

Delphi Technique: A veritable policy analysis tool for enhancing sustainable economic recovery in Nigeria through Industrial and Technology Education Programme

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Abstract

There are various policy analysis tools used in analyzing various policies in various organizations, company, or educational institutions globally. These tools have peculiar qualities which makes them more suitable for a particular kind of policy task or institutional framework. This research paper therefore, identified ten policy analysis tools suitable for various types of organizations whether it is educational institution, industry or corporate enterprises with specific emphasis on Delphi technique. The core meaning of Delphi technique was explained. The term paper also discussed the three major types of Delphi techniques, the characteristics as well as the processes involved. The paper also discussed the usefulness of Delphi technique for enhancing sustainable economic recovery in Nigeria through Industrial and Technology Education Programme.

Keywords: Delphi Technique, Policy analysis tool, Economic recovery, Sustainable economic recovery, Industrial and Technology Education Programme.

Introduction

Economic recovery is a stage in the economic cycle which could be experienced by the economy of a nation at any time. Of the four stages of economic cycle which are economic expansion, recession, depression and recovery; economic recovery is the last stage and involves reviving a recessed or depressed economy (Paul, 2017). In an economic recovery, various indicators will turn higher in favour of the masses; including Gross Domestic Product (GDP) annualized growth and employment. In an economic recovery, business enterprises will see an up rise in product demand and will start hiring thereby increasing employment. People will begin going back to work, confidence will start to increase and consumers will have regular supplies of products and services will be easily available at affordable cost.

Sustainable economic recovery according to Onyenekenwa (2010), refers to a continual process of strengthening the economy of a nation after a period of recession or depression. Sustainable Economic Recovery (SER) can also be referred to as a continual process that is geared towards restoring positive economic development and growth in a nation that has experienced economic recession or depression. A sustainable economic recovery occurs when an economy continues to strengthen progressively after a period of economic recession or depression. SER brings about economic expansion and an economic expansion increases the demand for both capital and consumer goods. During SER, industries invest in more production facilities in anticipation of taking advantage of increases in sales and profit. SER also allows banks to lend capital for expansion at low interest rates. Strong demand pushes the need for more workers to work on these industries, which brings about an increase in employment levels.

SER stage is characterized by an increase in consumers' confidence of the market. The bank lending rates are low to encourage loan collection, and companies can afford to finance projects (Prince & Odia, 2010). There is an increase in productivity due to the increased aggregate demand in the economy. Increase in production allows companies to start employing, which in turn, increases the income of consumers who can now afford to purchase capital goods. Profit margins of companies starts rising, and the gross domestic product also start to increase. SER is a way of reviving a recessed economy to enhance better social and economic well being of citizens.

Overview of Policy and Policy Analysis Tool

A policy refers to a plan of action agreed or chosen by a political party, government, business or an organization which guides their action and decision. It can also refer to the principle that an individual believes in, that influences how he behaves. Webster (2003) defined a policy as a definite course or method of action selected by government, institution, group or individual from among alternatives and in the light of given conditions to guide and, usually, to determine present and future decisions. According to Smith (2002), a policy is a principle or protocol to guide decisions and achieve rational outcomes.

In the field of education, policy is a plan of action used by the Ministry of Education to set out clear rules and expectations for the delivery of programs and services to the public (Gerald ,2006). Policies come from legislation or from decisions made by elected officials, such as Ministers and School Trustees, or public servants and school administrators. Policies can be communicated through various instruments, including: policy documents, laws, contracts, partnerships, the funding formula, government direction such as the throne speech, and many others.

Policy analysis tools are aids or instrument used for analyzing policies to enhance organizational or institutional effectiveness. There exists various policy analysis tools used in analyzing various policies in various organizations, company, or educational institutions globally. These tools have peculiar qualities which makes them more suitable for a particular kind of policy task or institutional framework. Stone .(2008) identified ten policy analysis tools which includes : Management by objective, Planning programming budgeting system, Zero based budgeting, Policy indicators, Policy experiments, models and simulations, cost benefit analysis, program evaluation/performance assessment, SWOT analysis and Delphi technique. This term paper aimed at explaining Delphi technique and its usefulness to Industrial and Technology Education programme.

Delphi Technique as a Policy Analysis Tool

The Delphi technique is a policy analysis tool as well as a research tool used to gain consensus through a series of rounds of questionnaire surveys, usually two or three, where information and results are fed back to panel members between each round. This research tool permits researchers to combine the reports of a group of experts into one, useful statement. The Delphi technique had its genesis at the Rand Corporation in the early 1950s as a forecasting tool for the military. Its purpose is to solicit reliable responses from a panel of experts regarding a particular problem or dilemma. According to Hsu and Sandford (2007), the Delphi technique, mainly developed by Dalkey and Helmer at the Rand Corporation in the 1950s, is a widely used and accepted method for achieving

convergence of opinion concerning real-world knowledge solicited from experts within certain topic areas.

Millar (2001) describe the Delphi method as a communication process that is structured to produce a detailed examination of a topic/problem and discussion from the participating group, but not one that forces a quick compromise. Thus, the structuring of group communications is an essential component of the Delphi. This structure permits the process to be an effective way to allow a group of individuals, as a whole, to deal with a complex problem.

Critical to this communication process are four factors: some feedback of individual contributions of information and knowledge; some assessment of the group judgment or view; some opportunity for individuals to revise views; and some degree of anonymity for the individual responses (Powell, 2003). This research technique allows educators, amongst others, to communicate and effectively develop trends, needs, or other factors relative to a particular area of education.

The Delphi Technique is a research methodology that is used to elicit, distill, and determine the opinions of a panel of experts from a given field, seek consensus among the experts, and make predictions or decisions using the expert opinions of the panelists involved in the study. The Delphi Technique also highlights areas of divergence of opinions. This research methodology is based on the premise that the collective opinions of expert panelists are of richer quality than the limited view of an individual. This research methodology was developed by Helmer and Dalkey at the Rand Corporation during the early 1950s to explore technology and science trends (Munier, & Rondé , 2001), The authors described the Delphi Technique 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.

The Delphi Technique is one of the most beneficial forecasting procedures used by decision makers. While participants, usually referred to as expert panelists, in a Delphi study are separated by time and space, they can engage in the same process at their own pace and time, independent of each other and without the influence of the other expert panelists on their opinions. The Delphi process relies on the anonymity of the participants to minimize any influence on the opinion of expert panelists as they vote on issues. The Delphi technique is well suited as a means and method for consensus-building by using a series of questionnaires to collect data from a panel of selected subjects. Cohen, Manion and Morrison (2000) revealed that Delphi technique can be used for achieving the following objectives:

1. To determine or develop a range of possible program alternatives;
2. To explore or expose underlying assumptions or information leading to different judgments;
3. To seek out information that may generate a consensus on the part of the respondent group;
4. To correlate informed judgments on a topic spanning a wide range of disciplines, and;
5. To educate the respondent group as to the diverse and interrelated aspects of the topic.

Types of Delphi Technique

According to Van-Zolingen, and Klaassen (2003), three major types of Delphi are in existence and are: Classical Delphi; Policy Delphi and also Decision Delphi.

The Classical Delphi: This type of Delphi is characterized by five features. They are: anonymity, iteration, controlled feedback, statistical group response and stability in responses among those with expertise on a specific issue. Participants in this type of Delphi have expertise and give opinions to arrive at stability in responses on specific issues.

The Policy Delphi: The aim in this situation is not to reach stability in responses among those with expertise but to generate policy alternatives by using a structured public dialogue. Here the Delphi is an instrument for policy development and promoting participation by obtaining as many divergent opinions as possible. It is characterized by 'selective anonymity', iteration, controlled feedback, polarized group response and structured conflict. Selective anonymity may mean that participants answer questions individually but may also come together in a group meeting.

The Decision Delphi: This type of Delphi is used for decision making on social developments. Reality is created by a group of decision-makers rather than from the ad-hoc decision of only a small number of persons. Crucial to this type is that decision-makers involved in the problem participate in the Delphi. They are selected according to their position in the hierarchy of decision-makers and the aim is to structure thinking so that consensus can be achieved. The characteristic is 'quasi-anonymity' (where people with expertise are mentioned by name and known to everybody from the beginning but questionnaire responses are anonymous).

Characteristics of Delphi Technique

Hsu and Sandford (2007) revealed that Delphi technique possess the following characteristics which distinguish it from other policy analysis tool:

1. Delphi, in contrast to other data gathering and analysis techniques, employs multiple iterations designed to develop a consensus of opinion concerning a specific topic. Hsu and Sandford (2007) indicated that: Iterations refer to the feedback process. The process was viewed as a series of rounds; in each round every participant worked through a questionnaire which was returned to the researcher who collected, edited, and returned to every participant a statement of the position of the whole group and the participant's own position. A summation of comments made each participant aware of the range of opinions and the reasons underlying those opinions.
2. More specifically, the feedback process allows and encourages the selected Delphi participants to reassess their initial judgments about the information provided in previous iterations.
3. Since participants in a Delphi study can reassess their initial judgments about the information provided in previous iterations, it implies that, in a Delphi study, the results of

previous iterations regarding specific statements and/or items can change or be modified by individual panel members in later iterations based on their ability to review and assess the comments and feedback provided by the other Delphi panelists.

4. Delphi technique provides anonymity to respondents. One of the primary characteristics and advantages of the Delphi process is subject anonymity which can reduce the effects of dominant individuals which often is a concern when using group-based processes used to collect and synthesize information
5. It allows a controlled feedback process. Controlled feedback in the Delphi process is designed to reduce the effect of noise. Hsu and Sandford (2007) defined noise as that communication which occurs in a group process which both distorts the data and deals with group and/or individual interests rather than focusing on problem solving. As a result, the information developed from this kind of communication generally consists of bias not related to the purposes of the study. Basically, the controlled feedback process consists of a well organized summary of the prior iteration intentionally distributed to the subjects which allows each participant an opportunity to generate additional insights and more thoroughly clarify the information developed by previous iterations. Through the operation of multiple iterations, subjects are expected to become more problem-solving oriented, to offer their opinions more insightfully, and to minimize the effects of noise.
6. Delphi technique permits the suitability of a variety of statistical analysis techniques to interpret the data. The ability to use statistical analysis techniques is a practice which further reduces the potential of group pressure for conformity. More specifically, statistical analysis can ensure that opinions generated by each subject of a Delphi study are well represented in the final iteration because, at the end of the exercise there may still be a significant spread in individual opinions. That is, each subject would have no pressure, either real or perceived, to conform to another participant's responses that may originate from obedience to social norms, customs, organizational culture, or standing within a profession. The tools of statistical analysis allow for an objective and impartial analysis and summarization of the collected data.
7. Delphi technique enhances confidentiality. The issue of confidentiality is facilitated by geographic dispersion of the subjects as well as the use of electronic communication such as e-mail to solicit and exchange information. As such, certain downsides associated with group dynamics such as manipulation or coercion to conform or adopt a certain viewpoint can be minimized.

The Delphi Process

Delphi technique involves four processes called Rounds. According to Keeney, Hasson and McKenna (2001), the following discussion, however, provides guidelines for up to four iterations in order to assist those who decide to use the Delphi process as a data collection technique when it is determined that additional iterations beyond three are needed or valuable.

Round 1: In the first round, the Delphi process traditionally begins with an open-ended questionnaire. The open-ended questionnaire serves as the cornerstone of soliciting specific information about a content area from the Delphi subjects. After receiving subjects' responses,

investigators need to convert the collected information into a well-structured questionnaire. This questionnaire is used as the survey instrument for the second round of data collection. It should be noted that it is both an acceptable and a common modification of the Delphi process format to use a structured questionnaire in Round 1 that is based upon an extensive review of the literature.

Round 2: In the second round, each Delphi participant receives a second questionnaire and is asked to review the items summarized by the investigators based on the information provided in the first round. Accordingly, Delphi panelists may be required to rate or rank-order items to establish preliminary priorities among items. As a result of round two, areas of disagreement and agreement are identified. In some cases, Delphi panelists are asked to state the rationale concerning rating priorities among items. In this round, consensus begins forming and the actual outcomes can be presented among the participants' responses.

Round 3: In the third round, each Delphi panelist receives a questionnaire that includes the items and ratings summarized by the investigators in the previous round and are asked to revise his/her judgments or to specify the reasons for remaining outside the consensus. This round gives Delphi panelists an opportunity to make further clarifications of both the information and their judgments of the relative importance of the items. However, compared to the previous round, only a slight increase in the degree of consensus can be expected.

Round 4: In the fourth and often final round, the list of remaining items, their ratings, minority opinions, and items achieving consensus are distributed to the panelists. This round provides a final opportunity for participants to revise their judgments. It should be remembered that the number of Delphi iterations depends largely on the degree of consensus sought by the investigators and can vary from three to five (Lai, Wong & Cehung, 2002).

Overview of Industrial and Technology Education Programme in Nigeria

The Industrial and Technology Education programme is a programme designed to train Vocational and Technical teachers to teach effectively in Technical Vocational Education and Training (TVET) institutions as well as to function effectively as skilled technicians in the industries. The aim of establishing Industrial and Technology Education programme is to train individuals to equip them with teaching skills and technical skills in specific occupational area of specialization to enable them function effectively as Vocational and Technical teachers at TVET institutions (technical colleges, vocational schools, training centers) as well as skilled technical personnel in industries. The graduate of this programme is also trained on how to teach Basic Technology (Introductory Technology) at the junior secondary school level as well as other vocational and pre-vocational subjects at secondary school level. Usually in most institutions, the specific occupational area of specialization covered by Industrial and Technology Education programme include: Automobile Technology, Building Technology, Electrical / Electronics Technology, Metalwork Technology as well as Woodwork Technology. In some institutions, courses in related occupational areas are merged together or given different names. For example in some institution the five options are categorized as: Building/Woodwork Technology, Electrical/ Electronic Technology and Motor Vehicle/Mechanical Technology. The major objective of Industrial and Technology Education programme is to produce qualified skilled technical teachers to enhance implementation of effective TVET programmes in Nigeria.

TVET is the aspect of education saddled with the responsibility for equipping individuals with relevant work skills in specific occupational areas. TVET according to Adetokunbo (2009), is a form of education that prepares learners who could apply relevant practical skill to make positive changes within their society and afford a self dependent life. TVET major objective is to prepare individuals for employment in chosen occupations by equipping them with vocational skills, knowledge and attitude necessary for employment in specific occupations. TVET equips individuals with the requisite technical skills for survival in the world of work. Educational scholars and researchers have several times attested to the fact that this form of education provides self employment, enhance productivity and self reliance (International Labour Organization, 2010). TVET gives individual the skills to live, learn and work as productive citizen. It reduces the over dependence of graduates on government for employment. The National Policy on Education (FRN, 2013) described TVET as a comprehensive term referring to those aspects of the educational process involving, in addition to general education, the study of technologies and related sciences and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of economic and social life. Specifically the National Policy on Education (FRN, 2013) stated that the goals of TVET shall be to: provide trained manpower in the applied sciences, technology and business particularly at craft, advanced craft and technical level; provide the technical knowledge and vocational skills necessary for agricultural, commercial and economic development; and give training and impart the necessary skills to individuals who shall be self-reliant economically.

Usefulness of Delphi Technique for Enhancing Sustainable Economic Recovery in Nigeria through Industrial and Technology Education Programme

Research in Industrial and Technology Education (ITE) programme often centers around qualitative and quantitative research designs. The Delphi Technique provides a structured communication process designed to produce a detailed examination of a topic and/or problem and discussion from the participating group (Keeney, Hasson & McKenna ,2001). The contributions of individuals via this tool produce a group perspective not otherwise attainable effectively via other tools.

Lai, Wong and Cehung (2002) revealed that empirical studies conducted within the Industrial and Technology Education programme globally tends to give greater emphasis to quantitative data collection techniques. Aware of the potential usefulness of combination of techniques, called for the need for the application of the Delphi technique where qualitative and quantitative data collection techniques are used to reach useful results.

The usefulness of Delphi technique to industrial and technology education programme are numerous as outlined and explain below:

- a. The Delphi technique is very useful as it provides the opportunity for researchers in Industrial and Technology Education programme to gather input from participants without requiring them to work face-to-face. Often, the process is used to find consensus among TVET experts who have differing views and perspectives.
- b. The Delphi technique enables group problem-solving using an iterative process of problem definition, discussion, feedback, and revisions.

- c. The Delphi technique enhances research in ITE programme. ITE is an educational system that provides specialized training to increase the level of skills and some other skills in leading toward a developing country. To sustain ITE, research is one of the vital activity. Research in field of ITE have predominantly used the quantitative research design approach and less so the qualitative approach. Thus, in this article we will discuss one research approach that effectively combine the quantitative and qualitative approach namely, the Delphi technique which can be used by ITE researchers for structuring a group communication process to facilitate group problem solving and to structure models.
- d. The policy analysis tool can also be used as a judgment, decision-aiding or a forecasting tool, and can be applied to program planning and administration.
- e. The Delphi method can be used when there is incomplete knowledge about a problem or phenomena.
- f. The method can be applied to problems that do not lend themselves to precise analytical techniques, but rather could benefit from the subjective judgments of individuals on a collective basis and to focus their collective human intelligence on the problem at hand.
- g. The Delphi method is a mature and a very adaptable research tool used in many research arenas by researchers across the globe. To better understand its diversity in applications, one needs to consider the origins of the Delphi method.
- h. To reiterate, the Delphi technique is a framework used to conduct a research by collecting and analyzing opinions of a group of experts in the fields of the chosen study. Delphi technique is efficient to determine the competency of vocational and technical teachers, the curriculum or lesson content and direction of specific goals in ITE programme to ascertain progress.
- i. This technique is said to be a unique and useful method, especially in the process of collecting and refining the review of all the information thus obtained feedback from a group of experts who have been selected.
- j. Delphi technique is very useful in predicting a future expansion of ITE programme. This is because in the Delphi technique, there are three resources that will determine the final outcome of the study. The three resources are knowledge, suggestions and speculative submitted by each expert. Through these three sources, the agreement or consensus on the decision to be made by a group of experts will be more accurate and true. Knowledge is the key resource in making a decision because it can be used as a basis in giving the right suggestion and information. With knowledge, speculation can be made so that it can be used as a source of information despite the lowest status to make decisions (Munier and Rondé , 2001). Thus, the use of speculation, suggestions and knowledge among experts in decision making is the most suitable for predicting a future expansion of ITE programme.

Conclusion

Based on the review it was concluded that there are four individual phases in the Delphi process. The first phase explores the subject being researched, giving participants the opportunity to contribute information they feel is appropriate. The second phase moves to determine an understanding of how the entire group views the issue. If significant disagreement is determined,

the third phase is used to explore that disagreement and determine reasons for differences. The fourth phase is a final evaluation of all gathered information. The Delphi method provides different opportunities to researchers than other policy analysis tool. Essential components of the Delphi technique include the communication process, a group of experts, and essential feedback. The Delphi method has been used in a variety of ways in government, business, and education. This manuscript has presented the key principles of the Delphi technique and has provided its usefulness in industrial and technology education programme. The technique benefits from being a democratic and structured approach that harnesses the collective wisdom of participants via a questionnaire. Its most significant strength lies in the ability to gather opinion and seek consensus among a diverse group of participants. The weakness of the Delphi technique lies in the fact that, a wrong sequence or selection of the Delphi technique for use by a research can lead to failure and waste of resources. It is therefore recommended that researchers and policy analyst understand the components of Delphi technique before using it as a policy analysis tool.

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