

THE REAL-TIME DELPHI METHOD

By

Theodore J. Gordon

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I. HISTORY OF THE METHOD

As described in a previous chapter, the Delphi technique was developed at RAND, the Santa Monica, California, "think tank" in the early 1960s by Olaf Helmer, Nicholas Rescher, Norman Dalkey, and others¹. Its philosophical base was described by Helmer and Rescher (1959). Literally thousands, perhaps tens of thousands, of studies requiring the elicitation and synthesis of expert judgments using this method have been conducted over the past decades since its introduction. In September of 2008, a review was made of the Scopus data base, which includes articles from 15,000 peer-reviewed professional journals from 4,000 publishers, proceedings papers, and trade publications; 105 papers and presentations were identified as having been published in 2008 in response to the search terms "Delphi study."

But conventional Delphi studies have always taken a long time to complete (on the order of months) and have been expensive: a single round can easily require three weeks; a three-round Delphi is at least a three- to four-month affair, including preparation and analysis time. Real Time Delphi is a faster, less expensive system based on the Delphi principles of feedback of prior responses of the participating group and guarantees of anonymity of the respondents. For example, Landeta and his colleagues (2008) say:

One of the main disadvantages of the Delphi method is that the period of time taken by the research may be excessively long. One should bear in mind that the intervals of time elapsing between the replies of the different experts for each round and the times elapsing between one round and the next, used for the study and analysis of the information supplied by the panel members and the preparation of the following questionnaire, could distort the research and dishearten the groups taking part. Our experience in other studies has vouched for this.

While Delphi had its birth in concern about spurious factors that intrude in face-to-face meetings among experts, new technology can minimize some of these factors. Some Delphi-like studies have been performed on-line (Shota, 1993) and applications date back to the 1970's when Murray Turoff experimented with early computer-based communications to link experts together in networks. (Turoff, 1972). Recently he and his colleagues have described a Social Decision Support System in which large groups of people (thousands) interact and vote dynamically (can change votes as in Delphi) on social issues. (Turoff, Hiltz, Cho, Li, and Wang, 2002)

Several recent studies have used on-line questionnaires to reduce communication delays and burdens. These studies have substituted the communications tools available via the Internet for the old paper forms that were transmitted by fax, postal mail, or more recently e-mail, Nevertheless, the studies still employed sequential questionnaires and preserved the Delphi principles of anonymity and feedback,

In Finland, futurists Hannu Linturi—the key person behind eDelfoi software—Osmo Kuusi and Jari Kaivo-oja met in 1996. They discussed the possibility of using the World Wide Web in Delphi processes so that changes of judgments and comments could be collected anonymously

¹ The author had the good fortune to be able to contribute to the first RAND external Delphi: Gordon, T. and Olaf Helmer, Report on a Long Range Forecasting Study, RAND, September, 1964

during the same round. In 1998, a software package called Professional Delphi Scan was used, and in 2008 the third generation of the software was developed, now called eDelfoi. According to its developers, about 300 exercises have been carried out using the different versions of the software and about 30 Finnish organizations have licensed it, including the Finnish Futures Research Centre. The Finnish language is used in most applications of the software and the applications have been poorly reported on the international level.

An international pilot study using the Professional Delphi Scan was made in 1998. The study concerned the future of education and panelists were from Finland and the United Kingdom. An early study, which was comparatively extensively reported also on the international level, concerned the features of futures-related weak signals. More information about eDelfoi is on <http://www.edelfoi.fi>. (Also see Kuusi, et al., 2000)

In September, 2004, the Defense Advanced Research Projects Agency (DARPA) awarded a Small Business Innovation Research grant to Articulate Software, Inc. to develop a Delphi-based method for improving the speed and efficiency of collecting judgments in tactical situations where rapid decisions are called for. The grant was based on a decision-making problem: a hypothetical decision maker, uncertain about tactics that might be followed in accomplishing a specific objective, calls on a number of experts to provide their judgments about values of the alternative approaches. Delphi was specified in the grant as the method to be employed. The objective was to improve the speed of the process, to real time if possible (hence the name: Real Time Delphi). The number of participants representing different areas of expertise was assumed to be small, perhaps 10-15 people.

The Real Time Delphi design that emerged is particularly applicable in this situation: synchronous or asynchronous participation, a small number of participants, rapid completion required, but can be used when the number of participants is greater, and more time is available. It offers speed, efficiency, transparency to the study administrators, and flexibility to the participants.

Since its introduction in 2006 the Millennium Project has used the method extensively. Applications have included:

- Decision models:
 - Real Time Decision Making. (DARPA)
 - Choosing a Configuration. (auto mfg)
- Priority studies:
 - Assessing Priorities of Proposed Millennium Project Study Topics, 2006
 - Assessing Priorities of Proposed Millennium Project Study Topics. 2007
 - Assessing Priorities of Proposed Millennium Project Study Topics. 2008
- SOFI studies:
 - Variables for the Global State of the Future Index
 - Variables for the Republic of Korea State of the Future Index
 - Variables for the South Africa Global State of the Future Index

- Substantive studies:
 - Future education and learning possibilities
 - Future energy developments
- Studies in support of UNESCO:
 - Judgments on acceptability of a Delphi process.
 - Scenario Drivers.
 - Report construction
- Resource allocation (World Bank subcontractor)
 - Performance
 - Biodiversity
 - Climate Change

II. DESCRIPTION OF THE METHOD

Imagine a Delphi-like study involving a set of numerical questions, for example “What is the priority of a proposed research project?” When each respondent joins the on-going study, he or she is presented an on-screen form that contains for each potential research project:

1. A space for a respondent to provide his or her numerical estimate of the priority of each item on a Linkert-like scale
2. The average of all of the responses of the group so far
3. The number of responses made so far
4. A window that shows reasons that others have given for their responses
5. And finally, a window that provides a place for respondents to type in the thinking behind their own answers.

In considering his or her answer to each question the respondent may refer to the reasons others have given (4). Considering this information, the respondent provides a numerical input (1) on the priority and instructs the computer to “save” the answer. The group average or median (2) is updated immediately and presented back to the respondent and anyone else who has signed on along with the number of people who have contributed to the group response (3).

If the respondent’s numerical answer is beyond a pre-specified distance from the average or the median, an attention-getting indicator may be used to flag the question for the respondent. When the flag is “up” the respondent is asked to give reasons for their response (item 5 above) which, when saved, become an entry in the “reasons window” and is seen later when anyone opens that window (item 4 above).

There is no explicit second round. When the respondent comes back to the study in a minute or a day, the original input form is presented to him or her. Of course, by then others may have contributed judgments, the averages or medians may have changed and other questions may be flagged since the group response may have changed sufficiently to move the respondent’s

previous answers outside of the pre-specified distance from the average or the median since the last time the input page was viewed.

In this way the Delphi requirements of anonymity and feedback are met and the process, once underway, yields the distribution of the group's responses and reasons for the extreme positions. The process can be synchronous or asynchronous, and if implemented on an Internet site, can involve a worldwide panel. The administrator can publish a cutoff time (an hour, a day, a week, or a month away) and encourage participants to visit the site often before that time. There will be no "stuffing of the ballot box" since each participant has only one form - their original form - that is always brought back when the participant revisits.

The method has been employed in the following settings by the Millennium Project:

- Small groups operating synchronously in a conference room with laptop computers connected wirelessly with anticipated completion of the exercise in, say, 20 minutes.
- Participating individually from remote locations in scheduled on-line sessions designed to help evaluate policy options for a decision maker in, say, 20 minutes.
- Larger groups participating asynchronously from remote locations at convenient times over a somewhat longer period, in some cases over weeks or months.

To see and participate in a Real Time Delphi study that is open to the public, go to www.realtimedelphi.org and use the code "automobiles." Your responses are invited.

There is another example of an on-line expert system which should be mentioned. TechCast is an online service that uses a standing pool of participants to forecast the emergence of future technologies.² They self-rate their expertise and can, as in other Delphis and Real Time Delphis, elect to omit any questions about which they feel unqualified. The activity is continuous and thus provides not only a set of technological forecasts at any point in time but also serves as a scanning system. It presents its data with excellent graphics for easy comprehension.

² See: <http://www.techcast.org/>

III. How to Do It

The key to a successful Delphi study lies in the selection of participants; this is also the key in Real Time Delphi since the results of a Delphi depend on the knowledge and cooperation of the panelists. In a statistically based study, such as a public opinion poll, participants are assumed to be representative of a larger population; in Delphi, non-representative, knowledgeable persons are needed. Potential participants are identified in the same way as the more usual Delphi studies: through literature searches for who has published on the subject under study, through recommendations from institutions (e.g., The World Future Society) and other experts in a process known as "daisy chaining."

In general there are two approaches: one can build the required software and data bases or one can team with an organization that has already built the required systems and will supply the formats and help execute the study.

For self-builders, the original programs developed under the DARPA contract are open-source and are available on SourceForge (<http://sourceforge.net>): search under the term "Delphi Blue."

Two examples of self-built Real Time Delphi studies are:

- 1) Zipfinger, Sabine, *Computer Aided Delphi, An Experimental Study of Comparing Round-Based with Real-Time Implementation of the Method*, Trauner, 01/01/2007. The author says:

Delphi was originally done as iterative approach. A newer variant called Realtime Delphi requires computer assistance instead of paper and pencil and is done roundless. Although the computer era encourages a realtime implementation, the original round structure is adopted in most computer-aided Delphi studies.

The goal of the experimental study was to find out, if Realtime Delphi should be preferred to round-based online Delphi. Therefore, two online Delphi studies, one of them done realtime while the other one used the common round structure, were implemented in parallel. After closing both studies their performance and results were compared.

Because the topic of both Delphi studies was the Delphi method itself, the precondition to take part as an expert was experience in using the method. The questions concerned different statements about special details and the implementation of Delphi. The anonymous answers and comments of experts from all around the world are quite interesting and provide useful information for the design and implementation of further Delphi studies.

- 2) Fraunhofer Institute for System and Innovation Research (ISI) conducted a Real Time Delphi study on the future of logistics. At the opening ceremony for an industry conference on logistics and supply chain management in May, 2008, Prof. Dr. Christopher Jahns, Executive Director, Supply Management Institute, described the planned study as follows:

... we have now launched an interesting new initiative, never before seen at the international level in the logistics industry: a so-called Real Time Delphi survey of expert opinion. None of us can look into the future. But if the expertise of many individuals is bundled and statistically analysed, the result is a clear and remarkably reliable picture of the future of logistics in 2025.

The system employed by the Millennium Project uses HTML, PHP and SQL codes and is located on an Internet server. (Development was carried out using Dreamweaver on a local computer.) The system employs a generic form of the questionnaire that is used in all studies. It is molded into specific forms that support particular studies through the use of three other forms: a specifications loader that contains information such as the number of rows and columns and the study's completion date, a question loader that lists the questions and references that are specific to the questions, and a master that specifies information such as the administrator's code (for security), and the logo to be employed.

The features that are built into the Millennium Project implementation are:

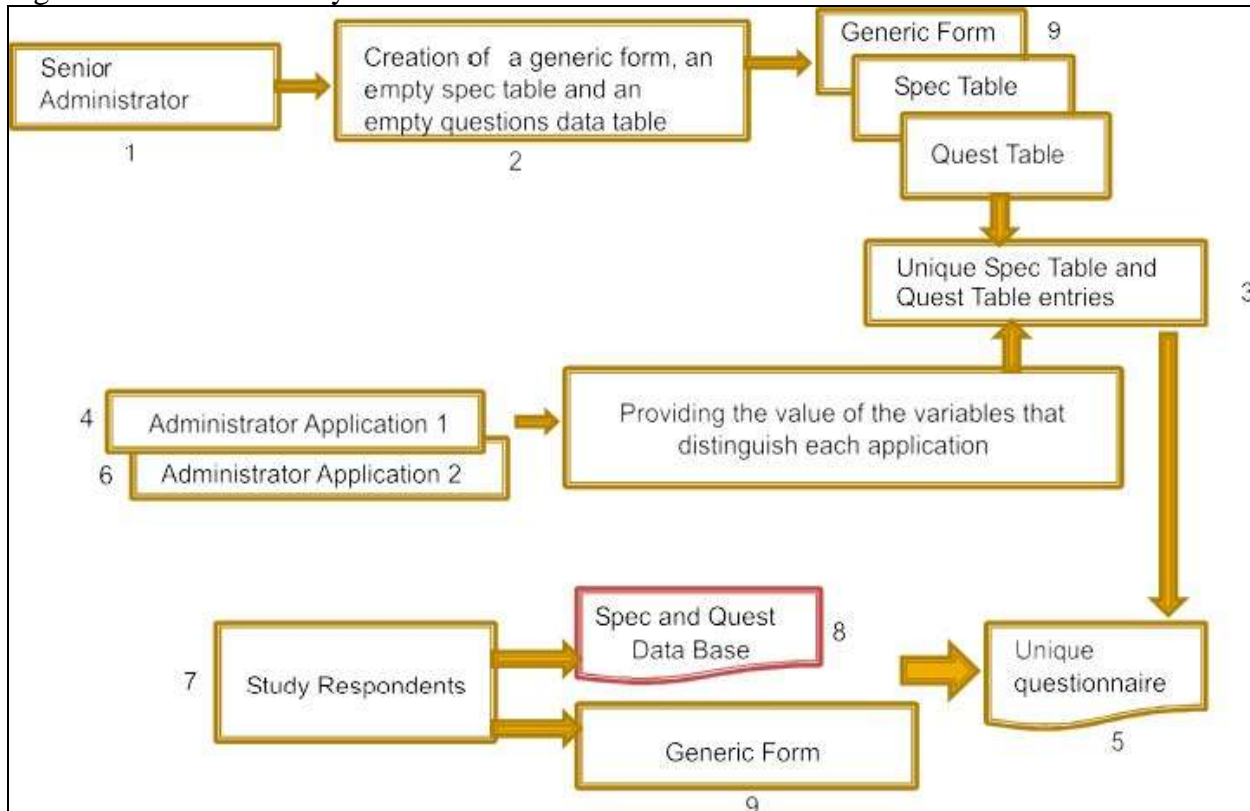
- There is only one round; no explicit second round is necessary as in a conventional Delphi.
- When a respondent revisits the study in a minute or a day, the original input form is presented with their prior answers in place and the new average or median of the group, and, if desired, the distribution of responses.
- By then others may have contributed judgments, so the averages or medians may have changed since the original answers were provided.
- If an answer is beyond a pre-specified distance from the average, an indicator “flag” can be used to show the respondents the questions in which their answers differ significantly from the group.
- When the flag is “up” reasons become particularly important.
- The respondents are not shown the group average until after they have inserted an answer and a selected number of responses have been received or a given time has elapsed since the study has started.
- The answers can be submitted cell by cell or as an entire document.
- To avoid crowding, the reasons can be submitted and appear on a separate page.
- A notation appears after the respondent has submitted an answer, indicating that the response has been received and entered into the database.
- Notations also appear if individual responses are outside of predetermined plausible ranges.
- Extensive hyperlink reference material can be included to permit the respondents to retrieve data on-line while completing the questionnaire.
- Reference material is included directly on the questionnaire.
- Split samples can be used to reduce the effect of bias introduced by question placement on the questionnaire.
- A permanent record is maintained of responses including both quantitative and narrative responses.

The actual implementation at the Millennium Project is illustrated in Figure 1.

A Senior Administrator (1) is responsible for creating (2) a generic form composed of PHP, HTML, and SQL code (9). Administrators for each application (4) (6) specify the unique values of the variables that define their application, such as the number of questions, the number of columns to be used in the form, and the completion date. These are entered into the spec data table and the questions table (3). These attributes are used by the server to create the form (5)

that will be seen by the respondents. When an application is fielded, the respondents (7) provide a security code appropriate to their study (previously supplied by their study's administrator (4) or (6) and a unique questionnaire (5) is presented to them, having been assembled on the generic form (9) from the information in the spec and questions data table (3).

Figure 1. Illustration of System Flow



In practice, the number of variables defined in the spec data table (3) is essentially unlimited but usually is 50 or more. The number of applications simultaneously contained in the spec table is also essentially unlimited. The number of respondents to any given study is limited only by the rate at which the server can accept parallel entries and in practice can be in the thousands.

While this sketch describes a poll type questionnaire, it is also applicable to any situation in which a common generic form is adapted for use across multiple applications. Further, in some applications, multiple spec data tables can be used. The questions themselves also reside in a separate table and are assembled into the form in the same manner as the specifications.

Application types include:

- Collection of judgments about when certain developments might occur, their importance, and impacts and reasons for extreme opinions
- Choosing from among alternative decisions based on clear-cut criteria which may be made by the participants themselves or chosen by the researcher
- Providing information for and sharpening of scenarios

- Input/output and cross impact matrixes
- Environmental monitoring

Several analysis programs have also been written; these extract data stored on the SQL data bases and include:

- Average, median, standard deviation
- Distribution of opinions
- Summaries by region, occupation, gender
- Correlation of qualitative responses with quantitative responses (e.g. “those who answered with a low estimate, had these reasons...”)

IV STRENGTHS AND WEAKNESSES

The central weakness of Real Time Delphi is its failure to attract most of its respondents back for re-estimation. The rate of return in Real Time Delphi revisits has run about 25-50%. Depending on the design and the amount of cajoling, ordinary Delphi studies run higher than this, although differences among studies make it difficult to arrive at some standard panel persistence number. The low revisit rate of Real Time Delphi participants tempts one to say that the feedback principle of Delphi is being violated, but even first timers see the averages and reasons of those who have preceded them in the study, so the carrying of group response to all is still maintained. However, it would certainly be preferable if all participants revisited the study to update their inputs in view of what others have said. To overcome this weakness, at least partially, administrators have sent out reminder emails during the study and these have been found to be at least partially successful.³

In Finland, where eDelphi has been in extensive use, problems of participation have also been observed. Besides the participation, another difficult problem has been how to motivate experts in serious argumentation. Now a common practice in Finland is that before an eDelphi is run 5 to 10 key experts are interviewed either face-to-face or using telephone. During these interviews personal opinions are evoked concerning most important issues concerning the theme of the study. This seems to motivate experts to contribute serious argumentation in the Real Time Delphi stage. Besides, the interviews give hints about issues/questions that are especially important to discuss during the study. This approach makes it possible to start discussions concerning most relevant themes in which opinions of experts differ. Because the interviews are made by Delphi managers, the anonymity requirement is met.

In Finland, another way to promote active participation and especially fruitful argumentation has been to organize "hot periods" of one or two hours during the Delphi process. In those periods, most experts are present for commenting and changing their judgments. When experts see that

³ One reviewer of this paper said “It may be premature to call the failure to attract most of the respondents for re-estimation a serious weakness or a central weakness. Could you test this belief by running the Delphi as described, but sort out the respondents (who do not revisit)? You could then also run an experiment along the line that Dalkey did, with historic events and compare the dropouts with the re-estimators I think this is an important question because I am finding that more and more people are running single-pass Delphis.”

their contributions have immediate impacts on the judgments of others and result in numerous comments, it motivates them to give their best to the Real Time Delphi process.

Strengths of the systems include: speed, flexibility, lower costs, and centralization of a data bank of questions and responses.

V. FRONTIERS OF THE METHOD

To date, the method has been applied to questions about the future, resource allocations, study designs, effective policies, and decisions- a wide variety to be sure, but other applications appear attractive and promising. These include:

Cross-impact matrices, in which respondents would be asked to provide initial probabilities of the events and to complete the matrix by providing conditional probabilities (if one event occurs how will the probability of the other event at the intersection be affected?). This is similar to an input/output application.

Judgments about the value and impacts of exogenous variables to be used in systems or econometric models.

Construction of scenarios, as the first illustration below begins to show.

VI. SAMPLES OF APPLICATIONS

Three applications will be presented here: an illustration drawn from the DARPA contract mentioned earlier, a current Millennium Project application dealing with the future status of women, and, briefly, the Finnish usage mentioned in the history.

The first application called for a decision-making application; when signing on, the participant was given the following instructions:

This software allows a group to score potential decisions by comparing them to a set of criteria to help identify the best decision among those that are being considered.

In the process of completing this assessment you will be asked to:

- Consider alternative decisions that have already been suggested and to add others of your own if you wish
- Review the list of selection criteria and their weights, to add or delete criteria and to change weights if that seems appropriate.
- Provide judgments about how each alternative decision meets each criterion, in full consideration of the emerging judgment of the group and justifications that have been provided by others.

Consensus is not a requirement, but users should think carefully when their weights or criteria are very different than that of the group as a whole.

Please plan to have several sessions with the project so that you will be able to see how the analysis has evolved. The other participants will be contributing their judgments every day; these inputs will include new candidate decisions and criteria. When you revisit you will have a chance then to update your inputs if you wish. We suggest you plan to revisit the site once a day over the next three or four days.

In the pages that follow you will first see a statement of the problem. Then you will see some solutions to the problem that have been proposed and the selection criteria that are presently under consideration. You will also see how others have weighted the criteria and judged the candidate decisions. You will be asked to provide your views and throughout you should freely express your opinions since we rely on your experience.

All of your answers will be displayed to you so that you may revise them before you submit them. When you are satisfied, please click the "save" button. Then your answers will be merged with existing answers and made available to the group.

When you revisit the site, even five minutes later, you will be able to see the group's responses updated with new entries including yours. You will be shown a copy of your prior answers and asked to reconsider them in view of the group's responses.

Most of your answers can be entered by checking a box, but a few questions call for you to type in an answer. Please keep your responses short- others will see it in the form you provide. Omit any questions you wish. All of your answers will be anonymous although your name will be listed as a participant.

Then a statement of the hypothetical problem was presented:

Project Description

This is a hypothetical scenario:

A year ago a single person acting alone triggered a major epidemic by releasing a bio-toxin in a downtown crowd in an Asian city. The death toll attributed to the insane act was almost 500,000 people worldwide, before the epidemic was quelled. At first, there were cries for retribution against suspected terrorists, but clearly there were no “masterminds” or even other terrorists involved. This person engineered his bio-weapon in his own laboratory and believing he was an “Agent of God” (AOG) doing God’s work. In his suicidal act, he had hoped for an even bigger kill. Psychologists, analyzing his background found that he believed the world impure and found the future bleak. His concerns were inequities, poverty, and hypocrisies. He believed he had to remove hypocrites and non believers. There is fear that a terrorist organization will learn from the AOG and his techniques will spread.

Now there is to be a coordinated world conference of experts who will seek to find ways to prevent a recurrence at perhaps even greater scale. The US representative to the conference is soliciting expert judgments to guide his recommendations. The funding is essentially unlimited, all nations have pledged support. The question is what to do?

You, as an expert have been asked to provide advice through this online tool which is an approach to the automated collection of judgments of experts for use in decision making.

The analysis technique built into the process was a utility matrix in which alternate actions were compared on the basis of the degree to which each was seen to meet a previously stated criterion. The alternative strategies included at the initiation of the study were:

- Governments modify school curricula to remove cultural biases
- The world implements a vastly improved disease early warning system
- UN sponsors vigorous anti-terrorist campaign among religious leaders
- Governments build redundancy into societal and technical infrastructure
- Governments establish dialogs with dissidents
- The UN employs advanced detection systems for all of its WMD on-site inspections
- Systematically alter policy to defuse terrorist recruitment

And the criteria were:

- The decision is not likely to have serious negative consequences
- The decision is likely to be effective
- The decision can be implemented quickly
- The decision is plausible
- The decision is likely to provide useful feedback to alter future strategy
- The decision has reasonable cost

The questionnaire was in the form of a matrix (alternative strategies vs. criteria) and the respondents were asked to fill in the matrix with judgments about the weights of each criterion and the degree to which each alternative strategy met each criterion. The instructions read as follows:

This matrix presents the average of all users' judgments so far and offers you the opportunity to provide or change yours. The rows specify candidate decisions; the columns specify the criteria with which the excellence of a decision can be judged.

Each cell in this matrix has the following information

AVG. = the average response so far

Responses = the number of responses so far

Reasons (Click on this to see a list of reasons given by the panel for prior responses)

Input (This shows your previous input and the **pull down menus** allow you to change your input)

Justify (Click on this to add reasons for your answers)

1. Please provide or change your inputs using these drop-down menu scales:

For criterion weights:

10 = absolutely essential in any rational decision

5 = moderately important

1 = contradicts the decision, may be counterproductive

0 = suggest deletion

For each cell to specify how well a candidate decision in a row is seen to fit a criterion in the column:

10 = fits this criterion exactly.

5 = fits this criterion modestly well.

1 = does not fit this criterion at all.

0 = suggest deletion

“No comment” is also an acceptable drop-down menu choice.

2. If a cell has a shaded background, your responses are significantly different from the group's. We invite you to consider these cells carefully.

3. You may also add new criteria and candidate decisions.

To add a new [candidate decision click here](#)

To add a new [criterion click here](#)

A portion of the matrix into which judgments could be entered appears below. Some cells are darkened to draw attention to questions in which the respondent's answers differ considerably from the group average. The underlined text indicates a hyperlink.⁴

⁴ Note that the numbers in this chart are randomized input, not the result of a real study, and are used for illustration only.

	<i>The decision is not likely to have serious negative consequences</i>	<i>The decision is likely to be effective</i>	<i>The decision can be implemented quickly</i>	<i>The proposed decision is plausible</i>	<i>The decision is likely to provide useful feedback to alter future strategy</i>	<i>The decision has reasonable cost</i>
Weights ----> Policies ↓	Avg.: 4 Responses: 5 <u>Reasons.</u> Input 4 <u>Justify</u>	Avg.: 6 Responses: 5 <u>Reasons.</u> Input 5 <u>Justify</u>	Avg.: 7 Responses: 5 <u>Reasons.</u> Input 6 <u>Justify</u>	Avg.: 8 Responses: 5 <u>Reasons.</u> Input 7 <u>Justify</u>	Avg.: 3 Responses: 5 <u>Reasons.</u> Input 4 <u>Justify</u>	Avg.: 6 Responses: 5 <u>Reasons.</u> Input 5 <u>Justify</u>
Governments modify school curricula to remove cultural biases	Avg.: 10 Responses: 5 <u>Reasons.</u> Input 10 <u>Justify</u>	Avg.: 6 Responses: 5 <u>Reasons.</u> Input 1 <u>Justify</u>	Avg.: 4 Responses: 5 <u>Reasons.</u> Input 6 <u>Justify</u>	Avg.: 5 Responses: 5 <u>Reasons.</u> Input 4 <u>Justify</u>	Avg.: 9 Responses: 5 <u>Reasons.</u> Input 8 <u>Justify</u>	Avg.: 9 Responses: 5 <u>Reasons.</u> Input 10 <u>Justify</u>
The world implements a vastly improved disease early warning system	Avg.: 2 Responses: 5 <u>Reasons.</u> Input 1 <u>Justify</u>	Avg.: 3 Responses: 5 <u>Reasons.</u> Input 2 <u>Justify</u>	Avg.: 1 Responses: 5 <u>Reasons.</u> Input 2 <u>Justify</u>	Avg.: 5 Responses: 5 <u>Reasons.</u> Input 7 <u>Justify</u>	Avg.: 9 Responses: 5 <u>Reasons.</u> Input 8 <u>Justify</u>	Avg.: 2 Responses: 5 <u>Reasons.</u> Input 1 <u>Justify</u>
UN sponsors vigorous anti-terrorist campaign among religious leaders	Avg.: 6 Responses: 5 <u>Reasons.</u> Input 6 <u>Justify</u>	Avg.: 7 Responses: 5 <u>Reasons.</u> Input 7 <u>Justify</u>	Avg.: 4 Responses: 5 <u>Reasons.</u> Input 4 <u>Justify</u>	Avg.: 6 Responses: 5 <u>Reasons.</u> Input 6 <u>Justify</u>	Avg.: 9 Responses: 5 <u>Reasons.</u> Input 9 <u>Justify</u>	Avg.: 6 Responses: 5 <u>Reasons.</u> Input 1 <u>Justify</u>
Governments build redundancy into societal and technical infrastructure	Avg.: 8 Responses: 5 <u>Reasons.</u> Input 9 <u>Justify</u>	Avg.: 9 Responses: 5 <u>Reasons.</u> Input 10 <u>Justify</u>	Avg.: 3 Responses: 5 <u>Reasons.</u> Input 4 <u>Justify</u>	Avg.: 9 Responses: 5 <u>Reasons.</u> Input 10 <u>Justify</u>	Avg.: 4 Responses: 5 <u>Reasons.</u> Input 5 <u>Justify</u>	Avg.: 9 Responses: 5 <u>Reasons.</u> Input 10 <u>Justify</u>
Governments establish dialogs with dissidents	Avg.: 5 Responses: 5 <u>Reasons.</u> Input 4 <u>Justify</u>	Avg.: 1 Responses: 5 <u>Reasons.</u> Input 2 <u>Justify</u>	Avg.: 5 Responses: 5 <u>Reasons.</u> Input 7 <u>Justify</u>	Avg.: 7 Responses: 5 <u>Reasons.</u> Input 6 <u>Justify</u>	Avg.: 4 Responses: 5 <u>Reasons.</u> Input 2 <u>Justify</u>	Avg.: 2 Responses: 5 <u>Reasons.</u> Input 3 <u>Justify</u>

In this implementation, the respondents’ inputs in each cell were accommodated using a drop-down menu that ranged from 1 to 10 and included a “no comment” possible response.

The computation is automatically performed, and a respondent is presented with two rank order listings of the highest scoring alternatives, one based on the group averages and the other based on the respondent’s inputs. This comparison is another source of information that may lead the respondent to revise their inputs.

Scores of proposed decisions so far:		
Candidate Decisions	Group Score	Your Score
Governments build redundancy into societal and technical infrastructure	245	250
Governments modify school curricula to remove bias	219	191
UN sponsors vigorous anti terrorist campaign among religious leaders	205	166
Governments establish dialogs with dissidents	141	133
The world implements a vastly improved disease early warning system	112	112

These scores are computed as weighted sums:

$$\text{Score } y = \text{Sum } [Wt(x) \times \text{cell}(x, y)]$$

Where Score y is the score of alternative y , $Wt(x)$ is the weight accorded criterion x , and $\text{cell}(x, y)$ is the judgment in the cell that depicts how well alternative y meets criterion x .

The study is left on line until sufficient data have been collected. Sufficiency is defined by the administrator and is likely to be based on the number of responses received, the spread in judgments, and the richness of the reasons furnished by the respondents.

The second application is the Millennium Project's study for Millennia 2015 on the future of some selected issues related to the status of women. Here is the instruction page:

Introduction

Gender equality and advancement of women is addressed by the Commission on the Status of Women of ECOSOC, and dozens of other governmental and non-governmental organizations. Nevertheless, disparities continue worldwide, from the glass-ceiling in the nations claiming equality principles, to more stringent issues as unequal access to education, health care and decisionmaking positions in many cultures and world regions. This Real Time Delphi aims to identify *long term* gender-sensitive issues that are not yet sufficiently addressed or resolved, those that are emerging or might grow in importance in the next two decades, as well as policies, strategies, challenges and barriers to improving the status of women worldwide and in specific regions or cultures, and the organizations that exist or should be established to address them. The results will contribute to building a foresight diagnosis about that question. They will be presented and discussed within the research process of Millennia 2015 international conference about "Women actors of development for the global challenges" (www.millennia2015.org). They should also provide policy makers at international and national levels as well as of the private sector and NGOs with an array of policy suggestions and strategies of global and local significance for improving gender equity. This study is designed to collect judgments about the answers to a list of questions. You may omit any questions you wish and you do not have to complete this list of questions in one visit. When you return to the questionnaire you will see your previous answers and may add to them or change them if you wish. You are encouraged to return to this list of questions often, but please plan to complete your input before 2008-12-15.

Focus

The issues we review in this questionnaire are global, plausible, and important to the future of women and society as a whole.

Your answers will remain anonymous although your name will be listed as a participant. Please answer only those questions about which you feel comfortable. Leaving sections blank is acceptable.

The List of Questions

In the questionnaire below, you will find a list of developments that might affect the status of women in the future and some variables that might be used to measure the status of women in society. Please respond to those questions you feel comfortable with, for each addressing their probability and consequences. You may leave any of the questions unanswered, if you wish. When you return to the study at a later time, you will be able to change or edit your prior answers, as well as add others. In all cases the time horizon is the next 10 years and the geographic scope is global. Please use the REASONS page to provide reasons behind your answers and to provide any comments on the item.

You can also submit additional text on a separate page; just press the "SUGGESTIONS" button at the bottom of the list.

Each cell in the table below has several entries:

- 1) A place for you to enter your response to the question. Please enter a number; if the number you enter is outside the given limits, it will be rejected and a red message will appear asking you to reenter a number that is between the stated limits.
- 2) The current group average of responses. This will appear after you have entered your estimate and after a specified number of responses have been received.
- 3) The number of responses received so far.

The line "[Reasons click here](#)" appears at the bottom of each cell. This takes you to a new page where you will be asked for the reasons behind your answers. Please read the comments that others have submitted and respond if you wish. When you return you can change your inputs based on the comments.

There are two ways to enter your answers on this page. **1) You may enter your answers one at a time by pressing the "go" button in each cell or 2) you may press the "SUBMIT THIS PAGE" button at the bottom of the form** to enter your answers all at once. In either case, your answers will be entered immediately, and the form will return to your screen. The form will contain your answers, and the group's answers will have been updated to include your estimate. You may change your answers if you wish.

Finally

At the bottom of this page you will also find a link to a new page where you may submit comments, suggestions, and additions. Please follow this link; your inputs are important. Please enter any comments you might have about the process on the COMMENTS page.

Please return to the questionnaire often. When you come back you will see how the group's answers have evolved.

And the questionnaire itself appeared as follows:

	Developments and Variables	Question 1	Question 2	Question 3
1	<p>Development: National and international regulations requiring that all policies concerning important issues be gender sensitive.</p> <p><i>Développement: Règlements nationales et internationales impliquant que toutes les politiques publiques relatives à des enjeux importants intègrent la question des genres.</i></p> <p>Click here to see references</p>	<p>WHAT IS THE PROBABILITY OF THIS DEVELOPMENT BY 2018? (100= CERTAIN)..... QUELLE EST LA PROBABILITÉ DE CE DÉVELOPPEMENT D'ICI À 2018? (100 = CERTITUDE)</p> <p><input type="text"/></p> <p>Average=</p> <p>Reasons click here</p> <p><u>Submit only this cell</u></p>	<p>WHAT IS THE RELATIVE IMPACT OF THIS DEVELOPMENT BY 2018 (10= HUGE; 1=NONE)..... QUEL EST L'IMPACT RELATIF DE CE DÉVELOPPEMENT D'ICI À 2018 ?(10= CONSIDÉRABLE)</p> <p><input type="text"/></p> <p>Average=</p> <p>Reasons click here</p> <p><u>Submit only this cell</u></p>	<p>WHAT IS THE BACKFIRE POTENTIAL? (10= HUGE; 1= NONE).....QUEL EST L'IMPACT RELATIF DE CE DÉVELOPPEMENT D'ICI À 2018 ?(10= CONSIDÉRABLE)</p> <p><input type="text"/></p> <p>Average=</p> <p>Reasons click here</p> <p><u>Submit only this cell</u></p>
2	<p>Development: Most important social and economic indicators for essentially every country and the world as a whole are gender-disaggregated.</p> <p><i>Développement: La plupart des indicateurs sociaux et économiques importants pour la plupart des pays et pour le monde en général dissocient les genres.</i></p> <p>Click here to see references</p>	<p>WHAT IS THE PROBABILITY OF THIS DEVELOPMENT BY 2018? (100= CERTAIN)..... QUELLE EST LA PROBABILITÉ DE CE DÉVELOPPEMENT D'ICI À 2018? (100 = CERTITUDE)</p> <p><input type="text"/></p> <p>Average=</p> <p>Reasons click here</p> <p><u>Submit only this cell</u></p>	<p>WHAT IS THE RELATIVE IMPACT OF THIS DEVELOPMENT BY 2018 (10= HUGE; 1=NONE)..... QUEL EST L'IMPACT RELATIF DE CE DÉVELOPPEMENT D'ICI À 2018 ?(10= CONSIDÉRABLE)</p> <p><input type="text"/></p> <p>Average=</p> <p>Reasons click here</p> <p><u>Submit only this cell</u></p>	<p>WHAT IS THE BACKFIRE POTENTIAL? (10= HUGE; 1= NONE).....QUEL EST L'IMPACT RELATIF DE CE DÉVELOPPEMENT D'ICI À 2018 ?(10= CONSIDÉRABLE)</p> <p><input type="text"/></p> <p>Average=</p> <p>Reasons click here</p> <p><u>Submit only this cell</u></p>

The reasons page was laid out as follows:

Reasons Behind Your Answers

On this form we invite you to provide reasons for (or comments about) your numeric answer. If you enter or change your entry here, please remember to SUBMIT at the bottom of this page.

Development: National and international regulations requiring that all policies concerning important issues be gender sensitive.

Développement : Règlements nationales et internationales impliquant que toutes les politiques publiques relatives à des enjeux importants intègrent la question des genres.

The heading: Question 1

Your prior numeric answer: 25 (*To modify this answer, please return to the questionnaire.*)

Your reasons and comments are entered here. The reasons and comments you provided earlier are shown below. If you wish to change your prior input, type it here:

Reasons and comments provided by the group are shown below (*listed in order of reasons given for lowest answer to highest*):

Finally, the Finnish activity mentioned earlier (eDelfoi; <http://www.edelfoi.fi/> <<http://www.edelfoi.fi/en>>) has used formats such as that shown below:

The screenshot shows the eDelfoi website interface. At the top, there is a header with the logo and navigation links. Below the header, there are several tabs for different survey sections. The main content area is titled 'Elinikäinen oppiminen v. 2017' and contains a table with three columns: 'Teesi', 'Tulevaisuudessa...', and a Likert scale from 1 to 10. The table contains three rows of survey questions related to lifelong learning.

Teesi	Tulevaisuudessa...	Scale
Teesi 1.	Tulevaisuudessa "poikkeusopetussuunnitelmallisten taitojen" kehittäminen [oppimaan oppiminen, sosiaaliset taidot, kommunikaatioaidot, ongelmanratkaisutaidot jee.] korostuu.	1 2 3 4 5 6 7 8 9 10
- Wanne v. 2008		1 2 3 4 5 6 7 8 9 10
- Wanne v. 2010		1 2 3 4 5 6 7 8 9 10
- Wanne v. 2017		1 2 3 4 5 6 7 8 9 10
Teesi 2.	Elinikäisen oppimisen perustaa vahvistetaan parhaiten siten, että koulut tukevat yksilöllisiä oppimistyylejä ja -tarpeita.	1 2 3 4 5 6 7 8 9 10
- Wanne v. 2008		1 2 3 4 5 6 7 8 9 10
- Wanne v. 2010		1 2 3 4 5 6 7 8 9 10
- Wanne v. 2017		1 2 3 4 5 6 7 8 9 10
Teesi 3.	Elinikäisen oppimisen toteutumisen kannalta olennaista on rohkeisuuden ja posititiivisen mielipideilmaston syntyminen.	1 2 3 4 5 6 7 8 9 10

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