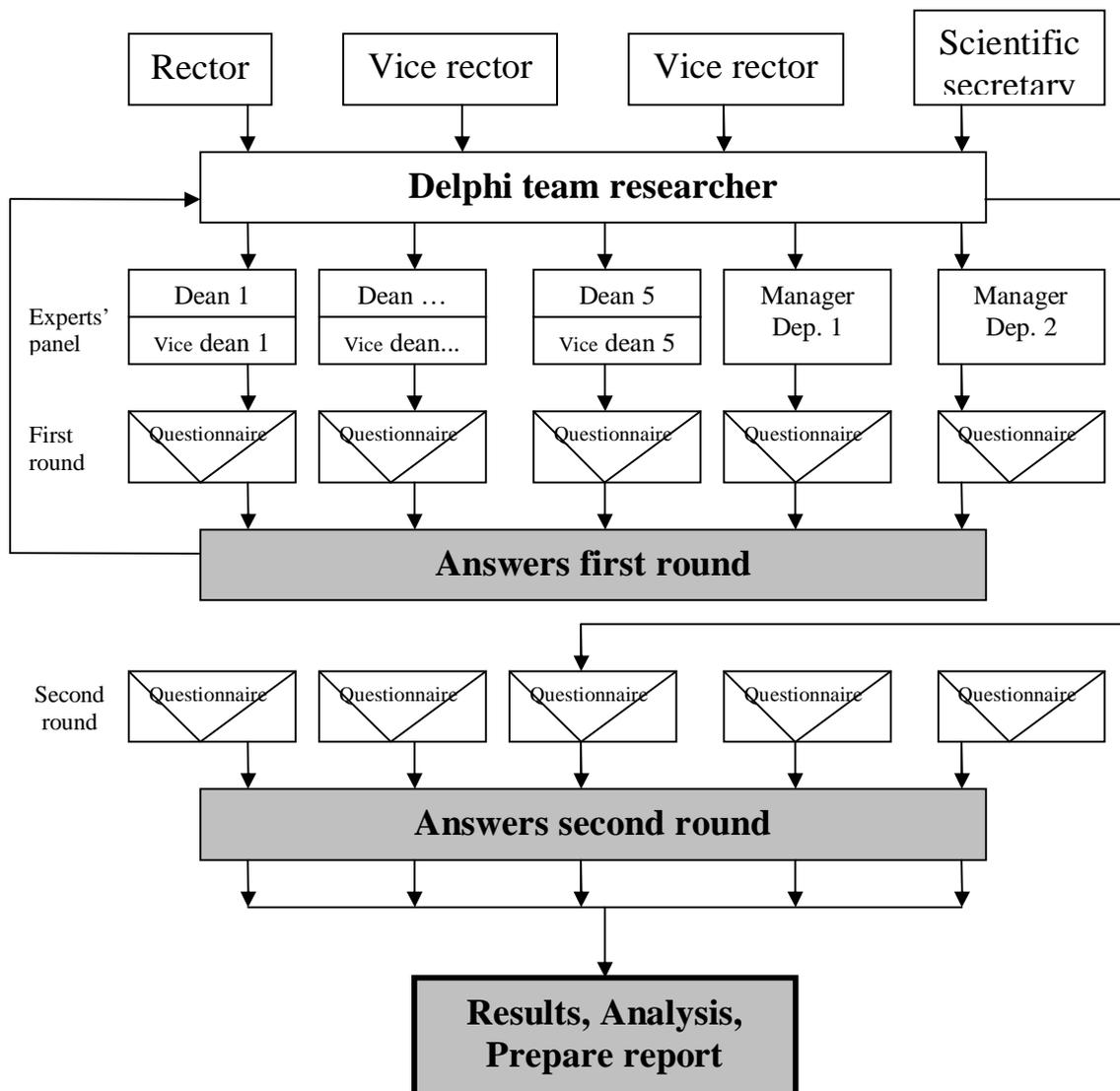

Fig. 1. The steps of Delphi Method

1.   Forming of a Delphi team to monitor the study (steering committee)

The team researchers organize the study in a very specific and thorough manner. They identify the problem for which some predictions are required, design the questionnaires, value the costs and select the experts. For our case study, we consider that the team researchers may be formed

by rector, vice rector for educational process, vice-rector for scientific research and the scientific secretary of the university.

2. Identifying the problem (the topic)

The Delphi team must identify the problem of the study; the easiest way to formulate it is to take the topics from the literature and the surveys that are available. However, the most creative way is to find working researchers who have the task to structure the field and formulate topics. Questions should be quite short and simple but too short questions may cause too many interpretation. In this study, we chose the second way, so our team generated the questionnaires. We suppose that will be two rounds and the questionnaire - that will be a simple one – will have eight questions:

Survey questionnaire

1. How do you appreciate the quality of the educational process in Petroleum-Gas University Ploiesti?
   a. Unsatisfying   ☐
   b. Satisfying   ☐
   c. Good   ☐
   d. Very good   ☐

2. In what way do you consider that the actual number of students of Petroleum-Gas University Ploiesti influence the quality of the educational process?
   a. Positive   ☐
   b. Negative   ☐
   c. It has no influence   ☐

3. How do you think the number of students will develop in Petroleum-Gas University Ploiesti in the next five years?
   a. It will be reduced less than 10%   ☐
   b. It will be reduced more than 10%   ☐
   c. It will stay constant   ☐
   d. It will rise less than 10%   ☐
   e. It will rise more than 10%   ☐

4. How do you appreciate the evolution of the number of students by faculties?
   1. Faculty of Petroleum Engineering   will rise☐   will decline☐
   2. Faculty of Mechanical and Electrical Engineering   will rise☐   will decline☐
   3. Faculty of Petroleum Refining and Petrochemistry   will rise☐   will decline☐
   4. Faculty of Letters and Science   will rise☐   will decline☐
   5. Faculty of Economic Sciences   will rise☐   will decline☐

5. Name two factors that will influence the most the evolution of the number of students in Petroleum-Gas University Ploiesti.
   a. Negative demographic trend   ☐
   b. The evolution of the quality of life   ☐
   c. School taxes evolution   ☐
   d. The Government financial policy concerning the education ☐
   e. Others (name)……………………………………………………. ☐

6. What would be the most important consequences if the number of students decreases?
   a. The quality of the educational process will grow   ☐

       b.   It will have a negative influence on financial situation of the university   ☐

       c.   It will be necessary a reshape of the university staff   ☐

7. Name two directions that might be taken into consideration by the university team managers to improve the quality of the educational process.
       a.   Improving the material base   ☐
       b.   Developing the scientific research   ☐
       c.   Reshaping the human resources   ☐
       d.   Improving the collaboration with other university (from inside or outside) ☐
       e.   Others (name)…………………………………………………………..   ☐

8. Specify two domains that must be more taken into consideration for the next few years.
       a.   Bachelor   ☐
       b.   Master   ☐
       c.   Doctoral studies   ☐
       d.   Scientific research   ☐
       e.   Other domains (specify)…………………………..   ☐

3. Selecting experts

One of the most important problems in Delphi forecasting is the selection of the experts; they must have specific knowledge on the subject and be prepared to get involved in this type of procedure. The number of experts must not be too small to make the assessment too narrowly based, nor too large to be difficult to coordinate. It also depends on the number of topics, the expected response or participation rate and other issues.

In our study, we consider that a number of twelve experts can provide a good base for the forecast. The twelve experts may be for instance:

- ▪ The five deans of the faculties;

- ▪ The five vice deans of the faculties

- ▪ The manager of Open and Distance Learning Department;

- ▪ The manager of Psycho-Pedagogy Department.

We choose these experts because each of them has at list ten years experience in the field of education.

4. Developing the first stage in Delphi forecasting

The questionnaires are distributed to each expert in order to fill them in; they are encouraged to draw upon their experience and use any historical data or other available information to answer the questions. The team researchers tabulate the responses and the issues raised are identified. The committee uses this information to develop more specific questions in a second questionnaire. To simplify the study, the second questionnaire will consist only in five questions, namely those questions to which the experts have answered by focusing on completely different issues.

Developing the second stage in Delphi forecasting

Each expert is informed on the results of the first stage, receives a second questionnaire and is asked to provide a new answer and to justify the different from the general tendency [2]. The experts return to the researchers' team their answers to the second questionnaire, along with any revision of their previous answers.

Finally, taking into consideration the expert's answers, the team of researchers draft the study report and present the conclusions regarding the perspectives for the educational process in Petroleum-Gas University.

Conclusion

The Delphi Method is a qualitative method for a flexible and an efficient research that forecasts those situations where historical data are not available or whenever there is incomplete knowledge about an issue. The method has a long tradition as a qualitative method and it is appropriate for future education studies.

The major advantage of the Delphi Method is that it allows the researchers to obtain an objective consensus of experts' judgment on the problem under study.

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Delphi - cea mai performantă metodă calitativă de previziune

Rezumat

Previziunea poate avea un rol foarte important în procesul de luare a deciziei. Articolul reliefează importanţa metodei Delphi pentru previzionare în diferite domenii (afaceri, tehnologic, ştiinţific şi social), avantajele şi dezavantajele acesteia. Pe baza unui studiu de caz realizat pentru previzionarea procesului educaţional în Universitatea de Petrol-Gaze Ploieşti, lucrarea prezintă paşii ce trebuie parcurşi în vederea realizării unei previziuni Delphi.