

# Pragmatic Research Design: an Illustration of the Use of the Delphi Technique

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**Abstract:** The creation of wealth is an important issue in any society, and entrepreneurship is regarded as an important catalyst in the creation of new wealth. This presents a challenge to develop entrepreneurship successfully. An important site for the development of entrepreneurship is higher education. The challenge however, is that there is a lack of a general understanding on how to educate students for entrepreneurship. In addition, current thought and practice on entrepreneurship education is historically biased, implying that graduates are essentially prepared for the past instead of for the future. From the perspective of higher education, the problem is how to develop current students to be entrepreneurial in the future. What is needed is to project into the future and then to develop an understanding of what should be taught as well as how it should be taught today.

A versatile research technique that can assist in achieving this objective is the Delphi technique, as it is used to conduct futures research or research into areas where knowledge is incomplete. The Delphi method is a type of group interview, using the collective opinion of knowledgeable experts. The technique makes use of several rounds of data collection and feedback to create a consensus of opinion.

Making use of the Delphi technique, research is being designed that will formulate expert-based strategic guidelines on entrepreneurial education within the South African higher education sector. The aim of this paper is to illustrate the research design considerations that arise in the use of the Delphi technique for this purpose and how they are addressed.

The main characteristics of the Delphi are presented and arguments for the use of the Delphi within a constructivist paradigm are discussed. Practical issues related to the design of the Delphi, panel-member selection, and the formulation of panel questions, are examined. In illustrating these design considerations, the paper demonstrates a pragmatic approach to research design as well as the importance of creating coherence between the research question, the research paradigm, the research method and its use, encouraging research practitioners to adopt a more systematic, deliberate and philosophically-based approach to research design.

**Keywords:** entrepreneurship, Delphi technique, higher education, entrepreneurial education, innovation, research design.

## 1. Introduction

This paper presents a research practitioner's perspective of the design and application of a futures research technique, namely the Delphi. The aim of the paper is to identify the design considerations that arise in the use of the Delphi technique and illustrate how they are addressed. The paper applies this illustration in the use of the Delphi, to research being conducted into identifying an appropriate and effective teaching and learning process for entrepreneurial education in South African universities. The paper begins by introducing the origins of the Delphi technique and its main characteristics and types, before providing the context of the relevant research question. In the light of the research question, the appropriateness of the Delphi is considered and justified, followed by a discussion of the philosophical considerations and practical issues in planning the use of the Delphi, and how they are addressed. This example of the use of the Delphi, serves to highlight the interface and tension between the design requirements posed by the research problem versus those requirements imposed by the typical conventions of a research method, and illustrates how a researcher needs to grapple with both philosophical and practical requirements to develop a coherent design that is customised to the particular study's needs.

## 2. The Delphi technique

The Delphi technique has its origins in Defence research in the United States in the 1950's. "Project Delphi" was the name given to a study of expert opinion originally conducted in the United States of America (USA) at the Rand Corporation during the 1950's for defense research (Dalkey and Helmer, 1963). The method brings a broad range of perspectives and ideas to bear on problem solving from a comprehensive panel of experts responding to feedback (Gibson and Miller, 1990). The method was used by the Rand Corporation to "... obtain the most reliable consensus of opinion of a group of experts ... by a series of intensive questionnaires interspersed with controlled opinion feedback" (Dalkey and Helmer, 1963:458). The purpose

of the original study was "... to apply expert opinion to the selection, from the viewpoint of a Soviet strategic planner, of an optimal U. S industrial target system and the estimation of the number of A-bombs required to reduce the munitions output by a prescribed amount" (Dalkey and Helmer, 1963:459).

The Delphi technique is typified by five main characteristics which are discussed in more detail below, namely (1) its focus on researching the future or things about which little is known, (2) reliance on the use of expert opinion, (3) utilising remote group processes, (4) the adoption of an iterative research process, and (5) the creation of a consensus of opinion.

Firstly, Delphi is a futures technique used for "developing forecasts of future events" (Stewart and Shamdasani, 1990:23), for conceptualizing and inventing the future, recognizing that quantitative forecasting tools alone cannot solve forecasting problems, as the historical data on which these techniques depend are unavailable or because the available data provide little or no insight into the probability of events of interest (Stewart and Shamdasani, 1990). It is also useful where there is a "lack of agreement or incomplete state of knowledge concerning either the nature of the problem or the components which must be included in a successful solution" (Delbecq, Van de Ven and Gustafson, 1975:5), or when modeling is difficult (Gibson and Miller, 1990). In such cases a satisfactory course of action needs to be invented or discovered (Delbecq, Van de Ven and Gustafson, 1975). As a method of data collection and analysis, Beech (1999) argues that the Delphi method produces data that would otherwise be impossible or difficult to obtain.

Secondly, the technique is characterized by the use of a group format (Stewart and Shamdasani, 1990; Denzin and Lincoln, 1994) in the form of panels of knowledgeable experts. The collective opinion of these experts is used as the source of information. Clayton (1997) defines an expert as someone who has the required knowledge and experience to participate in a Delphi. The membership of a panel may be national or international and may come from the same discipline or from different social/professional stratifications.

Thirdly, the Delphi is a form of remote group communication (Jeffery, Ley, Bennum and McLaren, 2000) in that it typically does not require face-to-face contact and is particularly useful for involving experts, users, resource controllers or administrators who cannot come together physically (Delbecq, Van de Ven and Gustafson, 1975). Communication with the individual panel members is typically via mail or faxed but there is also evidence of e-mail being used to distribute the questionnaires (Saint-Germain, Ostrowski and Dede, 2000). It is argued (Saint-Germain, Ostrowski and Dede, 2000:163) that "the e-mail version of the Delphi method preserves much of the traditional method ... can also improve upon the traditional method ... and provide a quicker response and cut the drop-out rate among participants".

Fourthly, the Delphi uses an iterative research process. The typical Delphi requires a group of relevant experts to respond to an iterative series of written questionnaires (called rounds) interspersed with summarized information and feedback of opinions derived from earlier responses to stimulate thinking mailed or faxed to each respondent individually with the objective of the group reaching consensus.

A fifth characteristic of the Delphi is the development of consensus. Consensus is typically observed through the convergence of variances or the decrease of standard deviations in subsequent iterations (Linstone and Turoff, 1975) and defined as an agreement in opinion of all concerned or as a majority view (Williams and Webb, 1994).

### **3. Researching entrepreneurial education in South Africa**

In South Africa, the changing social and economic needs of a global world as well as South African legislation is emphasising the need for higher education in the country to become more responsive to the nation's needs. Current economic and social indicators in South Africa as well as future projections point to a desperate need for wealth creation in the face of a critical skills shortage.

An important catalyst in wealth creation is entrepreneurship (Timmons, 1999). But, an "entrepreneurial culture" is still missing in South Africa, as well as the broader presence of entrepreneurs as initiators and innovators (Louw, Du Plessis, Bosch and Venter, 1997; Van Aard, Van Aard and Bezuidenhout, 2000). Intervention in facilitating the permeation of entrepreneurship in any economy is clearly sensible (Binks and Vale, 1990). In particular, Binks and Vale (1990:173) call for "... investment in educational and attitudinal policies which encourage freedom of thought, creativity, and imagination". According to Davidson (2002:19), "entrepreneurs are made, not born", and there seems to be general agreement in the literature and growing

evidence that entrepreneurship can be developed through education (Brockhaus, 1991; McMullan and Vesper, 2000; Kent. Cited in Cronje, Du Toit & Motlatla, 2000; Ronstadt, 1987).

The most obvious and ideal place for entrepreneurship education is the university (Hull, Bosley and Udell, 1980; McMullan and Long, 1987). In fact, Chia (1996) argues that the cultivation of the entrepreneurial imagination is the single most important contribution of universities to their national economies. Congruence between the output of higher education and the needs of an economy is of vital importance (Department of Education, 1997) as is the appropriateness and effectiveness of the teaching and learning process (Scott, 1994). A critical issue is not whether entrepreneurship can be taught but rather how it can best be taught (in addition to the content, educators are challenged with designing effective teaching and learning processes and opportunities), for pedagogies to reflect the changing times and for the field of entrepreneurship education to stay on the “cutting edge” (Solomon, Duffy and Tarabishy, 2002).

Timmons (1999) argues that it is the result of entrepreneurship that counts. Ideally what is needed then is Schumpeterian or N-entrepreneurship (entrepreneurial activity that relies upon a completely new combination of resources) as compared to routine entrepreneurship (entrepreneurial activity that refines existing combinations) (Leibenstein, 1968). Marginal micro-enterprises providing what Bhidé (2000:360) calls “... routine services in mature fields such as lawn care and beauty salons” are not required, as their high rate of appearance and disappearance has limited economic significance (Bhidé, 2000). Schumpeter (1934) identified innovation as the single factor that specifically distinguishes entrepreneurial from other activities and the driving force for creating new demand and therefore wealth. For Schumpeter an entrepreneur is “the person who destroys the existing economic order by introducing new products and services, by creating new forms or organisation, or by exploiting new raw materials” (Bygrave. In Bygrave, 1997:1).

While literature highlights the function of the entrepreneur in an economy as that of innovation, there is a lack of understanding of the “psychology” or qualities of an individual who can be innovative. Also, Coberly (1996) argues that educators need to help people prepare for a continuously changing workplace and for the future. However, it is difficult doing this when there is a lack of knowledge and understanding of what that future will be like. What is needed is to develop an understanding of the future economy as the context wherein graduates will need to see and realise innovative opportunities. In addition, there is a need to determine the qualities of an innovative individual in light of the context in which the person will apply their ability to innovate. Having developed an understanding of the qualities of innovative individuals for the future economy, the next question concerns what Higher Education needs to do to develop entrepreneurs.

In the light of this discussion, the research question being posed in this study is “What should Higher Education be doing to ensure that students are still able to be entrepreneurial 25 to 40 years after graduating?”

Addressing this question involves addressing three subsidiary questions, which also provide the basis of a three-phase research procedure. These questions are:

1. What sector of the South African economy will most likely offer the greatest potential for entrepreneurial opportunities in the next 25 to 40 years?
2. What qualities are needed by graduates to equip them to be innovative entrepreneurs in the future?
3. What should Higher Education in South Africa do to prepare/develop students to constructively participate in the future economy as innovative entrepreneurs?

#### **4. The relevance of the Delphi technique for the research problem**

In examining the key characteristics of the Delphi technique, its relevance to addressing the above research question becomes clear. Firstly, the research focuses on future requirements rather than current practice. Secondly, relatively little is known about these requirements. While the Delphi technique is able to address these requirements, most other research methods are not, as they tend to focus on historical or current realities. Even survey designs which may ask respondents for their opinions of the future, are restrictive in that they present a preconceived construction, usually derived from the literature, which itself has a historical bias.

Thirdly, the research questions lend themselves to making use of a wide range of experts. However, these groups of experts are geographically dispersed both within South Africa, and internationally. Fourthly, the research is an iterative process, requiring an answer to one question before proceeding to the next. With

regard to data collection, most other research designs are restricted in time and place and do not engage with the research participants in setting the direction of the research and collaboratively and progressively constructing an answer to the research question. While longitudinal research designs are less restrictive with respect to their time dimension, they do not have the same flexibility as the Delphi in allowing the emergence of the research problem, and focus on the unfolding of events in current reality, rather than on future projections. Similarly, while case studies may document the unfolding of events and processes over time, they are also historically focused. Furthermore, the Delphi explicitly facilitates the interaction of experts in this construction process rather than assuming that the researcher holds the monopoly on knowledge construction. This implies that not any and every opinion is accepted at face value, but through the iterative process, needs to stand up to the scrutiny of experts.

However, the question of meeting the Delphi characteristic of consensus requires a more detailed discussion, as the use of a technique that traditionally produces quantified results within a recognizably positivist approach does not seem to serve the requirements of this research. Given the research question, the entrepreneurship education research process required here is essentially qualitative in nature with exploration, identification and description of multiple realities as the main intention, rather than the determination of a single consensus.

While consensus was originally thought of in a statistical sense, different understandings of the idea of consensus are reflected in different versions of the Delphi technique that have emerged. There are three main variations, namely the numeric, the policy and the historic versions (Strauss and Ziegler, 1975; Reid. In Ellis, 1988). The numeric Delphi represents its original design, which aims to specify a single or minimum range of numeric estimates through the use of summary statistics. On the other hand, the policy Delphi and historic Delphi tend to produce more qualitative responses (Reid. In Ellis, 1988). The policy Delphi does not focus on establishing a single consensus relative to a specific reality but on the exploration, generation and definition of several alternatives and the arguments for and against each of these alternatives (Strauss and Ziegler, 1975; Mitchell, 1991) along with their underlying assumptions and views (Turoff. In Linstone and Turoff, 1975). The historic Delphi is retrospective and aims to "... explain the range of issues that fostered a specific decision or the identification of the range of possible alternatives that could have been poised against a certain past decision" (Strauss and Ziegler, 1975:253). Reid (in Ellis, 1988) states that with the policy and historic versions of Delphi "the collation of these responses will require some subjective judgments, but the normal practice is to feed back the full range of opinions or statements produced with some indication of the strength of support for each, and to invite the panel to reconsider on the basis of this information".

Considering the different approaches to the achievement of consensus should be reflected in debates about the research paradigm underlying the use of the Delphi technique, but explicitly debating and identifying the appropriate paradigm is often neglected.

The Delphi however does have a hybrid epistemological status as it straddles the qualitative and quantitative divides (Citcher and Gladstone, 1998), and evident in the literature is use of modified Delphi methods (Jeffery, Hache and Lehr, 1995; Cox and Hooper, 1998; Stewart and O'Halloran, 1999). Selecting from the range of paradigms identified by Guba (1990), when considering the ontology and epistemology appropriate to this research design, a constructivist paradigm is adopted.

Firstly, the research adopts a relativist ontology. This implies that "realities exist in the form of multiple mental constructions, socially and experientially based, local and specific in nature" (Guba, 1990; Guba and Lincoln. In Denzin and Lincoln, 1998:200). Also, the three-phase approach to the Delphi which is proposed here not only attempts to bring together multiple realities and perspectives at each phase, but in progressing from one phase to the next also entails the combination of different worlds, as the research moves from the realm of South African economic futures, to psychological requirements, to questions of educational policy, curriculum, teaching and learning within higher education.

Secondly, the research adopts a subjectivist, transactional epistemology. Subjective interaction is used to access the realities that exist only in the minds of respondents (Guba, 1990). The investigator and the object of investigation are assumed to be interactively linked with the "findings" being the creation of the process of interaction between the two, literally being created as the investigation proceeds (Guba and Lincoln. In Denzin and Lincoln, 1998; Guba, 1990). The conventional distinction between ontology and epistemology consequently disappears (Guba and Lincoln. In Denzin and Lincoln, 1998). A hermeneutic/dialectic methodology is used to identify the variety of constructions that exist and bring them into as much consensus

as possible (Guba, 1990). The constructions are elicited and refined through interaction between and among investigator and respondents and interpreted using conventional hermeneutical techniques (Guba and Lincoln. In Denzin and Lincoln, 1998; Guba, 1990).

In the entrepreneurship education Delphi, the researcher essentially adopts a role of what Miller and Crabtree (1992) call the constructivist inquirer. Here the researcher performs "... an ongoing iterative dance of discovery and interpretation" (Miller and Crabtree, 1992:11). The final aim is "... to distill a consensus construction that is more informed and sophisticated than any of the predecessor constructions" (Guba and Lincoln. In Denzin and Lincoln, 1998:207).

## **5. Practical issues in the Delphi research design and procedure**

While it has been argued that the Delphi technique is both relevant and flexible enough to be useful in addressing the entrepreneurial education research question posed above, there are still a number of practical considerations that need to be addressed, namely designing the Delphi, member selection and panel questions. These considerations need to be addressed in the context of the paradigm relevant to the research question and in light of the fact that the research consists of three phases to systematically address the three subsidiary questions.

### **5.1 Delphi design**

Delphi typically uses one panel with a number of rounds. However, the range of expertise and layering of the questions for this research requires a phased approach of three Delphi studies each with its own number of rounds. Each Delphi has its own objective yet is relevant to the next Delphi.

In phase one the focus is on clarification of the nature of the future economy. From the perspective of entrepreneurship education, where entrepreneurial opportunities are most likely to be found in the future economy need to be identified, in order to help clarify educational priorities. The objective of the phase is to identify a sector/area in the economy that will most likely make a significant contribution to economic growth and hence offer entrepreneurial opportunities. Another objective is to determine the technical skills domain of graduates entering the economic sector identified. A tension that emerges in this phase concerns the role of published literature versus the role of expert opinion, whether a Delphi is required, and if so, for what purpose. Published reports are available on the future growth areas and skill requirements of the South African economy, but these reports tend to have a shorter time horizon than 25-40 years from now. The suitability of a numeric version of the Delphi in this phase consequently arises from the need to establish consensus around economic and educational priorities 25-40 years from now.

Phase two of the research moves onto the qualities that will be required of the innovative entrepreneur participating in the economy in the next 25 to 40 years. This phase requires a policy-type Delphi. The objective of this phase is to formulate a profile of the person who will be able to participate successfully as an innovative entrepreneur in the identified sector of the economy.

Having an idea of the profile of the innovative entrepreneur in mind, the focus shifts in the third phase to the preparation and education of these individuals within the Higher Education context of South Africa. The objective of the phase is to identify what Higher Education in South Africa needs to do to prepare and develop students to participate in the economy in 25-40 years as innovative entrepreneurs. Here the policy variation of Delphi is appropriate in that the focus is more on the exploration of alternatives regarding what can be done to prepare and develop innovative entrepreneurs. Three separate Delphi panels can be used with alumni of entrepreneurship education programmes first judging the teaching and learning practices and processes that were used in their education, current academics teaching entrepreneurship in South Africa judging the adequacy of what is currently being done in the light of the requirements identified, and lastly educationalists and academics teaching entrepreneurship in South Africa creating insight into what higher education can do to develop the innovative entrepreneur.

### **5.2 Member selection**

An important practical consideration here concerns who is most qualified as an expert to serve on a particular Delphi panel. Again this decision is influenced by the objective of the particular Delphi.

Phase One requires panel members to be experts on the South African economy. Criteria for membership to the panel will be based on their representation on bodies such as the South African Department of Trade

and Industry (DTI), or the Human Sciences Research Council (HSRC), since they are involved in futures research relevant to the South African economy and the future skills requirements.

Given the objective of phase two, experts can include those knowledgeable in the area of entrepreneurship. Criteria to be used to identify experts include individuals occupying an endowed Chair in the area of entrepreneurship. The task of this panel of experts will initially be that of creating insight into the qualities of an innovative entrepreneur and to judge the appropriateness and importance of the qualities.

Given the objective of phase three, individuals who can assist in this phase include alumni who will be selected on the basis of having graduated from a university programme designed specifically to develop entrepreneurs, educationalists selected on the basis of their role in the South African Higher Education Quality Committee (HEQC) and academics responsible for designing entrepreneurship programmes and teaching entrepreneurship in South Africa universities.

### **5.3 Panel questions**

The future focus of the research is a particular challenge for researchers. The challenge is to get individuals to see into the future, which in itself is difficult. Questions arise as to the appropriate time period in the future, how to get panel members to project themselves into the relevant time period, and how to get them to provide valid and reliable information. Much depends on the formulation of the question for panel members. The question for panel members would be "What do you envisage the economic growth areas to be in 25 to 40 years from now, and what academic disciplines would primarily be required to realise this growth?"

With the results of phase one in mind, the panel members in phase two will need to generate a profile of an innovative entrepreneur who is a graduate from one of the specified academic disciplines, and is able to participate in an innovative way in the specified sector of the economy. The question for panel members would be "What knowledge, understanding, skills, behaviour, attitudes and thinking is required of the innovative entrepreneur?"

The third phase, involving Delphi panels would pose different questions to each panel. Alumni would need to initially describe the teaching and learning activities and processes used in their education and would then be asked to judge these activities and processes. Academics involved in teaching entrepreneurship will describe the teaching and learning activities and processes used to develop entrepreneurs and would be asked to judge the activities and processes in the light of the results generated in the previous phases. Academics teaching entrepreneurship as well as educationalists would be asked "What do Universities in South Africa need to do to prepare and develop students as innovative entrepreneurs?"

## **6. Conclusion**

This paper illustrates a pragmatic approach to research design. In illustrating the use of the Delphi in this paper, it is apparent that the research problem at hand drove research design considerations. Therefore, the research design needs to adapt to the research problem's requirements, rather than being imposed upon and reformulating the problem. The Delphi technique is a versatile research method used for futures research, or for research into areas where knowledge is incomplete. As illustrated above, no other research design seems to offer the same degree of versatility. However, when using the technique, this versatility may lead to superficial consideration being given to its appropriate use, from the perspective of the philosophy of the research, and the overall coherence of the research design. The researcher needs to systematically think through and construct the relationship between the research problem, the appropriate research paradigm and the design of the research. By engaging in the debate regarding the philosophy of the research design, the researcher is able to not only determine the relevance of the Delphi but also to plan the appropriate use of the technique. In considering entrepreneurial education research illustrated in this paper, these considerations were evident in the formulation of the research paradigm and in the design of a three-phase approach.

In planning the use of the Delphi careful attention needs to be paid to practical issues in the design and use of the Delphi. In particular, the researcher needs to carefully consider the specific purpose for which the Delphi is to be used in the research which in turn assists in determining the type of Delphi. In considering the purpose, it is useful to formulate clear objectives for the Delphi in line with the research question. It is also useful to clarify the task of the panel in terms of either judging information and/or creating an understanding, or new knowledge. Attention also needs to be paid to who will be selected and on what basis, to participate as members of the panel. Finally, attention needs to be paid to the questions to be posed to the panel to

elicit information relevant to the research question. The objectives for the Delphi assists in the formulation of questions, but the biggest challenge here is to understand the concept of the future in relation to the research question, and to formulate questions for the panel which will elicit information relevant to the research.

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