

BEYOND CONSENSUS: A REVIEW OF DELPHI RESEARCH PUBLISHED IN MALAYSIAN SOCIAL SCIENCE JOURNALS

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ABSTRACT

The Delphi method has been widely used as a judgement tool in social science research. To date, however, there has been little analysis of how the method has been used in the Malaysian context. Hence, the aim of this study was to review the Delphi studies published in Malaysian social science journals and seek further avenues to carry out more reliable and valid Delphi research. Our findings show that half of the selected studies used only a single Delphi round to obtain data, although a minimum of two rounds is needed to allow feedback and revision of responses. In addition, only one of the selected studies appeared to use a pre-test to improve the rigour of the Delphi method. The characteristics of the Delphi method are discussed in terms of enhancing rigour. The evidence from this study suggests that researchers aiming to conduct Delphi studies in the future need to make greater efforts to comply with the rigour that is typically required in such research. As one of the first studies to analyse how Malaysian researchers and practitioners have used the Delphi method in social science research, this paper provides further guidance for not only Malaysian academics and practitioners, but also other researchers interested in the Delphi method.

Keywords: Delphi; Delphi method; Delphi technique; qualitative method; qualitative rigour.

1. INTRODUCTION

The Delphi method was originally created by the RAND Corporation in the United States in the 1950s, and has been widely used for decision making, policy making and forecasting future issues. Since its development, the method has been widely applied in social science research, particularly when input is required on a particular issue from a group of experts or panellists (Dalkey & Helmer, 1963; Linstone & Turoff, 1975). As a qualitative research method that follows a consensus-seeking approach, however, the Delphi method is still seeking recognition as a methodologically rigorous approach (Hasson & Keeney, 2011). One of the most overlooked aspects of the Delphi method is the reliability of the measurement with scientific validation of the findings (Sackman, 1975). Numerous studies (Woudenberg, 1991; Hasson, Keeney, & McKenna, 2000; Mullen, 2003; Thangaratinam & Redman, 2005; Donohoe & Needham, 2009; Hallowell & Gambatese, 2010; Hasson & Keeney, 2011; Rowe & Wright, 2011; Lin & Song, 2015) have outlined the methodological considerations required to establish rigour in a Delphi study. These studies have

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argued that a lack of distinct guidelines combined with a poor understanding of the Delphi method may lead to problems with the reliability, validity and trustworthiness of findings.

In recent years, at least one Malaysian-based Delphi study a year has been published in a peer-reviewed journal to help the decision-making process on specific purposes and tasks. We became interested in the rigour of the Delphi method after reading a few articles published in Malaysian scholarly social science journals. Although Delphi research must adhere to scientific procedures and guidelines to ensure reliability, validity and trustworthiness, some of the articles we examined did not seem to meet the criteria. Extensive studies have examined the rigour of the method in Western contexts, yet similar studies focusing on the Malaysian context are still lacking. Therefore, in this study, we aimed to provide a comprehensive review of the Delphi studies published in Malaysian social science journals. As the first Delphi review study focusing on the Malaysian context, this critical examination is expected to enhance our understanding of the Delphi method and provide academics and practitioners in Malaysia with further guidance on the correct application of the method in future studies.

2. LITERATURE REVIEW

2.1. Background of the Delphi method

The word 'Delphi' originated from Greece (Palmer, 1969). It is the name of the Greek town where the temple of Apollo is situated, and was once home to the oracle. Throughout thousands of years of Greek history, numerous people, both private individuals and official ambassadors, visited Delphi to consult the prophetess Pythia. Pythia's mission was to recount the divine purpose in a normative way to shape future events (Habibi, Sarafrazi & Izadyar, 2014). The Delphi method was first developed in the 1950s by the RAND Corporation in the United States. It was introduced as a method for scientifically studying experts' opinions on operational research.

Although there is no absolute definition of 'Delphi', most Delphi researchers refer to the definition coined by Linstone and Turoff (1975). According to Hasson et al. (2000), the main purpose of the Delphi method is to acquire the most reliable consensus from a group of experts using iterative questionnaires together with controlled opinion feedback. The Delphi method differs from other qualitative methods, as it is used as a tool to build consensus among a panel of selected participants to forecast assumptions or develop a particular concept (Dalkey & Helmer, 1963; Linstone & Turoff, 1975; Grisham, 2009). The method uses multiple iterations or feedback processes to develop a consensus on a specific topic (Hsu & Sandford, 2007). Riggs (1983) argued that this feedback process specifically allows and encourages the panel of experts to review their original judgements about the information given in previous iterations. Dalkey and Helmer (1963) claimed that iterative feedback helps to reduce the influence of group interactions such as dominant individuals, conformity and group pressure when gathering opinions from experts.

Another underlying characteristic of the Delphi method is that it provides anonymity to respondents by using a variety of statistical analysis techniques for interpretation (Mullen, 2003; Hsu & Sandford, 2007). The anonymity of the process can reduce the effects of dominant individuals, which is often a concern during the collection and synthesis of information from group-based processes (Dalkey & Helmer, 1963; Sekaran & Bougie, 2010). The controlled

feedback of the Delphi method also reduces such noise by sharing the opinions of other participants and giving them a chance to re-evaluate their judgements without the pressure of other panellists.

The Delphi method continues to grow in various fields such as health and social science research. However, the debate over whether it qualifies as a scientific method continues in the literature due to its blurred philosophical position, which is somewhere between ontological and epistemological (Keeney, McKenna, & Hasson, 2010). Furthermore, identification of the research paradigm is often neglected, as the method is often concurrently used in both qualitative and quantitative research. As an alternative, Critcher and Gladstone (1998) suggested that the Delphi method stood in a 'hybrid epistemological' position given that it overlapped with both quantitative and qualitative ideologies.

Despite many scientific issues, the Delphi method has mainly been used to forecast assumptions or develop a certain framework. In the health services field, it has been used to forecast changes in disease patterns and predict future resource patterns. It has also been widely used for identifying service development priorities in the nursing field (Mullen, 2003). Although the Delphi method has a number of potential pitfalls that should be avoided, as a group judgement tool, it remains a promising method among researchers (Brady, 2015).

2.2. Process and critiques of the Delphi method

Ideally, the Delphi process is progressively iterated until a consensus is deemed to have been reached. Nevertheless, the number of iterations depends predominantly on the degree of consensus sought by the researchers, and can vary from three to five (Ludwig, 1994; Delbecq, Van de Ven & Gustafson, 1975). This view is supported by Cyphert and Gant (1971), Brooks (1979), Ludwig (1994) and Custer, Scarcella and Stewart (1999), who considered three iterations as normally sufficient to reach a consensus and to gather the necessary information. Hallowell and Gambatese (2010) also encouraged researchers to use at least three rounds to determine the reasons for outlying responses in the third round. In this discussion, the authors provide guidelines for up to three iterations.

Round 1: An open-ended questionnaire is often used in the first round of the Delphi process. A questionnaire is designed to solicit specific information on the research content from the participants (Custer et al., 1999). After receiving the experts' responses, the researchers use the gathered information to develop another well-structured questionnaire for Round 2. Modification of the Delphi process in relation to modes of communication with the group of experts is applicable if the basic information concerning the research issue is already usable and available (Hsu & Sandford, 2007).

Round 2: In the second round, the experts are asked to review the information summarised by the researchers from the responses provided from the first round. They are presented with the second questionnaire and asked to rate the items to establish preliminary priorities, after which the areas of agreement and disagreement can be identified (Ludwig, 1994).

Round 3: The experts or panellists are presented with a questionnaire in Round 3, and must either 'specify the reasons for remaining outside the consensus' or re-evaluate their judgements based on the items or ratings summarised by the researchers in Round 2. The experts can then clarify the information they have been given and make a judgement based on the relative priority of items

(Hsu & Sandford, 2007). However, only a slight increase in consensus is expected compared with previous rounds (Weaver, 1971; Jacobs, 1996). The researchers then collate and analyse the remaining items, the experts' ratings, minority opinions and the achieved consensus.

The method can be modified and adapted according to the different social realities and requirements of the study (Fletcher & Marchildon, 2014). Previous studies (Vernon, 2009; Arof, 2015) reported various modifications in relation to modes of communication with the expert groups and to the design of the iterative feedback rounds. Therefore, the Delphi design that is adopted is situational, as it is guided by the research objectives regardless of the discipline (Hasson & Keeney, 2011).

The researchers' judgment and discretion are fully exercised in the design of Delphi studies. For instance, the data can be analysed either qualitatively or quantitatively. The level of agreement and disagreement can be measured first by using a Likert scale and then by open-ended surveys. One of the strengths of Delphi research is its flexibility (Vernon, 2009). However, paradoxically, this can negatively affect the rigour of the research (Sackman, 1975).

Hence, several studies (Woudenberg, 1991; Hasson et al., 2000; Mullen, 2003; Thangaratinam & Redman, 2005; Donohoe & Needham, 2009; Hallowell & Gambatese, 2010; Hasson & Keeney, 2011; Rowe & Wright, 2011; Lin & Song, 2015) have suggested that establishing and applying guidelines should help to ensure rigorous implementation of the method. The guidelines are summarised in Table 1.

Table 1. Summarised Guidelines for the Rigorous Implementation of the Delphi Method

Criteria	Descriptions
Clear task(s) and purpose(s)	Application of the method to a specific problem
Selection of experts and size	Qualifying panellists as experts
Iterative feedback and consensus	Design and administration of the questionnaire
Pilot test of the questionnaire	Ensure reliability and reduce potential bias before executing the Delphi survey

3. METHOD

3.1. Article selection strategy

The MyCite (Malaysian Citation Centre, Ministry of Higher Education) and MyJurnal (Malaysian Citation Centre, Ministry of Higher Education) databases were used to conduct the study. The focus was on social science research papers that used the Delphi method and were published in Malaysian social science journals. MyCite and MyJurnal contain over 500 Malaysian scholarly journals with approximately 29,000 articles in the natural sciences, technology, medicine, social sciences and the humanities. Hence, both sites were chosen to identify and review the Delphi studies published in Malaysian social science journals.

We searched the selected articles based on two criteria, the keyword 'Delphi' and the journal name. First, we retrieved 43 Delphi studies from MyCite and MyJurnal using the keyword 'Delphi', with no date limits. The retrieved articles were all Delphi studies performed in various disciplines. Next,

we extracted those studies carried out in the social sciences, following the Scopus journal classification to obtain the list of Malaysian social science journals. This process finally identified six Delphi studies that were used as the sample articles for this study.

The six Delphi studies were published in four Malaysian social science journals: *International Journal of Economics and Management*, *Journal of Sustainability Science and Management*, *Jurnal Pengurusan* and *Pertanika Journal of Social Science and Humanities*. The five selected studies were written in English and only one was written in Malay. To avoid any misunderstanding or misinterpretation, the authors asked a peer business lecturer from Malaysia to translate the article from Malay into English.

3.2. Review of the selected Delphi studies

This study examined the application of the Delphi method in Malaysian social science journals. The evidence from these studies suggests that a Delphi study involves a group of experts (panellists), clarification of the Delphi research purpose, a number of rounds, feedback from experts and a consensus reached by convergence. Some studies (Skulmoski, Hartman, & Krahn, 2007; Hallowell & Gambatese, 2010; Hasson & Keeney, 2011; Clibbens, Walters, & Baird, 2012) have argued that pre-testing or pilot testing is vital to ensuring the validity and rigour of Delphi studies. Table 2 summarises the main characteristics of the six Delphi studies.

4. FINDINGS

4.1. Task(s) and purpose(s)

The Delphi method is one of a range of consensus techniques used to seek experts' judgements on particular problems. It is mainly applicable when researchers aim to forecast future events or develop a certain framework or model. Its aims can vary depending on the nature of the research. The earliest study included in the review was conducted by Imang and Ngah (2012) to develop a set of indicators for sustainable development in Sabah rice-growing areas. First, the researchers established a study context, including identifying the key stakeholders and understanding the sustainability issues, through an extensive literature review and in-depth interviews with local leaders and officers from the agriculture department and local research institute. The study used the Delphi method for two purposes: to generate and identify potential indicators and to evaluate the potential indicators.

Triangulation is often combined with the Delphi method to test results. For instance, Thomas and Rajendran (2012) used the Delphi method to construct the hypothesised investment choices of the five investor personality types proposed by Bailard, Biehl and Kaiser (1986). One noteworthy feature was that the researchers used a close-ended survey questionnaire for triangulation, with few established hypotheses. To test the Delphi results, the researchers performed regression analysis to assess the relationships between the five investor personality types and their investment choices. Imang and Ngah (2012) also constructed a survey instrument based on their Delphi results, which enabled them to examine the effectiveness of the indicators and measure the sustainability of rice-production development.

The Delphi method has undergone continuous evolution with advancements in IT (Daim, Oliver, & Kim, 2013). Table 2 illustrates the variations in the method compared with the classical Delphi.

Marco and Ismail (2013) attempted to analyse the relationship between involvement in the 'alternative music scene' and English language learning. They used the Delphi method to individuate and discuss English language learning constructs. Interestingly, the Delphi panel meeting was organised as an interactive cyber conference without a physical offline meeting. Although online or e-Delphi studies take advantage of computer technology for various reasons, they adopt a process similar to that of the classical Delphi (Keeney et al., 2010).

Although the classical Delphi method uses open qualitative questions to collect information in the initial round, researchers occasionally prepare a structured questionnaire to be sent to panellists before the first round. The questionnaire is normally crafted through a comprehensive literature review or pre-interviews with experts. The researcher provides the panellists with the initial questionnaire to be critiqued and obtains responses from the panellists. According to McCampbell and Stewart (1992), the modified Delphi method expedites the research process and enables the researcher to verify the content and face validity.

The majority of the selected studies adopted the modified Delphi, narrowing down the scope of the research. A study of Bangladesh rice farming areas (Roy, Chan, & Ahmed, 2014) used the modified Delphi method to capture and determine the sustainability factors for rice farming areas in Bangladesh. Gani, Awang, Mohamad and Samdin (2015) also applied the modified Delphi method to derive critical attributes from a group of experts for successful public participation in tourism planning in Malaysia's protected areas. Imang and Ngah (2012) likewise began with a set of structured questionnaires developed from a thorough review of the literature and informal interviews. The classical Delphi technique has evolved in many different respects (Davidson, 2013). Another form of modification involves using face-to-face interviews or a focus group in the first Delphi round (McKenna, 1994). Two of the selected studies (Senik, Makhbul, Yusof, Isa & Sham, 2012; Thomas & Rajendran, 2012) are classified as using a modified Delphi method.

Overall, these results indicate that all of the selected studies actively used the Delphi method to develop new indicators or elements with clear aims in a given field.

4.2. Selection of experts and panel size

Among several key features of the Delphi study, the use of a purposively selected panel of experts has significant implications for reaching a consensus on a particular research question over iterative survey rounds. Studies (Mullen, 2003; Donohoe & Needham, 2009; Goluchowicz & Blind, 2011; Brady, 2015) have noted the importance of the researchers' role in clarifying who the experts in the research area are, and what criteria should be applied to select the panel. Donohoe and Needham (2009) illustrated a Critical Design Decision (CDD) phase, and placed alongside an expert panel development phase. They argued that the CDD phase must consider the selection and validation of the panellists' expertise. Although no consensus has been reached on the level of knowledge or experience needed to be a Delphi panellist (Mullen, 2003), researchers should clarify the definition of expertise and what constitutes a suitable group of experts to meet their research aims (Jorm, 2015).

Several studies (Powell, 2003; Donohoe & Needham, 2009; Hallowell & Gambatese, 2010) have noted that there seems to be little evidence on the appropriate panel size and statistical representativeness for Delphi studies. The specific number of panellists should be determined by the nature of the research. Some scholars, however, hold the view that researchers should invite at

least 7-15 panellists (Delbecq et al., 1975). It is clear that there is wide variation in the number of panellists.

In this vein, the majority of the selected studies met the aforementioned criteria by clearly identifying the selection criteria, sampling strategies and preferred panel composition. For instance, Imang and Ngah (2012) presented three explicit selection criteria, at least one of which had to be met by potential panellists. Similarly, Roy et al. (2014) defined three rigid selection criteria: (1) individuals with 15 years of relevant professional experience, (2) individuals with at least 12 years of direct involvement in rice research and (3) individuals with 10 years of involvement in agricultural policymaking.

4.3. Iteration, consensus, and analysis of results

An ultimate goal of Delphi studies is to obtain or produce a consensus of informed opinion by reducing the variance in panellists' responses (Hallowell & Gambatese, 2010). This convergence is achieved by a series of iterative Delphi rounds accompanied by a questionnaire and controlled feedback. Some authors (Dalkey, Brown, & Cochran, 1970; Gupta & Clarke, 1996) have proposed that the number of rounds typically ranges from two to six. Mullen (2003) and Brady (2015), in contrast, asserted that the process could continue until the predetermined criteria had been met, such as reaching a consensus. According to Lin and Song (2015), the mean, median and inter-quartile ranges are the most commonly used measurements to judge the degree of convergence.

Table 2 reveals that the number of rounds can vary from one to three. It is somewhat surprising that half of the selected studies (Senik et al., 2012; Thomas & Rajendran, 2012; Marco & Ismail, 2013) carried out only a single Delphi round to obtain answers to the research questions. These studies used qualitative methods, such as in-depth interviews and a conference meeting, to arrive at a group consensus. However, their findings provide little evidence of how they arrived at the group consensus. The other three selected studies (Imang and Ngah, 2012; Roy et al., 2014; Gani et al., 2015) used descriptive statistics and summarised the means and standard deviations from a pool of expert opinions. To achieve a group consensus, these three studies adopted at least two Delphi rounds.

In summary, both quantitative (e.g., factor analysis, rankings, means, standard deviations) and qualitative analyses (e.g., extraction of dimensions or factors, interview analysis) were used to present the Delphi results.

4.4. Pre-test or pilot test

As mentioned, a modified Delphi study commonly requires the researcher to pre-select items before the first Delphi round. For a modified Delphi study, a pre-test or pilot test is suggested to ensure the instrument has the appropriate level of detail and validity. A number of studies (Skulmoski et al., 2007; Hallowell & Gambatese, 2010; Hasson & Keeney, 2011; Clibbens et al., 2012) have insisted on the proper use of a pre-test to establish the rigour of a modified Delphi study. However, contrary to expectations, only one selected study carried out a pre-test before the commencement of the first Delphi round.

Table 2. Summary of Delphi Studies Published in Malaysian Social Science Journals

No.	Study	Design type	Task(s) / Purpose(s)	Panellists components	Number of rounds	Size of panel	Consensus / Convergence	Analysis of results	Pre-test / Pilot test	Triangulation
1	Imang and Ngah (2012)	Modified	Develop a set of indicators for sustainable	Local residents and local experts	2	104, 82	Mean, SD	Factor analysis	None indicated	Follow-up survey
2	Senik et al. (2012)	Modified	Identify the dimensions and sub-dimensions of the internationalisation process of SMEs	Academic experts, policymakers, government agents and researchers	1	32	Individual interview	Extraction of dimensions and sub-dimensions	None indicated	None indicated
3	Thomas and Rajendran (2012)	Modified	Construct hypothesised investment choices of individual investors	Experts from leading broking houses and financial intermediaries	1	16	Individual interview	Extraction of sub-dimensions	None indicated	Regression analysis
4	Marco and Ismail (2013)	Online	Individuate and discuss constructs for English language learning	A purposively selected musician, independent record label owner, fanzine writer and	1	4	Interactive cyber conference	Extraction of constructs	None indicated	None indicated
5	Roy et al. (2014)	Modified	Explore the potential factors of sustainable rice farming in Bangladesh	Academic experts, researchers, extension workers, policy makers, NGO workers, agro-business leaders and	2	61, 53	Mean, SD, soundness	Mean, SD, soundness, extraction of factors	None indicated	None indicated
6	Gani et al. (2015)	Modified	Determine the important attributes of successful public participation in planning for	Government officers, members of non-governmental agencies and academics	3	29, 27, 26	Mean, SD, Kendall's coefficient of concordance, additional	Mean, SD, ranking	Yes	None indicated

5. DISCUSSION

From the summary in Table 2, it is apparent that all of the selected studies used the Delphi method to develop a certain framework or elicit certain factors to meet their research aims. The purpose of RAND's original 'Project Delphi' was to estimate the risk factors associated with an atomic bomb attack on the United States, and it was deemed as a national defence study. Since then, the Delphi method has been widely used to seek experts' opinions on current issues, as witnessed by this study.

It is important to note further developments of the Delphi method. As Simoens (2006) stated, more practical applications of the Delphi method can be expected for economic evaluations. He used the Delphi method to provide estimates of health care resource requirements. Some tourism-related studies have also made noteworthy contributions, demonstrating a variety of applications of the Delphi method. According to Donohoe and Needham (2009), it is a well-suited tool for forecasting uncertain factors that may affect tourism, such as climate change and terrorism. Furthermore, the method was shown to be effective for assessing the tourism market and forecasting future events. An implication of this is that some avenues may still remain unexplored in the Malaysian social science field. As the Delphi method has only been applied in theory development, it is recommended that researchers fully use the Delphi tool to forecast potential issues in economics and other social science disciplines.

Although all of the panellists or experts were purposefully selected in accordance with the aims of the research, there was no consistent trend in the number of iterative Delphi rounds. Table 2 shows significant differences among the six selected studies. As explained in the literature review section, the rigorousness of the method has been subject to some criticism. Rowe and Wright (2011) argued that it was imperative for Delphi researchers to obtain the most reliable consensus through a series of iterative feedback rounds. The first round, as a preliminary survey round, is typically used as a means to solicit reactions, identify ambiguities and enhance the study's focus (Powell, 2003). Dalkey et al. (1970) highlighted that the results could be taken as accurate after the second round. Until recently, there was no reliable evidence that Delphi research can be accomplished with only one round. In addition, from a methodological point of view, the Delphi method suffers from researchers' bias as a judgement tool. To minimise the bias, clear criteria and procedures for interpreting qualitative data (e.g., interview analysis, focus groups) must be specified based on the level of panellists' agreement or disagreement. Readers may wonder how the qualitative data procured by researchers converge on a consensus. Despite the challenges encountered by qualitative Delphi researchers, Brady (2015) suggested the adoption of constructivist inquiry and grounded theory using thematic analysis.

As previously mentioned, one unanticipated finding was that only one of the selected studies carried out a pilot test before conducting the Delphi survey. A pilot test is a crucial element of a good Delphi research design to ensure the reliability and soundness of the data (Mitchell, 1991). More importantly, in the pilot test, researchers are encouraged to compile qualitative justifications from experts to ascertain what areas should be strengthened and eliminated in the next round.

When the Delphi method is implemented systematically and rigorously with clear directions and criteria, the results may eventually contribute significant knowledge in not only the social sciences but also other disciplinary areas.

6. CONCLUSIONS AND RECOMMENDATIONS

This study examined the application of the Delphi method by reviewing six papers published in Malaysian social science journals. This was the first study to analyse how Malaysian researchers and practitioners have used the Delphi method in social science studies. The findings suggest that researchers who wish to conduct Delphi studies in the future must make efforts to comply with the rigour that is typically required in Delphi research. A possible area for future research would be to investigate how other types of Delphi research, including classical and policy Delphi studies, can be implemented with distinct purposes. Meanwhile, a greater focus on rigour could produce interesting findings according to different Delphi approaches. Taken together, the Delphi method could finally be enriched in the future.

ACKNOWLEDGEMENT

The authors would like to extend our appreciation to Republic Polytechnic for providing a conducive environment to conduct this research.

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