THE DELPHI TECHNIQUE IN DOCTORAL RESEARCH: CONSIDERATIONS AND RATIONALE

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ABSTRACT

The purpose of this paper is to explore and provide extended details on the Delphi technique research design. The focus was primarily on the doctoral student researcher audience because the Delphi technique appears to be coming increasingly popular as a research design for doctoral dissertations. The classical Delphi technique is described as well as a number of variations in design. To illustrate the process of conducting a Delphi study, an actual investigation was conducted and described. The purpose of that Delphi study was to ascertain best future practices in helping doctoral students complete their doctoral program. The study conducted included three rounds with an expert panel of faculty who also served as dissertation chairs. A list of best practices was generated in the first round. These practices were then ranked in order of effectiveness in the second round. The third round asked the expert panel members to expand on how they would bring the suggested best practices into reality. The third round results were then coded using the methodology of Saldaña (2009), codes listed, and categories and subcategories evolving from the coding described. The final discussion includes the advantages and challenges of using the Delphi technique for doctoral research. The principle challenges include the difficulty of future forecasting, timing and commitment, panel membership, and bias. The advantages include the ability to define a problem where little is known, clarification through iteration, avoidance of issues such as groupthink because of panel anonymity, and the ability to have panel members located virtually anywhere as the process can all be done electronically.

Keywords: Delphi, Research Technique, Expert Panel, Future Forecasting, Scholarly Research.

INTRODUCTION

Many doctoral students beginning to work on their dissertations find themselves faced with the challenge of selecting a research methodology and a design (M&D). For many, this is their first experience in selecting an M&D that they will actually have to use, rather than just discuss. Experience suggests that most have minimal experience in the various research methodologies, and some drift one direction or another, based on what others are doing, or on
false information and beliefs about which methods and designs are “easier” or at least most understandable to them.

The importance of this Delphi specific discussion revolves around the fact that researchers are using the Delphi technique more frequently, and this is visible over the last few years as researchers explore and expand on its original design. “The Delphi is labeled in the literature variously as a ‘technique’, a ‘process’, a ‘method’, an ‘exercise’ and a ‘survey.’ Indeed there are so many variations of the original, that Delphi is often preceded by the word ‘modified’” (Stewart, 2001, p. 922). The following provides background information on the evolution of the Delphi research technique, common variations, and suggestions about the use of the Delphi technique in scholarly research.

The goal of this paper is to focus on the Delphi technique and how it can be applied in scholarly research. The discussion includes a general description of the Delphi technique followed by details of different types of Delphi techniques. Additional background information, and how some of the unique variations might be, especially in academic research, follows the general discussion.

It is important that students clearly understand the background and variations of the specific research method and design they select. A clear match between their problem and the research method and design helps make their research more credible and easier to defend. To complete the process, a portion of a Delphi study will be included and discussed as a way of describing the technique.

Background

One of the earliest papers on the Delphi Method was by Dalkey and Helmer (1963). “Project Delphi,” as described by the authors, was a research project conducted by the RAND Corporation. The process involved a series of questionnaires and several rounds of questioning and data aggregation. Those participating as the panel in the multiple rounds of discussion were experts in their fields. This process of research became known as the Delphi Method or Delphi Technique, taken from the project name and referring back to the Oracle at Delphi in ancient Greece. The Delphic oracle was supposed to be able to look into the future, and the Delphi Method was designed to try to forecast solutions to future problems.

Dalkey (1967) provided one of the earliest definitions of Delphi. “Delphi is the name of a set of procedures for eliciting and refining the opinions of a group of people. In practice, the procedures would be used with a group of experts or especially knowledgeable individuals” (Dalkey, 1967, p. 1). Turoff and Linstone (1975) added to the definition of Delphi, describing it 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” (Linstone & Turoff, 1975, p. 3). There are two key elements to the Delphi technique as noted in these two definitions: Delphi uses a panel of experts and the Delphi technique seeks to arrive at a consensus on complex problems.
The Delphi approach typically also includes anonymity as an important part of the expert panel. It is important that the experts not know who are other members are. This avoids issues of modifying or changing opinions because of professional agreements or differences with other professionals and experts. The process is iterative. Experts respond to questions through a series of rounds where initial responses to the primary question are refined and some sort of consensus is achieved.

Different Types of Delphi Techniques

Classical (Original) Delphi

Dalkey and Helmer (1963) described the original Delphi method. The methodology evolved from “Project Delphi,” a study under the auspices of the RAND Corporation and the United States Air Force. The goal was to try to determine, from a Soviet perspective, “The number of A-bombs required to reduce the munitions output [of the United States] by a prescribed amount” (Dalkey & Helmer, 1963, p. 458). The study’s goal was to seek a set of convergent opinions from acknowledged experts. The final results from the study could then be used by the government to make defensive plans against potential attacks by the Soviet Union.

One of the most important aspects of the Delphi (all variations) is the anonymity of the expert panel members who remain unknown to each other. “This mode of controlled interaction among the respondents represents a deliberate attempt to avoid the disadvantages associated with more conventional uses of experts, such as round-table discussions” (Dalkey & Helmer, 1963, p. 458). The authors argued that this technique appears “to be more conducive to independent thought” (p. 459).

Direct confrontation, on the other hand, all too often induces the hasty formulation of preconceived notions, an inclination to close one’s mind to novel ideas, a tendency to defend a stand once taken or, alternatively and sometimes alternately, a predisposition to be swayed by persuasively stated opinions of others. (Dalkey & Helmer, 1963, p. 458)

It should be noted that, in the original Delphi study discussed by Dalkey and Helmer (1963), complete anonymity was not achieved. Their study took a lot of time and the experts worked with each other on other projects. This issue needs to a consideration for students considering the Delphi technique.

This is one of the most critical aspects of an effective Delphi study. Sackman (1974) was critical of the Delphi approach. His criticism is that the technique is “unreliable and scientifically unvalidated in principle and probably in practice” (p. vi). Sackman argued, “Users are urged to work with psychometrically trained social scientists who can apply rigorous questionnaire techniques and scientific human experimentation procedures tailored to their specific needs” (p. vi). Sackman (1974) also argued that the anonymity, which is so important to the Delphi technique, may give the expert panel the feeling that they can say anything they want as accountability is removed because of the anonymity. This argument does not hold up,
however, as the researchers are aware of the membership of the panel. However, this last argument underscores the need for picking the panel experts carefully.

Another important aspect of the classical Delphi is that it is an iterative process, moving through a series of rounds. Brown (1968) described the process as an “orderly program of sequential individual interrogations usually conducted by questionnaires” (p. 3). It is the questions asked, the information solicited, and the type of information that primarily differentiates the different types of Delphi methods. While there is no required number of rounds, the most common number of iterative rounds appears to be three. The number of rounds, anonymity, and selection of the expert panel are issues critical to all Delphi methods, and will be discussed in detail after a discussion of the different techniques.

The original Delphi study conducted by Dalkey and Helmer (1963) used five questionnaires, given to the members of the expert panel approximately one week apart. The use of an initial questionnaire is common in Delphi studies. In Dalkey and Helmer’s study, they also interviewed panel members have the first and third questionnaires.

The initial open-ended questionnaire is critical as it serves as the foundation for everything that follows. Because this is such a key element, researchers need to be careful not to slant or bias this initial questionnaire in order to direct the outcome desired by the researcher inadvertently. As noted by Hsu and Sandford (2010), an alternative to an open-ended question from the researcher, some researches will base the initial literature on the current literature.

In round two of the classical Delphi, panel members are given a synopsis of the inputs from round one. This can be done in any fashion that aids the expert panel in getting a complete picture of the first round data, always being careful to never disclose the identity of panel members or specific comments that might help identify panel members. Panel members then rank the round one data by levels of importance, and are usually asked to explain their rankings.

In the third round, the panel members receive a summarized set of rankings from round three. They are asked comment upon the ratings as well as expand on the most critical elements. In the study used in this paper, the panel members were asked to elaborate on the three most critical issues from round two.

There is no “correct” number of rounds for a Delphi study, but three rounds has been the traditional number. In the original study by Dalkey and Helmer (1963), they went to five rounds, but the complexity of the issues they were addressed seemed to require that, and that is key. If an additional round is necessary, that is appropriate, and panel members need to be aware that this is a possibility.
**Modified Delphi**

The classical Delphi technique has been modified in almost every way. One form of modification involves having face-to-face interviews or a focus group for the first round (McKenna, 1994). The number of rounds also varies. Some Delphi techniques use more quantitative information (Skulmoski, Harman & Krahn, 2007). The critical factors that must remain to stay within the definition of a Delphi are the use of an expert panel and anonymity of the panel members. While focus groups and group interviews have occurred, that is typically with the first round, and responses after the first round are anonymous.

**Policy Delphi**

The policy Delphi differs from other Delphi techniques in the composition of its expert panel and the overall goal of the research. The policy Delphi is “A tool for the analysis of policy issues and not a mechanism for making a decision” (Rauch, 1979, p. 162). The panel members are typically lobbyists or politicians with the goal of coming to consensus and agree on future policy related to a specific topic. “The aim is not consensus; it is a clearer understanding of the plurality of standpoints” (Crisp et al., 1997, p. 117). This technique continues the practice of iteration and anonymity, which is critical to the Delphi technique.

**Decision Delphi**

The decision Delphi is a focused attempt to bring a group of decision-makers together to make decisions about future developments. “Delphi in this variation is no longer a tool for obtaining a group opinion about forecast statements (as in the case of the classical Delphi) or a means for the analysis of a social situation (as in the case of the policy Delphi)” (Rauch, 1979, pp. 159-160). Other than the composition of the expert panel, Rauch differentiates the decision Delphi as dealing with decisions, whereas the classical Delphi deals with facts and the policy Delphi deals with ideas.

**Real Time Delphi**

The real time Delphi varies in the structure of the processes involved and is sometimes referred to as a consensus conference. Gnatzy, Warth, von der Gracht, and Darkow (2011) developed the real time Delphi to increase “The efficiency of the process, accommodates expert availability, and reduces drop-out-rates” (p. 1681). Participants are provided a hyperlink to a welcome page where they can read details of the approach and access the initial questionnaire. The process described by Gnatzy et al. used a refined interface, and the authors argued that the outcomes reduced the issues found in the classical Delphi without losing content.

**e-Delphi**

Like the real time Delphi, the e-Delphi replicates the process of the classical Delphi, but the questionnaire(s), feedback, and participation of the expert panel is all done by email or online surveys. As with the Delphi study described in detail in this paper, this approach is sometimes categorized under modified Delphi.
Technological Delphi

The technological Delphi has similarities to the real time Delphi yet there are differences. The key difference between the technological Delphi and the real time Delphi is that the technological Delphi uses handheld devices to respond immediately to the questions by the researcher. Voting can take place related to specific questions, and this process lends itself to a more quantitative Delphi approach as it is more difficult to ask and explore open-ended questions.

Disaggregative Delphi

The disaggregative Delphi as described by Tapio (2002) is critical of the classical “consensual” Delphi. In Tapio’s study, panelists “were invited to give estimates . . . of probably and preferable futures” (p. 83). The method uses cluster analysis to disaggregate responses of key variables. This study used two rounds, the first being the quantitative, disaggregative round, while the second was qualitative and involved interviews of the panel members.

Example of a Modified Delphi Study

On review, it is clear to see that the distinctions are not always as clear as the researcher might like. For example, a simple classical Delphi could well become a policy Delphi, depending on where the researcher data lead. A technological Delphi is typically also a real-time Delphi, while the reverse is not always true. Most Delphi studies can be conducted online, so there is a crossover of definitions. Last, most are modified from the original classical design. The following Delphi study was conducted over the internet by email.

Study Purpose

A research study was undertaken to ascertain best practices of dissertation chairs that aided doctoral students in completing the dissertation process in a timely manner. There is a wide spectrum from start to finish in doctoral programs as to the length of time it requires students to complete and defend the dissertation. Spending an excessively long time to complete the dissertation process is expensive, time consuming, and may negatively affect student perceptions of self-worth and adequacy. While not completing the dissertation may not be the end of the world (Cassuto, 2010), the ability of a university to graduate the majority of their students has positive financial and public relations benefits. Therefore, understanding what practices aid students in the dissertation process would be of value.

METHODOLOGY

As noted, one of the most important criteria in a Delphi study is the expert panel and the expertise of its members. For this study, the expert panel consisted of faculty who met specific qualifications. This group of faculty had a high rate of success in getting students through the various approval steps, of which there are several. The success of this small group of faculty (n=25) defined them as “experts” for this study.
Faculty members were engaged in three rounds of questioning. In the first round, they were asked to respond to a specific question that resulted in multiple responses. Those responses counted, and similar responses combined. In the second round, the ten most frequent responses were sent to the faculty members and the list was alphabetized to mask any indication as to their frequencies from the first round. The panel members were asked to prioritize the list, with #1 being the most effective practice and #10 being the least effective practice. The responses from the second round were recorded. The responses from the faculty members were combined, and the top three practices highlighted. In the third and final round, the expert panel members were asked to explain how they were able to put each of the top three ideas into practice and describe their ideas and methods for doing so. This last round was then coded and categorized, ultimately seeking a thematic description of the best practices. The process described by Saldaña (2009) was followed in the coding and categorization of the textual comments from the expert panel in round three.

**RESEARCH RESULTS**

**Research Question-Round One**

Faculty members who served as dissertation chairs and who qualified as “experts,” based on the definition above, were asked to provide three practices they believed helped students achieve their success more quickly. The panel members were asked to provide these answers in 2-3 word phrases, and could provide additional detail afterwards. The goal at this point, however, was to begin the creation of a list of best practices.

Seventy-five responses were received and similar or identical responses combined to create a list of 22 unique practices. The number selecting each practice varied, but two were mentioned most frequently. However, it was important that the panel members not be aware of which practices were noted most frequently, so a list of the top ten was created and presented in alphabetical order.

**Table 1: Top Ten List**

The ten most frequently selected best practices to aid doctoral students in the quick completion of their dissertation process. The table is in alphabetical order. Three of the responses were selected most often (#4, #6, and #8), but that information was not revealed to the panel members.

<table>
<thead>
<tr>
<th>Practice</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Communicate with student on a regular basis</td>
<td></td>
</tr>
<tr>
<td>Emphasize importance of problem statement</td>
<td></td>
</tr>
<tr>
<td>Expect high performance</td>
<td></td>
</tr>
<tr>
<td>Recommend editors for writing, APA, and statistics</td>
<td></td>
</tr>
<tr>
<td>Reinforce the value of what they are working to achieve</td>
<td></td>
</tr>
<tr>
<td>Rigorous, extensive, and timely feedback</td>
<td></td>
</tr>
<tr>
<td>Students must take the lead</td>
<td></td>
</tr>
<tr>
<td>Talk with student by phone</td>
<td></td>
</tr>
<tr>
<td>Time management discussions from the beginning and timeline agreement (contract) with student</td>
<td></td>
</tr>
<tr>
<td>Work with student in-between classes</td>
<td></td>
</tr>
</tbody>
</table>
Research Question-Round Two

In round two, the list noted in Table 1 was emailed to the expert panel. They were asked to modify this list, which was alphabetical, and rearrange it so that the most important was #1; the least important was #10. When the list was returned, the values were averaged for each of the responses and the list rearranged with the lowest value ("the most important") at the top. Table 2 reflects the numerical standings.

Table 2: Top Ten List Arranged by Importance

<table>
<thead>
<tr>
<th>Best Practices</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rigorous, extensive, and timely feedback</td>
<td>3.50</td>
</tr>
<tr>
<td>Communicate with student on a regular basis</td>
<td>4.00</td>
</tr>
<tr>
<td>Emphasize importance of problem statement with student</td>
<td>4.09</td>
</tr>
<tr>
<td>Expect high performance</td>
<td>4.68</td>
</tr>
<tr>
<td>Students must take the lead</td>
<td>5.59</td>
</tr>
<tr>
<td>Work with student in-between classes</td>
<td>5.50</td>
</tr>
<tr>
<td>Time management discussions from the beginning and timeline agreement (contract)</td>
<td>6.23</td>
</tr>
<tr>
<td>Recommend editors for writing, APA, and/or statistics</td>
<td>7.18</td>
</tr>
<tr>
<td>Talk with student by phone</td>
<td>7.00</td>
</tr>
<tr>
<td>Reinforce the value of what they are working to achieve</td>
<td>7.23</td>
</tr>
</tbody>
</table>

The numbers were not reported to the expert panel until after the study was completed. It may be interesting to note that the three most frequently stated best practices in round one came in first and second, and eighth in round two.

Research Question-Round Three

In the third and final round, the top three practices were emailed to the expert panel members. The panel were not given any numbers, but simply informed that the three practices forwarded to them were the three most frequently selected. Panel members were then asked to respond to each of the three practices and describe what they would suggest (in the future). This is the common practice in Delphi studies is to use the last round to either forecast or suggest future considerations based on the results of the first two rounds.

It is important to make the final questions as open as possible in order to gain a robust response. That was a problem in this study as the second round best practices were fairly specific. This is a something students will need to consider when conducting a Delphi study. In order to make the final questions more open, the top three practices were reframed into the following three questions:

1. What do you do (what practices) to ensure that feedback in rigorous, extensive, and timely?
2. What tools do you use and what practices do you follow to communicate with your students on a regular basis?
3. What steps do you take to emphasize the critical nature of the problem statement?
The process described by Saldaña (2009) was followed in the coding and categorization of the textual comments from the expert panel in round three. Saldaña described a code as “is most often a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data” (p. 3). Each question was coded and re-coded, and then categories established. These codes are considered descriptive codes as they describe specific content within the text.

Categories represent codes that be grouped into “families,” using Saldaña’s (2009) word. The categorization of the codes allows the establishment of continuity and meaning, while subcategories can then provide additional detail. The questions asked in round three are repeated in each of the following sections to facilitate and eliminate the need for the reader to jump back and forth in the text.

The process of coding textual data from interviews or questionnaires can be tedious and time consuming. There are software products that can assist in this process, but there can be a challenge in learning these somewhat complex software tools and putting them into practice. If a large amount of textual data is being examined, these software tools can be very helpful. In the textual data is relatively small, coding by hand may work just as well. In his study, the textual data was coded by hand. The three main categories, subcategories, and codes are included in Table 3.

<table>
<thead>
<tr>
<th>Category</th>
<th>Subcategory</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rigor</td>
<td>Timely</td>
<td>Detailed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Regular</td>
</tr>
<tr>
<td></td>
<td>Extensive feedback</td>
<td>Detailed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Editorial</td>
</tr>
<tr>
<td>Communication</td>
<td>Phone</td>
<td></td>
</tr>
<tr>
<td></td>
<td>When Stuck</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Regular basis</td>
<td></td>
</tr>
<tr>
<td>Problem Statement</td>
<td>Do-overs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Method and design</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Communication</td>
<td></td>
</tr>
</tbody>
</table>

*The codes are established first, and then separated into categories, if subcategories exist.*
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Figure 1: Waterfall diagram of the categories, subcategories, and codes in Table 3. Some find it easier to create a waterfall or step down diagram to reflect the flow of ideas, and this can be done in various ways. Since the diagramming is dynamic, whatever process best reflects the flow of ideas and categorization is appropriate.

Please note that the Delphi study used as an example here is a real Delphi study, but the round three data is abbreviated. There were more codes, categories, and subcategories in the study, but this paper is not about that study. This paper is about the methodology of the Delphi technique, so the information in Table 3 is used to demonstrate the process of coding and categorization as suggested by Saldaña (2009).

Challenges with Delphi

Future Forecasting

The intent of the Delphi technique is to “look” into the future. “The Delphi technique was named after the oracle at Delphi, who, according to Greek myth, delivered prophecies. As the name implies, the Delphi technique was originally developed to forecast future events and possible outcomes based on inputs and circumstances” (Hsu & Sandford, 2010, p. 344). Students commonly misunderstand this idea. The Delphi study used in this paper was focused on discerning best practices for dissertation chairs in order to modify and enhance future practices. We frequently try to improve the future by looking at past events, but a research study that simply seeks people’s experience is not a Delphi study. Looking towards the future, such as for improved tools or methods, is important.

Timing and Commitment

Timing is an important issue when conducting a Delphi study. There is the length of time required to complete the study as well as the time required of the panel members. The primary issue is keeping the panel members engaged and focused. The quicker the study can be completed, the more likely the data will be complete. If a panel member should withdraw before all the rounds are complete, the study could be compromised. Getting a commitment
from panel members in writing can be helpful, but being respectful of their time and moving through the study as efficiently as possible is important.

Panel membership
One of the biggest problem areas is the selection and panel members. The original Delphi involved a group of experts, people who were clearly leaders in their field. The reason is that these experts would have the background knowledge and experience to suggest what future conditions might look like. Their experience was the key, and this experience was significant, which qualified them as an expert.

In the Delphi study used as an example in this paper, the panel members were dissertation chairs who had exceeded the norm in guiding doctoral students through their program quickly and effectively. The definition of the “experts” for the expert panel is up to the researcher, but the defense of the definition is also a responsibility of the researcher. The reviewers or readers of the study must also be convinced of the expert credentials of the expert panel. What is often seen is that students will pick a group of participants for a Delphi study, and there is no demonstrated expertise. Time doing the same job for an extended period does not, by itself, qualify an individual to be an expert.

Bias
One of the most difficult aspects of a good Delphi study is forming the questions, especially the first question, to avoid adding bias to the study. It is appropriate for the panel members to express their opinions and bias. The goal is to be as objective as possible, but the opinions and bias of the panel members also shapes the future outcomes of the study, and that is appropriate. However, as researchers, we can consciously or unconsciously shape the responses of the expert panel by asking questions that are limiting or leading. This is one of the major criticisms of this technique and something about which researchers need to be aware.

ANALYSIS & DISCUSSION
The purpose of this study was to provide more substantive information to doctoral students choosing the Delphi technique as a research design for their dissertation. A principle advantage of the Delphi technique is that it allows the expert panel members to more clearly define the problem. Sometimes the problem may have little or no background literature available, so the expert panel can supply a context for the problem. The iterative rounds also provides a time for reflection and clarification. The anonymity of the expert panel also allows participants to avoid issues of peer-pressure or groupthink. Last, the process can be conducted electronically, which allows the expert panel to be located virtually anywhere.

The classical Delphi methodology was explained in detail as well as seven other modifications of the method. Most of the variations deal with the process of delivering and receiving information from the expert panel. Having an expert panel is a common element. Anonymity
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is a common characteristic, although different Delphi methods compromise on this point, especially in the initial round. Iteration is also a common characteristic, although some methods may be as short as two rounds, whereas three rounds is the norm.

Last, an actual Delphi study was presented. All three rounds were described and the coding and categorization of the third round textual responses was described. Coding is the first step, which leads to the establishment of categories. Subcategories may evolve from the categorization. Some Delphi studies go an extra step and create themes. Some students state they are doing a thematic analysis of textual material, but that statement is in error. As Saldaña (2009) noted, “A theme is an outcome [author’s emphasis] of coding, categorization, and analytic reflection, not something that is, in itself coded” (p. 13). Themes evolve through the coding and categorization process.

It is hoped that, with the presentation of an actual example, students and other researchers will have a better understanding and feel for the Delphi technique. There is a great deal of peer-reviewed information available. There are many variations of the original technique. The problem statement defines the design, and students who clearly understand the technique and the possible variations will likely present an easily defended dissertation.

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