



Review of Delphi-based scenario studies: Quality and design considerations

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ABSTRACT

For meaningful scenarios, creative input concerning possible future trends is crucial. Herman Kahn, the father of modern scenario planning, underlined the importance of “*thinking the unthinkable*” in a significant scenario study. “*Blessed with high intelligence, an assertive personality and the research capabilities of the RAND Corporation,*” he could rely on genius forecasting. But how can this foresight be creative as well as simultaneously credible and objective if one does not possess Kahn's genius? In this article, we assess the incorporation of expert knowledge via the Delphi technique into scenario planning as a promising option. We discuss possible combinations and identify the span of design alternatives in the existing body of Delphi-based scenario studies through a systematic research review and provide recommendations on how a Delphi-based scenario study should be designed to ensure quality. We recommend focusing on the integration of the Delphi technique only in one phase of the scenario approach. In this way, the design options can be intentionally adjusted to the particular function. We further offer recommendations on how to accomplish this.

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1. Introduction

In order to develop meaningful scenarios, creative input concerning possible future trends and developments is crucial. Herman Kahn, the father of modern scenario planning, underlined the importance of “*thinking the unthinkable*” in a significant scenario study. “*Blessed with high intelligence, an assertive personality and the research capabilities of the RAND Corporation,*” he could rely on genius forecasting [1]. But how can this foresight process be creative, credible and objective if one does not possess Kahn's genius and resources? As MacKay and McKiernan [2] confirm, “*For most participants, these activities demand that they activate and utilize those artistic parts of the brain that normally lie dormant for long periods while they carry their daily routines...*” The Delphi technique itself is supposed to enhance creative thinking. According to Gupta and Clarke [3], it is “*one of the best known methods for dealing with open-ended and creative aspects of a problem because it motivates independent thought and gradual formation of group solutions.*” In this article, we assess the incorporation of expert knowledge via the Delphi technique into scenario planning as a promising option. We do this to give recommendations on how a Delphi-based scenario study should be designed to ensure the highest possible degree of quality. Therefore we address two research questions:

1. How can the Delphi technique enhance the quality of a scenario study?

The purpose here is to evaluate if a combination of the two methods is reasonable and contributes to a more effective scenario study.

2. What is the span of possible design options in the existing body of Delphi-based scenario studies?

Developed for military purposes by the RAND Corporation in the U.S. during the Cold War, both methods date back more than 50 years. Since then, several researchers have combined the two methods in very different ways. Therefore, a systematic research review that

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reflects the span of possible design options is needed. While the Delphi technique, in general, has been subject to several prior reviews [3–7] as well as scenario planning [8–13], no review on the combination of the two methods has been conducted.

2. Materials and methods

We develop the answer of the first research question by giving a short overview on the main design elements of scenario planning and the Delphi technique. Derived from the methodological literature, we present a generic scenario planning approach as well as the main functions of the Delphi technique and show in which steps of the scenario planning approach each Delphi function can be integrated. The impacts on the overall quality of scenarios will be discussed for each combination possibility. We do this based on quality criteria derived from general scientific quality criteria. The design options (design elements and functions) are taken in the next step, the systematic research review, as a basis.

To answer the second research question, we conduct a systematic research review and analyze the applied design options in the identified Delphi-based scenario studies. The review is conducted according to Cooper [14] and Fink [15] in combination with a content analysis approach [16].

We identified the relevant studies for the review by searching via the EBSCOhost interface the 12 databases of Academic Search Complete, Business Source Complete, EconLit with Full Text, E-Journals, Historical Abstracts, International Political Science Abstracts, Library, Information Science & Technology Abstracts, Literary Reference Center, MLA Directory of Periodicals, Risk Management Reference Center and TOC Premier. We used all databases accessible to us and excluded those that were out of focus such as the American Antiquarian Society (AAS) Historical Periodicals Collection Series 1 and 2, the ATLA Religion Database and the International Bibliography of

Table 1
Coding scheme.

Category	Subcategory	Question to answer	Example
Study	Author	Who is the author of the study?	Shifan et al.
	Year	In which year was the study published?	2003
Focus of the study	Time	What is the time frame of the study?	30 years
	Geographic	What is the geographic focus of the study?	Tel Aviv Metropolitan Area
Scenario planning	Thematic	What is the thematic focus of the study?	Transport
	Scenario goal	What is the main goal of the scenario study?	Predictive + norm. (sustainability)
	Range of future states	How many scenarios are developed?	2
	Presentation of scenarios	How are the scenarios presented?	Scenario sketch
	Discontinuity	Does discontinuity (wildcards, etc.) play a role?	No
Delphi-Function	Scenario logic	What are the determining factors of the scenarios?	Degree of probability & desirability
	Function of the Delphi technique	Which Delphi functions are used?	Idea generation; judgment; consolidation
Delphi-Iteration	Number of rounds	How many rounds are conducted?	2
Delphi-Experts	Number of invited experts	How many experts are invited?	63
	Number of responding experts	How many experts joined the Delphi rounds?	1st: 28; 2nd: 18
	Selection of experts	Is explicit criteria for the selection of experts mentioned? If yes, which?	No
Delphi-Anonymity	Composition of the Delphi panel	What is the actual composition of the Delphi panel?	Typical stakeholders
	Level of expertise	How is the level of expertise approved?	Not specified
	Anonymity	Is the whole Delphi process anonymous? If not, where is it weakened?	Not specified
	Questionnaire origin	Where does the questionnaire input come from?	Deskwork; expert interviews
Delphi-Questionnaire	Open-ended questions	Are open-ended, closed questions or both posed?	Open-ended
	Focus of queries	What is the focal point the questions?	Probability; desirability
	Medium	How is the questionnaire transmitted to the participants?	Not specified
Delphi-Feedback	Possibility to comment	Do the participants have the possibility to comment and complete their questionnaires?	Yes
	Feedback to experts	Is feedback send back to the participants?	Yes
	Type of report to the experts	What kind of feedback is send back to the participants?	Preliminary scenarios
	Consideration of comments	Are the questionnaires modified based on the comments?	Yes
	Explanatory statements	Can the participants (have to) explain their opinion if it differs from the majority?	Yes (possibility)
	Possibility to revise the opinion	Do the participants have the possibility to revise their opinion?	Yes
Statistical group response	Is a statistical group response provided? If yes, which?	Yes, quantile–quantile plot, frequencies, mean , median, standard deviation	

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