

The Delphi technique: A credible research methodology

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Abstract – The Delphi technique as a research method for achieving consensus of opinion of participants, is sometimes seen as a less reliable research method. This is because the participants do change their opinions from one round of the exercise to the other. Instead of seeing this as weakness, it is actually viewed as the strength of the technique. The controlled feedbacks allow participants to view their individual submissions in the light of the insight of the whole group. The Delphi technique is virtually the only research method that allows participants to interact with the opinions of each others, without coercion, adjust one's position where necessary and yet retain anonymity. The thoughtful selection of participants and effective communication throughout the exercise ensures that the outcome of the exercise is truly a consensus opinion of the group that can offer an appropriate solution to the research question. The participants for the Delphi exercise, being reported, were chosen from the strategic and tactical levels of leadership of the client, end-user and the service provider. Although participants changed their opinions from one round to the other, the net result showed a more refined selection of appropriate Key Performance Indicators, without evidence of complicity or coercion.

Keywords – Delphi technique, participants' opinion, selection of participants, effective communication

I. INTRODUCTION

The Delphi technique may not fit perfectly into the classical divide between qualitative and quantitative research methodologies or as a tool for a mixed methodology, but is a 'hybrid' of the qualitative and quantitative research methods. It is a single technique that integrates the elements of both qualitative and quantitative methodologies in addressing a specific research problem. Critics have sought different ways to discredit the Delphi technique as a valid method of robust research. One of the subtle criticisms is that panel members 'may change their views in line with perceived superior opinions', especially when the participating panelist knows about other participants whom they hold in high esteem [1, 2]. When participants change their opinions from one round of the Delphi exercise to another it should not be seen as weakness, but as strength of the Delphi technique; especially when these changes are unique to the individual participants. The controlled feedbacks allow participants to view their individual submissions in the light of the whole group, "bringing panelists towards group consensus" [1]. The choice and use of the Delphi technique for consensus building stem from the concept or theory that "several people are less likely to arrive at a wrong decision than a single individual" [1 p. 1013]. A unique feature of the Delphi method is that decisions are reached through informed consensus of knowledgeable participants [10]. Two internal components of a typical Delphi exercise that helps to guide against the 'bandwagon' effect are the choice of the panel of experts and effective communication between the research facilitator and participants.

Although the term 'experts' has attracted some debate, for simplicity sake, the term 'participants' will be used in this paper. The participants are individuals within an elastic continuum of an inclusive population of individuals with broad based professional and experiential knowledge of the subject and willing to dedicate time to the repeated process of the Delphi exercise [3]. The participants are not chosen at random, but 'purposively' by adopting defined prequalification criteria [14, 10, 4, 5, 6]. Therefore, participants chosen from within these envelopes should be persons of integrity with independent minds,

whose opinions can be trusted. Reference [1] observes that “if individuals are to be affected directly by the decision to be made, they are more likely to become involved in the Delphi process”.

The research being reported in this paper is part of a larger research exercise designed for the mutual development of Key Performance Indicators (KPIs) for measuring the performance of the operation of the Facilities Management (FM) unit in a Higher Education (HE) institution in South Africa. The panel members were drawn from the strategic and tactical levels of leadership among the client – dean of faculties, customer or end-users – heads of academic departments and the service providers – FM unit. This paper commences with a literature review, progressing to the research method, findings and discussion and culminates in the conclusion and recommendation.

II. LITERATURE REVIEW

The literature review serves the purpose of helping the researcher to position the new work in the context of previous research efforts by identifying existing theories and models. It helps new research efforts to identify unresolved problems in the field being studied and allows the new research to benefit from tested methods. In the area of consensus building, the Delphi technique is an emerging methodology gaining wide acceptance in both academic and industry-related research. The literature reviewed here provides general information on the use of the Delphi technique and how to mitigate potential shortcomings.

A The Delphi technique

The idea of obtaining a solution to a strategic or operational problem through a ‘group’ decision or ‘consensus’ building process is part of a well-established management approach. Some of the common tools used to achieve this objective include the Value Engineering (VE) seminar [7, 8], Focus Group (FG) sessions [9] and the Delphi method [10, 11]. The major difference between the VE and FG on the one hand and Delphi technique on the other hand is that, in the former the participants congregate at a point and share ideas on the subject under review, with the disadvantage of the most influential figure in the group lording it over the others. While in the Delphi technique the participants act as autonomous individuals contributing to the “consensus opinion of a group of experts by [using] a series of intensive questionnaires interspersed with controlled feedbacks” [5]. There are up to ten different types of Delphi designs [5, p. 1697], but three common classifications of the Delphi techniques in practice and the variations within each classification include the classical, decision-making and policy Delphi methods [12]. A brief description of the three types follows below.

The classical Delphi method functions as a forum for establishing facts about a specific situation or topic. The decision-making Delphi is used to encourage collaborative decision making whereas idea generation about a topic is the purpose of the policy Delphi method [12, p. 238].

The Delphi technique is useful where information gathering and feedback from stakeholders (experts) is difficult due to busy schedules (academics), geographical barriers and the need to guarantee anonymity [11]. The tool is “useful when objective data are unattainable, there is a lack of empirical evidence, experimental research is unrealistic or unethical, or when the heterogeneity of the participants must be preserved to assure validity of the results” [4, p. 1]; or the “issue under investigation does not lend itself to precise analytical techniques, but can benefit greatly from subjective judgments on a collective basis” [10, p. 114]. The Delphi technique for consensus building hinges on the concept that “several people are less likely to arrive at a wrong decision than a single individual” [1, p. 1013]. One of the unique features of the Delphi technique is that decisions are reached through informed consensus rather than through the opinions of many uninformed participants [10].

B The Delphi panel

The basic principles underpinning the Delphi technique include: the identification and use of cognate participants (who may or may not know each other) capable of addressing the issues raised in the research question [12]; the contribution of each member of the panel is treated in confidence and no participant will be traceable to his contribution [13]; the group interacts with the issue at stake through a series of iteration processes, where the information of previous iterations is communicated to all participants to

see; all submissions are processed through a central coordinator or facilitator, who recycles the feedback to participants after each iteration [13,12]. The size of a Delphi panel may be as small as three members and as large as 80 [2, 10]. It is important to select people who are knowledgeable in the field of study and are willing to commit themselves to multiple rounds of questions or interactions on the same topic [10].

Adopting appropriate prequalification criteria for the selection of participants allows the coordinator to harness individuals with substantive knowledge in the area being investigated, commonly known as a 'panel of informed individuals' [2, 14, 6]. The selection exercise could be as simple as possible or complex, but the objective is to identify experts in the field of study and thereby improve the quality of the result. Grisham [10] did a cross-cultural study that was to test the hypothesis that "there are universal attributes for cross-cultural leadership that are effective regardless of culture" [10, p. 119]. To examine this topic he raised a panel of 25 experts from different regions of the world including Eastern Europe, Nordic Europe, Germanic Europe, Latin Europe, Latin America, Confucian Asia, Southern Asia, Sub-Saharan Africa, and the Middle East" [10, p. 122]. The author described individual members of this group of experts "as a person that has at least 20 years of practical experience working in an international or multicultural environment, in any industry or a person that has an advanced degree in leadership or cross-cultural studies with over 20 years of research, teaching, publication experience; or a combination of the two" [10, p. 121]. The method of selecting the participants follows closely to the 'purposive or criterion sampling' rather than random sampling [1], because the participants are selected for a purpose, to apply their knowledge or expertise to a certain problem within the confines of the area to be investigated. Concerted efforts should be made to manage the effects of high attrition rates by recruiting a large number of participants at the initial phase, exceeding the set mark for 'preferred group size'. The best approach to secure effective participation is to engage prospective participants on a one-on-one interaction, where possible [14, 3]. Using the data base of professional bodies, institutions, etc. are possibilities, but may not be reliable due to changes in the location of the individuals.

C Managing the Delphi process

The Delphi exercise can be administered using either or both the Paper and Pencil (PP) Delphi or Real Time (RT) Delphi, using the computer system [11, 6]. Reference [11] confirmed that the results obtained from both methods to address the same problem were identical. The procedure is to circulate the information the participants are to interact with, collate the responses and re-circulate the feedback to the panel members. The process continues until consensus is achieved. There are no firm rules regarding the number of rounds in the Delphi exercise. One or many rounds of information gathering suffices, providing the facilitator is satisfied with the level of consensus, convergence of opinion or the participants are no longer modifying their earlier decisions [12, 15]. However, there is information in literature suggesting that a consensus range of between 51 and 80% of agreement amongst participants [1]. The method of determining convergence of opinion should be spelt out at the beginning of the exercise [16, 14], applied and communicated to all participants through the different rounds and in the final report. The use of descriptive and inferential statistics is a standard way of ascertaining the level of collective opinion; computing and disseminating information on central tendencies (means, medians, and mode) and levels of dispersion (standard deviation and the inter-quartile range) to participants that allows them to see the trend about the collected opinion [1,14,15].

III. RESEARCH METHOD

The subject of this research was the development of a performance measuring standard with which to measure the performance of the FM unit of a HE institution in South Africa. This was a single unit case study [17] that required "an intensive study for the purpose of understanding a larger class of (similar) units" [18, p. 342]. Although there are no strict rules on the sample size in qualitative research and using the Delphi technique for data collection, the sample size of eight participants is seen as an acceptable minimum [4]. In order to manage the attrition rate, a large sample size was at the initial stage recruited from the target population who are knowledgeable individuals and willing to participate in the exercise.

IV. FINDINGS AND DISCUSSION

The 'modified classic' Delphi method [5] was adopted in this research. It involved the circulation of a generic list containing 112 industry-wide KPIs, gleaned from literature and experience, arranged around

seven main headings and eight sub-headings. Participants interacted with the document, rating each item, anonymously, according to their perception of the order of importance, using the Linkert scale of 1-5, where 5 is the highest and 1 the lowest rating. The exercise went through three rounds of collating and successive iterations before results were escalated to the next stage. The participants were informed about the following rules of the game: The items on the list are not in any particular order. Please, interact with the list and rate each item in your considered order of importance on a scale of 1-5, with 5 being the highest and 1, the lowest rating. Mail your response to me for collation. We will engage in this process at least three times. Only the items that are rated 3 and above in this first stage will be escalated from first to the second stage. Similarly, the items that are rated 3 and above in the second stage will translate to the third stage and the items rated 3 and above in the third stage will constitute the performance standards – Key Performance Indicators (KPIs), to be arranged in their order of priority and classification in each sub-section. I will circulate the final result to all participants at the end of the exercise, after a focus group discussion.

Their responses to the information on the section dealing with ‘safety issues’, is cited here to illustrate the Delphi process. A generic list of ten items was circulated to participants in the first round. Although the list of items did not reduce from one round to the other, the position of the items kept changing, reflecting the priority perception of participants [14, 3, 15]. Table 1 shows the response to the three rounds.

Table 1: Response to the Delphi exercise

SAFETY ISSUES						
<i>S/No</i>	<i>Round 1</i>	<i>Score</i>	<i>Round 2</i>	<i>Score</i>	<i>Round 3</i>	<i>Score</i>
1	Compliance to statutory regulations	4.2	Effective management and disposal of hazardous materials	4.44	Effective demarcation of unsafe areas	4.57
2	Effective demarcation of unsafe areas	3.93	Compliance to statutory regulations	4.67	Compliance to statutory regulations	4.57
3	Maintaining safe working environment within academic facilities	4.13	Maintaining safe working environment within academic facilities	4,57	Maintaining safe working environment within academic facilities	4.57
4	Training of safety personnel in every local unit for teaching and research facilities	3.8	Effective communication before evacuation drill	4.22	Effective management and disposal of hazardous materials	4.71
5	Periodic education on safety matters	3.33	Effective demarcation of unsafe areas	4.78	Training of safety personnel in every local unit for teaching and research facilities	4.21
6	Proper signage	3.8	Regular practice of evacuation drill	4.22	Regular practice of evacuation drill	4.0
7	Regular practice of evacuation drill	3.87	Training of safety personnel in every local unit for teaching and research facilities	4.33	Effective communication before evacuation drill	4.0
8	Effective management and disposal of hazardous materials	4.33	Periodic education on safety matters	3.89	Proper signage	4.21
9	Effective communication before evacuation drill	4.07	Proper signage	4.11	Periodic education on safety matters	4.07
10	Installation of cable network in accordance with relevant building code.	3.27	Installation of cable network in accordance with relevant building code.	3.89	Installation of cable network in accordance with relevant building code.	3.64

Furthermore, in round 3, participants were encouraged to rate the items according to their perceived order of priorities. A synthesis of the final response identifying the priority list and classification of the KPIs is shown in Table 2. The items classified under high and medium priority agree with the strategic objectives of the institution. This challenges the service provider's (FM) unit to pay priority attention to these items to ensure safety within the built facilities of the university in the interest of the staff, students and visitors. Research on safety within built facilities has stressed the need for consistent information flow, maintain functional egress routes, main and emergency exit facilities in order to reduce fatality rates [19, 20]; adequate and legible signs to guide end-users to the nearest exit and adopting consistent colour to indicate the directional signs and exit features [19, 20].

Table 2: Priority list of KPIs and classification

S/No	Category	Description, classification and rating		
		High priority (4.5-5.0)	Medium priority (4.0-4.49)	Low priority (3.5-3.99)
		<i>Safety issues</i>		
		Effective management and disposal of hazardous materials	Training of safety personnel in every local unit for teaching and research facilities	Installation of cable network in accordance with relevant building code.
		Compliance to statutory regulations	Proper signage	
		Maintaining safe working environment within academic facilities	Periodic education on safety matters	
		Effective demarcation of unsafe areas	Effective communication before evacuation drill	
			Regular practice of evacuation drill	

V. CONCLUSION AND RECOMMENDATION

The Delphi technique, as a research method, seeks to achieve 'consensus opinion of a group of experts' through a repeated exercise where the participants have the liberty to change their opinions without coercion through the effective management of controlled feedbacks from the research coordinator [14, 5]. When participants change their opinions it should be seen as strength and not a weakness, because it is only the Delphi technique that allows participants to see the contribution of other participants in the same research exercise. The controlled feedbacks allow participants to view their individual submissions in the light of the whole group, "bringing panelists towards group consensus" [5]. Furthermore, the integrity of a Delphi exercise is increased by the caliber of participants, including those to benefit from the result of the exercise, stating the rules of engagement, method of achieving consensus of opinion and effective communication throughout the process [14, 5].

During data analysis, the coordinator should have eyes for detail [14, 11, 5]. Through the unique coding system it is possible to monitor the opinions of participants who know each other; thus challenging the coordinator to act decisively to ameliorate the negative impacts of complicity on the credibility of the exercise. In the exercise reported in this paper, there is evidence of the participants changing their opinions from one round of the Delphi exercise to another. The changes helped to reorganize the KPIs in their order of priority.

The final conclusion is that the Delphi technique is a suitable research method for addressing complex issues within the Engineering and Built Environment industry, without fear of complicity or coercion, even when the participants know each other. This level of certainty can be achieved through the

painstaking selection of appropriate participants, the skill of the research coordinator and transparent communications between the rounds and in the final report.

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