

Correlation Questionnaire Design and Analysis

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Abstract

Questionnaires are frequently used in social science studies. However, traditional questionnaires failed to effectively contribute to the targeted goals of question phases or overall evaluation. This study researched an investigation method termed the correlation questionnaire. The questionnaire was divided into three levels: the phase level, the question level and the performance level. The analysis results showed that the correlation questionnaire provides an overall performance effectiveness evaluation and comparative assessment for an individual program. In addition, when weighting values were added to the phase level, in accordance with the effective degree to questionnaire goal, they can effectively reflect the performance of the questionnaire goal.

Keywords: *Correlation Questionnaire; Effectiveness Assessment; Program Evaluation; Performance Value*

1 INTRODUCTION

The questionnaire method is often applied in social science research. Its purpose is to explore the interviewees' understanding or satisfaction degree with the questions in context. Jing [1] proposed the procedures and problems on questionnaire design. His analysis results stated that the design of a questionnaire should follow strict procedures and it is crucial that subjective questions are avoided. The questions should be based on specific indexes to achieve higher reliability and validity. Hsiao et al. [2] applied questionnaires when investigating selected residents' understanding and preferences in debris flow disasters. He adopted the Likert scale, which is a hierarchical analysis and multi-attribute utility theory used to conduct comparative analysis. The research results demonstrated that adopting the multi-attribute utility theory with Likert's scale to evaluate the interviewees' understanding and preferences is a better method than others in terms of theoretical bases, questionnaire design and field studies. Su et al. [3] used questionnaires to study flooding victims' subjective perspectives during the recovery period, adopting the contingency table analysis to explore the relation between the disaster experience, individual property and the length of the recovery period. The research results showed that the relieving aids after the disaster did not effectively affect the recovery period. Instead, expanding the accessible rescue channels to the victims and strengthening the victims' rescuing ability can assist their recovering capacity. Guo et al. [4] applied questionnaires and a differential evaluation method to establish a quantitative assessment model to evaluate the annual satisfaction of meteorology service to agriculture. The results made it clear that the evaluation method is easy to operate, with a strong comparability characteristic. Ahmed et al. [5] compared the Split-Questionnaire Design (SQD) and classical Full Questionnaire Design (FQD) to measure the public's perception of corruption in the public sector of Pakistan. The result showed the SQD was as efficient as the FQD. Raine-Bennett et al. [6] used item response theory-based methods to evaluate the psychometric properties of the Contraceptive Intent Questionnaire (CIQ). The result proved the CIQ is a reliable and valid tool. Makay et al. [7] used a large sample of adolescents to test three versions of the Aggression Questionnaire (AQ). Each case was examined with a unidimensional model, a hierarchical model, and a four-factor model. The results of the Confirmatory Factor Analysis revealed limited support for a unidimensional model in any of the AQ forms, but great support for the widely-used four-factor model, and to a lesser extent, the hierarchical model.

Nevertheless, the questions in traditional questionnaires are usually independent of each other and scale has an equidistant measurement property, failing to effectively contribute to the goals of phases or overall evaluation. This

study researched a correlation questionnaire method, in which the phase levels were composed of goal-reaching factors. The questions in the phase levels were based on the affecting conditions. The correlation questionnaire consisted of two to three levels. Experts were invited to evaluate the performance value of each individual question against the phase level or the overall goal. The performance value of each question contributed to the performance value of the individual phase. The performance value of each phase was applied to the comparative evaluation of different programs, or the performance values of the phases were combined to determine the total performance value of the overall goal.

2 CORRELATION QUESTIONNAIRE DESIGN

This research's questionnaire design and procedure flowchart is shown as Figure 1. First, the goal and factors affecting the goal were defined. Then the impact factors were divided into different categories as phase levels. The factors affecting the phase were formed into questions. The structure of the correlation questionnaire is shown as Figure 2. It consists of three levels: the phase level, the question level and the performance level.

The phase level was composed of the phases derived from the goal of the questionnaire. Each individual phase consisted of several questions derived from the evaluating factors. The question reflected its impact degree to the phase. Each question covered two to three levels. The questions made up the question level. Each question, after being pilot-tested, was evaluated by the experts for its contributing degree to the goal of each level. Various effective values constituted the performance level.

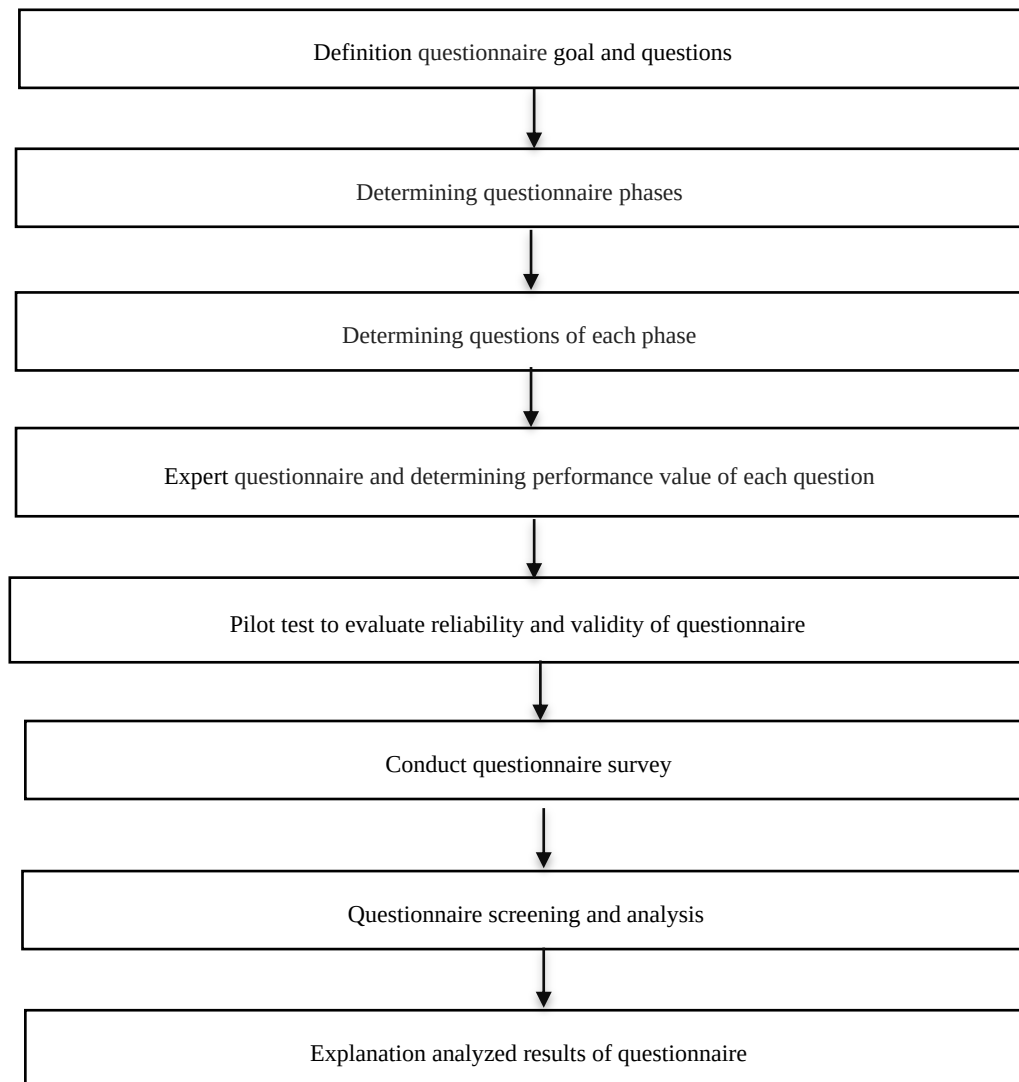


FIG. 1 QUESTIONNAIRE DESIGN FLOWCHART

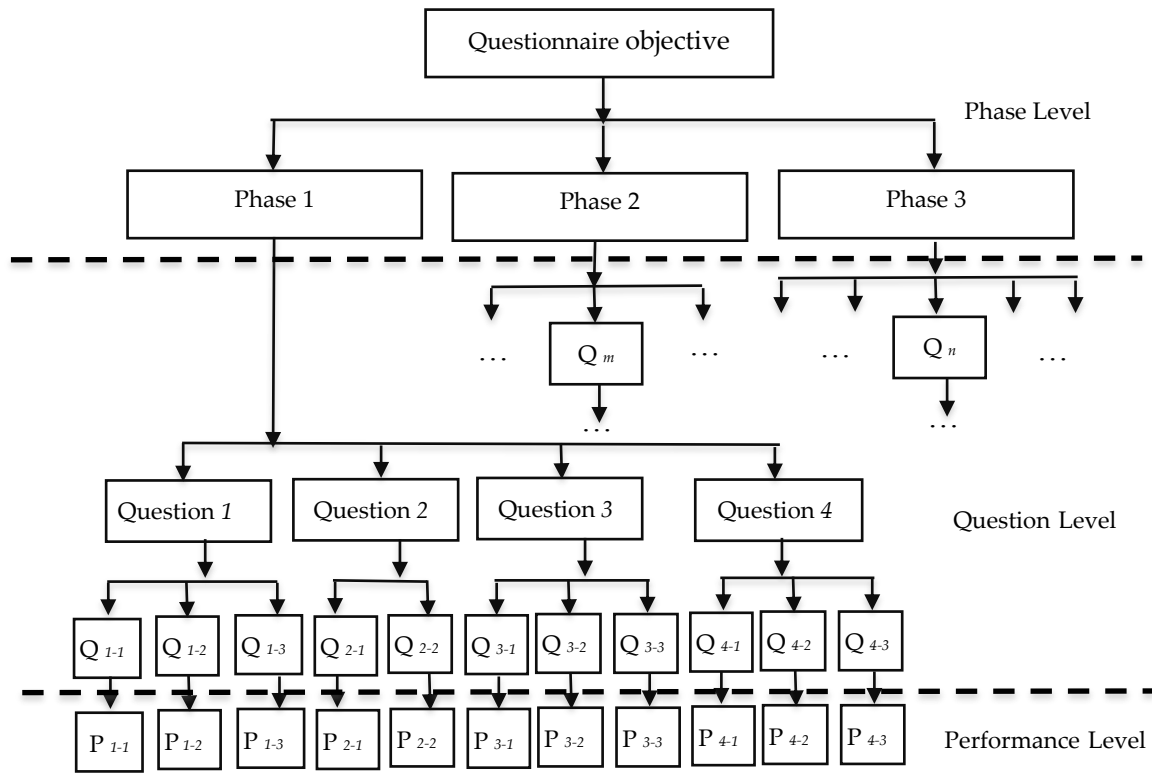


FIG. 2 FRAMEWORK OF THE CORRELATION QUESTIONNAIRE

3 QUESTIONNAIRE ANALYSIS METHOD

After the questionnaire was completed, the experts evaluated the questions on the questionnaire to determine each phase's weight in achieving the goal of the questionnaire. Suppose the questionnaire consists of i phases, each having j questions. The results are represented by a_{ij} , and the effective value of each phase is $r_i = \sum a_{ij}$. When the weight of each phase affects the questionnaire goal W_i , the overall effective value of the goal is $f = \sum (W_i \times r_i)$.

To evaluate the goal achieving degree of the questionnaire, the questionnaire result with the maximum performance value given by the experts is represented as a_{ij}^* , then the maximum effective value of each phase is $r_i^* = \sum a_{ij}^*$, and the maximum effective value of the overall goal is $f^* = \sum (W_i \times r_i^*)$. Therefore, the overall goal-achieving rate is $p = \frac{f}{f^*} \times 100\%$. If $p \geq 85\%$, then the rate is excellent; if $85\% > p \geq 70\%$, the rate is good. If $70\% > p \geq 50\%$, then the rate is poor; if $p < 50\%$, the rate is bad.

4 CASE STUDY

The correlation questionnaire can be applied to the models such as the overall effect evaluation or the case comparison. As an example, this research investigated the ability to protect community disaster victims. To examine the prevention and relief performance and weak points for community residents facing disasters, the questionnaire was conducted on a selected community's residents (the disaster-affected objects) and township staff (the disaster-response objects). Analyzing the objective, the impact factors were divided into three phases: the residents' preparedness for disasters and their self-help ability, the township's relief force and their qualification, and the relief equipments of the government. The performance values of each question and protection force were evaluated by experts who had considered the questionnaire objective. The average performance value is listed in Table 1.

One of the phases surveyed the community residents. It was supposed that there were 120 residents being interviewed. Phases two and three surveyed the township disaster response personnel. It was supposed that there were 85 interviewees. Once the questionnaire design was finished, its performance value to the overall goal of the questionnaire would be decided by the experts. During the questionnaire survey, the interviewees did not know of the performance value of each question. The questionnaire results and number of interviewees are listed as Table 2.

The highest and lowest performance values of each question were calculated as shown in Table 3. Table 3 shows that the best value for the residents' preparedness for disasters and self-help ability was 57.34%; the township relieving personnel and their qualification best value was 68.73%. The government's disaster relieving equipment best value was 80.23%. The questionnaire demonstrated that the total value of residents' disaster protection ability was 119.118, but its value was only 46.00% of the best value. The analysis results indicated that the residents' disaster protection ability was obviously insufficient, especially since the residents' preparedness for disasters and self-help ability results were the poorest. That particular phase was the crucial factor in determining if the residents were capable of safely protecting themselves in disasters. Therefore, the residents' self-help ability required strengthened training.

TABLE 1 THE CORRELATION QUESTIONNAIRE FOR DISASTER-AFFECTED COMMUNITY RESIDENTS' PROTECTION FORCE

PHASE	QUESTION LEVEL 1	QUESTION LEVEL 2	PERFORMANCE
I. RESIDENTS' PREPAREDNESS AND SELF-HELP ABILITY FOR DISASTERS (W ₁ =0.5)	1. DO YOU KNOW THE SHELTER LOCATION?	☐ YES. 1-1 AFTER A MAJOR DISASTER HAPPENED, WILL YOU GO TO THE SHELTER BY YOURSELF?	☐ YES. 0.85
			☐ NO. 0.44
		☐ NO. 1-2 AFTER A MAJOR DISASTER HAPPENED; WILL YOU SEEK HELP FROM THE COMMUNITY STAFF?	☐ YES. 0.63
			☐ NO. 0.20
	2. DO YOU DISCUSS THE SHELTERING PLACES AT HOME?	☐ YES. 2-1 DO YOU AND YOUR FAMILY PRACTICE THE WAY TAKING REFUGE?	☐ YES. 0.93
			☐ NO. 0.65
		☐ NO. 2-2 HAVE YOU TOLD YOUR FAMILY ABOUT THE MEETING PLACE AFTER A MAJOR DISASTER?	☐ YES. 0.55
			☐ NO. 0.28
II. THE RELIEF FORCE AND THEIR QUALIFICATION (W ₂ =0.2)	3. IS THE RELIEF BUSINESS UNDERTAKEN BY SPECIALIZED STAFF?	☐ YES. 3-1 DO DISASTER PREVENTION AND RELIEF STAFFS HANDLE THE BUSINESS MORE THAN TWO YEARS?	☐ YES. 0.90
			☐ NO. 0.68
		☐ NO. 3-2 DOES THE TOWNSHIP MAYOR TAKE THE INITIATIVE TO DISCUSS THE DISASTER RELIEF WORK?	☐ YES. 0.55
			☐ NO. 0.38
	4. DOES THE TOWN OFFICE RECOMMEND PEOPLE TO TAKE THE DISASTER PREVENTION TRAINING LESSONS?	☐ YES. 4-1 DOES THE RECOMMENDED TRAINEES SHARE THEIR TRAINING LESSONS?	☐ YES. 0.85
			☐ NO. 0.60
		☐ NO. 4-2 WILL YOU TAKE THE INITIATIVE TO PARTICIPATE IN THE DISASTER PREVENTION TRAINING LESSONS?	☐ YES. 0.78
			☐ NO. 0.30
III. THE GOVERNMENT'S DISASTER RELIEF EQUIPMENT (W ₃ =0.3)	5. DOES THE GOVERNMENT HAVE PREPARED ENOUGH DISASTER RELIEVING EQUIPMENT?	☐ YES. 5-1 DOES THE GOVERNMENT HAVE ENOUGH STAFF TO EFFICIENTLY USE THE DISASTER RELIEVING EQUIPMENT?	☐ YES. 0.96
			☐ NO. 0.55
		☐ NO. 5-2 HAS THE GOVERNMENT SIGNED ENOUGH CONTRACTS WITH FIRMS FOR DISASTER RELIEVING?	☐ YES. 0.85
			☐ NO. 0.20
	6. DOES THE GOVERNMENT HAVE REGULARLY MAINTAINED THE EQUIPMENT?	☐ YES. 6-1 ARE THE MAINTENANCE WORKERS ON THE JOB FOR MORE THAN A YEAR?	☐ YES. 0.87
			☐ NO. 0.55
		☐ NO. 6-2 HAS THE GOVERNMENT CONTRACTED COMPANIES TO REGULARLY MAINTAIN THE EQUIPMENT?	☐ YES. 0.76
			☐ NO. 0.30

TABLE 2 STISTICS OF QUESTIONNAIRE RESULTS

Question Number		Performance	Sampling Number	Summation of Performance
1-1	Yes	0.85	23	19.55
	No	0.44	32	14.08
1-2	Yes	0.63	34	21.42
	No	0.20	31	6.20
2-1	Yes	0.93	11	10.23
	No	0.65	40	26.00
2-2	Yes	0.55	21	11.55
	No	0.28	48	13.44
3-1	Yes	0.90	7	6.30
	No	0.68	21	14.28
3-2	Yes	0.55	37	20.35
	No	0.38	20	7.60
4-1	Yes	0.85	12	10.20
	No	0.60	48	28.80
4-2	Yes	0.78	15	11.70
	No	0.30	10	3.00
5-1	Yes	0.96	37	35.52
	No	0.55	16	8.80
5-2	Yes	0.85	25	21.25
	No	0.20	7	1.40
6-1	Yes	0.87	29	25.23
	No	0.55	19	10.45
6-2	Yes	0.76	24	18.24
	No	0.30	13	3.90

TABLE 3 PERFORMANCE OF QUESTIONNAIRE IN QUESTION LEVEL 1

Question Level 1	Minimum Performance	Performance of Questionnaire	Maximum Performance
1	24.00	61.25	102.00
2	33.60	61.22	111.60
3	32.30	48.53	76.50
4	25.50	53.70	72.25
5	17.00	66.97	81.60
6	25.50	57.82	73.95

5 CONCLUSIONS

Traditional questionnaire design usually posed questions on a single phase and its results are analyzed equidistantly. In this mode, the overall goal-achieving rate of the phase is difficult to demonstrate. This study, however, researched a correlation questionnaire design in which the questions were correlated and the goal-achieving rate was easily

conveyed. The analysis results demonstrated that the correlation questionnaire could effectively evaluate the overall goal of the questionnaire. The phases that affected the goal achievement were clearly shown.

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