The Delphi Technique: An Introduction

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The Delphi Technique is one of the most effective methods to harness the collective knowledge and experiences of experts as related to a particular research question. Most often used in the field of foresight, the method allows for the convergence of insight on future scenarios through an anonymized, remote, and iterative consultative research process. For example, [fill in the blank]. In order to rigorously apply the Delphi Technique in our own research and to increase general use of this foresight method, we present the following research brief.

Foresight Studies

Foresight, at a fundamental level, is the ability to consider and plan for the future. We, as human beings, are inherently capable of exercising foresight. Individuals utilize foresight on a daily basis, while small groups can reach consensus on future plans through unstructured processes such as conversations. However, with hundreds or thousands of individuals, it becomes increasingly difficult to engage in foresight, as each individual may bring a unique perspective about what the future *may* hold, as well as what the future *should* hold.

The discipline of foresight offers a variety of techniques to engage in structured conversations about the future. These techniques help build an understanding of differences in opinion about the future, develop a more complete understanding of what the future may hold and what it should hold, and collectively design strategies to pursue the type of future that stakeholders would like to see and live in. This is particularly true for organizations like those in international development, which seek to solve immensely complex challenges like food security, energy poverty, and climate change.

GKI defines foresight as:

The mindset and the methods that groups of people can use to come to a shared understanding of the future, with the goal of enabling anticipatory planning and more strategic decision making.

At the level of an organization or network, vastly different processes exist to engage in a constructive conversation about the future. Scenarios Planning and STEEP Analyses (or a consideration of the Social, Technological, Economic, Environmental, and Political forces affecting the future) are perhaps the most well-known techniques outside of the foresight discipline.

The Delphi Technique

The Delphi Technique, also known as the Delphi method or approach, is a foresight method that harnesses the expertise of a group of experts to achieve consensus on the most likely outcomes for the future. Every Delphi project begins with a panel of experts: participants in the process who possess significant and specialized knowledge related to the topic of interest. This panel of experts will ideally come from a diverse range of disciplines or backgrounds relevant to the topic.

With this panel assembled, the Delphi Technique provides a structured process for the group of experts to communicate, interact, and share their opinions on the topic. This engagement is typically conducted through questionnaires, which are used to solicit insights through multiple rounds of engagement. Experts iteratively build upon insights gathered in previous rounds through at least two, and typically three, iterative rounds of engagement. This is a critical feature of the Delphi Technique, as the process of responding to the totality of the group's opinions drives the panel toward a consensus on the most likely future outcomes relevant to the topic.

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Technical Development

After World War II, the United States military looked to develop a reliable and systematic forecasting approach after deeming existing forms unsatisfactory. RAND Corporation, most famous for its strategy of nuclear deterrence through mutually assured destruction, developed the Delphi Technique around this time. During the 1950-60s, the method underwent numerous revisions and adaptations—ultimately expanding its application outside the military context.

Today, the Delphi Technique has amassed popularity in many fields. It is recognized as a leading method for forecasting technology, economics, education, transportation and urban affairs (Iefremova and Kozak, 2015). However, the technique can also be applied to advance knowledge or practices not associated with any specific discipline. For instance, it has been applied to program planning, needs assessments, policy development, and resource utilization (Hsu and Sandford, 2007). Increasingly, the Delphi Technique is being incorporated into consensus-building on topics and areas that require a comprehensive, interdisciplinary response, such as those in the fields of international development and sustainability.

Application

The Delphi Technique is an alternative to in-person meetings, interviews, or other face-to-face interactions for generating prospective insights on the future (Rowe and Wright, 2011). The method is based around the premise that forecasts or decisions from a group of diverse, specialized experts participating in a structured process of communication will be more accurate than forecasts made through unstructured communications, such as focus groups.

The method offers a combination of systematization and flexibility that larger groups require when in engaging in collective foresight. The systematization is derived from the structured process, while flexibility is derived from broad applicability to a wide range of research inquiries. The iterative nature of the technique allows research teams to fine-tune the process to be responsive to insights emerging in the study. This enables researchers to ask and answer questions that may have previously neglected as less important, that they had not known to ask, or that they had not known how to address (Rowe and Wright. 2011).

What are the characteristics of an effective Delphi study?

Based on a review of available literature, we identified the following characteristics to consider for successful use of this technique:

- **Anonymous Responses**: Keeping responses anonymous avoids the insertion of undesirable social dynamics that can sway opinions. For instance, the phenomena of group think and/or deference to high status individuals participating in the study could push the panel away from a true consensus. In addition, anonymity helps minimize personal biases, encourages freedom of expression, and fosters the admission of errors from previous rounds—all of which increases the credibility of the panel and the project (Hsu and Sandford, 2007).

- **Exploration and Assessment:** A well balanced Delphi study should allow for free exploration by the panel in its initial phase, followed by an assessment and reassessment of initial survey responses over the subsequent rounds of the study. As the study progresses, this refinement not only improves the overall quality but also supports the aim of reaching consensus.

- **Process and Planning:** Planning the direction of information flow is vital to ensure the efficiency of the Delphi Technique. A well-defined process is reflected in increased engagement among panellists as they develop an understanding that the project is well-managed and communication is consistent (Okoli and Pawlowski, 2004). A properly planned process also allows research facilitators to filter out irrelevant content, ensuring the information remains topical and comprehensible to other panellists.

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- **Mixed Methods:** The most successful Delphi studies use questionnaires to collect a combination of qualitative and quantitative data. The extent of detail should be based on the context of a project. If responses can be statistically analysed, this can help the research facilitators maintain neutrality through the process as it prevents the interjection of the biases of the researchers. This supports divergent responses throughout the Delphi process (Geist, 2010 and Pill, 1971).

Application

The Delphi Technique is applicable to projects concerned with understanding a likely state of the future. Several elements may lead one to choose the Delphi over another foresight method:

- **Limited time to coordinate:** Generally, foresight processes rely on the contributions of experts with specialized knowledge on a given topic. Often this is conducted in the form of workshops spanning several hours or even days. In situations where time is limited, or coordination is difficult, the Delphi Technique can be used to provide experts more flexibility in determining when and how they contribute (Fefer et al, 2016).

- **Geographically diverse participants:** Similarly, in situations when experts are located throughout the world, which is often the case when considering complex global challenges, the Delphi Technique provides an alternative to face-to-face interactions.

- **High-value investment required:** Often research projects do not have as much funding as they might require for optimal completion. In such instances, the Delphi Technique offers a high rate of return in terms of the quality of insights gathered compared to the cost of running a project designed to elicit comparable results. Because the Delphi Technique can incorporate quantitative and qualitative analysis, it can produce a far more holistic presentation of the future (Thangaratinam and Redman, 2005).

- **Topic lacks evidence:** Generally, the Delphi Technique is best applied to subject areas that lack empirical evidence. In fact, situations that lack consensus around empirical evidence are exactly when the Delphi technique can be most effective, as it will help provide clarity on complex topics regarding the future (Pivo, 2008).

How to create the ideal panel?

Panellist selection is the most fundamental aspect of the Delphi Technique. Insights gathered through the process will only be as good as the people who are producing them. The panel determines the success of a Delphi project more so than any other factor. Core considerations for panel selection include:

- **Panel size:** Not only do panellists' areas of expertise matter, but so do their numbers (Hussler et al, 2011). While some Delphi panels have numbered in the thousands, this is unnecessary in most instances. Generally it is agreed that a panel between a minimum of 10-20 and a maximum of 60-70 will produce optimal outcomes (Rowe and Wright. 2011).

- **Experience:** As the credibility of the Delphi Technique rests on the expertise of the participants, the type of experience desired for the study should be clearly defined. To allow for the comparison of panellist candidates, clear criterion should be developed and applied to evaluate potential experts to include in the panel (Pivo, 2008). Individuals with experience in academia as well as those with field or industry experience provides a balance between practical understanding and theoretical expertise (Okoli and Pawlowski 2004). A chain referral strategy can also be helpful to grow the panel once a critical mass of experts has committed to participating in the study (Fefer et al, 2016).

- **Diversity:** Within the ideal range stated above, the panel size is less significant the type and diversity of the participants (Hsu and Sandford, 2007). It is recommended to begin by defining

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the sectors and industries of interest to the project, and to identify experts from all those affected sectors or industries (Nowack et al, 2011). Beyond this, other considerations may include traditional diversity factors like gender or geography. These determinations will depend on the desires and priorities of the researchers.

- **Attrition:** Attrition of panellists is unavoidable in Delphi studies. To minimize attrition, it advised to clearly assess the most appropriate individuals before beginning the project and to be as transparent as possible about the expectations and time commitment for participation (Mukherjee et al, 2015). Attrition should also be taken into account when determining the initial size of the panel. An overall response rate of 70% or more is considered high for a Delphi study. Therefore, researchers should plan for attrition to ensure the project concludes with enough panellists to lend credibility to the findings.

What process design elements should research teams consider?

A research team administering a study using the Delphi Technique should consider key factors in the design of the overall process as well as the questionnaires for each round of the study.

From a top-level view, the research team should consider the duration of the project, the number of rounds required to elicit quality insights on the topic, and how each round will build the knowledge of the group to produce these quality insights. It is helpful to articulate this design element to the panel ahead of time. Such transparency helps build the credibility of the research team and promotes engagement. As mentioned previously, ensuring anonymity in the responses is also a critical design parameter for the overall process. Procedures to ensure anonymity, along with appropriate communication channels, should be considered in the design process (Nowack et al, 2011). Again, articulating this to the panel ahead of the study will help to ensure the study runs smoothly.

It can be challenging to design questionnaires for sufficiently diverse panels. Indeed one of the weaknesses of Delphi Technique is difficulty involved in designing a universally understood questionnaire (Iqbal and Pipon-Young, 2009). However, our research of the Delphi Technique yields some recommendations for questionnaire construction:

- **Begin with a blank canvas:** In the first questionnaire, cover as many areas and topics as possible so that comprehensive answers are developed. This will also help to ensure all participants feel valued and included, which improves response rates and feedback throughout the process (Hsu and Sandford, 2007).

- **Use an accessible service:** While in the past Delphi studies were sometimes coordinated through traditional mail services, online services such as *SurveyMonkey* provide simple, amendable, and accessible resources with which most individuals can quickly develop familiarity.

- **Limit the response time:** Surveys should not exceed a reasonable amount of time, usually between 20-40 minutes. Depending on how the expectations are outlined at the beginning of the process, this time range can vary (Geist, 2010).

- **Plan each round ahead of time:** Ideally, each successive round of the study should be planned at the outset of the project, with the expectation that some revisions and adaptations will occur between rounds.

- **Mix qualitative and quantitative questions:** The best Delphi studies gather a combination of quantitative and qualitative data (Iqbal and Pipon-Young, 2009). For instance, multiple choice or check-box questions coupled with descriptive portions offer a nice balance in the initial phases of the study. As a study progresses, it will likely concentrate on one type of data. Most

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often, quantitative methods are preferred due to their brevity, but in areas like education qualitative methods have been shown to produce better outcomes (Linstone and Turoff, 2002).

How does each round build on one another?

Beyond the panel, the second most crucial element of any Delphi study is that the iterative rounds of engagement allow for the refinement of ideas by the entire panel. Therefore, it is critical to understand how each round of questionnaires and subsequent analysis will build on the previous rounds to ensure quality results at the close of the study.

- **Round 1:** A common recommendation is to make the initial round as open-ended as possible to encourage brainstorming. One review of the methodology found that in closed-ended questionnaires, participants often inquire whether they can add their own ideas (Rowe and Wright. 2011).

- **Round 2:** In this round, the goal is for researchers to identify patterns in the panel's responses, creating a clearer understanding of the likely outcomes. To do this, researchers gather the results from Round 1 and present this back to the panel to respond to the collection of their ideas. Depending on design, two rounds may be enough to reach consensus (Geist, 2010).

- **Round 3:** Most Delphi studies conclude after three rounds. For studies that use a three round process, the goal for Round 3 is to increase the level of clarity of the consensus. This stage is more about the finer details and may only consist of a short questionnaire to encourage panellists to expand or clarify their previous opinions (Hsu and Sandford, 2007). This round is also where rating systems, or outliers from previous rounds, can be considered in depth.

- **Beyond Round 3:** For a study with more than three rounds, each successive round would look at increasingly granular levels of detail to gain as accurate a consensus as possible. Theoretically, there is no limit to the number of rounds that can be built into a Delphi study.

As this process outline suggests, a critical element of process design the presentation of results from previous rounds in a clear, concise, and systematic way. Indeed, for the researchers conducting the study this is the most time consuming activity, as all anonymized responses should be incorporated into the share-out of results with the panellists. When possible, statistical analysis can reduce the amount of time required on panellists' behalf to sift through response collections (Fefer et al, 2016).

How does GKI use the Delphi Technique?

The Global Knowledge Initiative (GKI) is an international development organization that works with partners around the world to solve complex challenges. Our approach to problem solving is founded in the disciplines of systems thinking, human-centered design, and foresight, which we use to identify innovative approaches to address the world's most pressing problems.

In the past, GKI has conducted Delphi studies with a specific goal to identify innovations that are best suited to disrupt the status quo within a particular industry. For instance, in our work with the Rockefeller Foundation, as described in the report *Innovating the Future of Food Systems*, we used two parallel Delphi processes to identify the innovations best suited to address the challenge of postharvest loss in emerging markets. Currently, we are able to use the Delphi Technique to uncover insights about the likely future for any number of development challenges—ranging from regionally specific concerns to problems that are global in scale.

If you would like to discuss the application of the Delphi Technique to your challenge, please reach out to Chase Keenan at chase@gkinitiative.org.

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