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Pre-testing Semi-structured Interview Questions Using Expert Review and Cognitive Interview Methods

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Abstract: The aim of this methodological paper is to report on a way to pre-test semi-structured interview questions using both the expert review and cognitive interview methods for multiple case study research. Pre-testing, a type of pilot study, is important to ensure semi-structured interview questions can achieve the desired goal of rigour in the qualitative research process ensuring construct validity and reliability. Expert reviews can be undertaken using a modified Qualitative Appraisal System (QAS-99) questionnaire and cognitive interviews using Tourangeau's four-stage cognitive model with verbal probes and concurrent probing. Modifications can then be made to the initial semi-structured interview questions resulting in a final semi-structured interview protocol. Reflective insights in the pre-testing process should also be documented. As there is a dearth of reports on how to undertake pre-testing of semi-structured interview questions using both the expert review and cognitive interview methods, this paper provides a valuable methodological guide for qualitative researchers in the preparation and development of a semi-structured interview protocol especially for multiple case study research.

Keywords: *Semi-structured interview, pilot study, pre-testing, expert review, cognitive interview*

1. Introduction

Qualitative research is defined as the meanings, concepts, definitions, characteristics, metaphors, symbols, and descriptions of things [1] in order to discover meaningful patterns descriptive of a particular phenomenon [2]. Qualitative research encompasses a diverse variety of methods and is iterative by nature and will move back and forth between design and implementation to ensure congruence among question formulation, literature, recruitment, data collection strategies, and analysis [3]. Flexibility is thus important in qualitative research which explores human experiences [4].

One method of undertaking qualitative research is by using the case study approach with semi-structured interviews being the instrument of the study. Case study either single or multiple case is an empirical inquiry method that investigates contemporary phenomenon within a real life context to address "how" and "why" questions and can be either explanatory, descriptive or exploratory [5]. Semi-structured interviews are a common and a popular data collection method in qualitative research [6]. It is a combination of both structure and unstructured formats in one interview with open-ended questions allowing follow-up questions and prompts based on answers given by the respondent [7]. It is versatile and allows for flexibility in qualitative inquiry process [6]. Notwithstanding this flexibility in semi-structured interviews, qualitative studies involving questionnaires should be evaluated in terms of their content, cognitive responses, and usability with focus on terms, wording, structure, order of questions among other things [8]. It is important to assess the feasibility, validity, and reliability of a questionnaire design in the development of a semi-structured interview protocol to improve data quality to

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meet the objectives of a study [9]. An interview protocol represents a total set of guidelines in the conduct of a semi-structured interview along with the questions which will be asked during the interview [7] and is an integral tool in data collection for qualitative research as it provides a link between all the elements of what the research is trying to accomplish [10]. In the development of a semi-structured interview protocol, Kallio *et al.* [6] described five phases which are identifying the pre-requisites for semi-structured interviews, retrieving and using previous knowledge, formulating the preliminary semi-structured interview guide, pilot testing the interview guide and presenting the complete semi-structured interview guide. As Kallio *et al.* [6] notes, the proper development of a semi-structured interview protocol fundamentally influences the results of a study by improving objectivity and trustworthiness.

Pilot studies, one of the five phases identified by Kallio *et al.* [6] are a means to ensure feasibility, validity, and reliability in questionnaire design. They are undertaken with the aim to confirm coverage and content of the preliminary interview protocol [6]. There are two main types of pilot studies in qualitative research, namely feasibility studies which are just small scale "trial-runs" of the study and pre-testing which is meant to "try-out" a specific research instrument [11]. Feasibility studies sometimes called field testing are aimed at determining the feasibility of a study from the perspective of implementation and resources [11]. Pre-testing on the other hand is a type of pilot study to ensure that a questionnaire instrument is fit for purpose specifically focusing on validity and reliability. Thus, its importance in semi-structured interview protocol development. There are many methods to undertake pre-testing of interview questions [12], however the two most common methods that are widely used are the expert review and the cognitive interview methods.

Expert review is a pre-testing method where individual experts with experience in survey methodology or knowledge of the theoretical or practical aspects of questionnaire design, fieldwork issues, and of data processing provide opinions on the questions in the questionnaire. These experts can be consulted independently or together in the form of a panel [13]. Expert review is considered a traditional method of questionnaire pre-testing [14]. Cognitive interview on the other hand is an evidence-based quality assurance procedure to investigate whether questions be it attitudinal, behavioral, or factual in nature in a questionnaire fulfills its intended purpose. It relies on interviews with individuals who are specifically recruited and represent the actual intended respondent in a study [15]. It is widely used to pretest questionnaires as it helps identify different types of problems that respondents encounter, provides evidence about why these problems occur and identify the phenomena or sets of phenomena that a variable would measure once the survey data is collected [13]. There are two types of cognitive interviewing techniques, namely the think-aloud interviewing, and verbal probing technique which has increasingly become popular [16].

This paper will report on how pre-testing can be undertaken for semi-structured interview questions using both expert review and cognitive interview methods. The methods were chosen because it could help to improve construct validity and reliability in the development of a semi-structured interview protocol. This paper will first review the literature related to rigour focusing on validity and reliability in qualitative research, pilot studies and its lack of reporting and pre-testing in pilot studies. Then the methodology of the pre-testing that can be undertaken will be described. The report from this paper would benefit other qualitative researchers, especially those who are considering pre-testing for their pilot study.

2. Literature Review

2.1. Rigour in Qualitative Research

Qualitative inquiry can be viewed as the blending of scientific rules and artistic imagination [17]. There are thus many measures or criteria including meta-criteria to assess what constitutes good qualitative research [18]. However what constitutes good qualitative research including that for case study research must include the importance of rigour which has been highlighted by a number of authors [5,19]. Rigour or as Lincoln and Guba [20] puts it "trustworthiness" in qualitative research is generally thought to refer to the concepts of validity and reliability [21] although this may not always be true for all qualitative researchers. In qualitative research the concepts of validity and reliability are linked in that where validity has been established, reliability could be said to also be present [20] and thus the singular use of validity sometimes to represent both concepts in qualitive research. Although the concept of validity is accepted as important in qualitative research, it has been a point of serious contention amongst qualitative researchers [3,22,23]. This is because the concepts of validity and reliability of research are viewed differently between the qualitative research and quantitative research paradigms, where qualitative research may make little distinction between these two concepts and use a myriad of terms to refer to them such as credibility, transferability and trustworthiness [24] whilst also operationalising them in many different ways [22]. There are also concerns that parallel terminology and criteria to validity and reliability could marginalize qualitative inquiry's scientific legitimacy [3]. This is especially so since all distinctions between the quantitative and qualitative research paradigm lie on a continua and many parallels exist between them [25].

The operationalisation of the concepts of validity and reliability in qualitative research involves quite a large

number of strategies qualitative researchers employ to minimize threats to validity and increase legitimization including but not limited to the collection of rich thick qualitative data or descriptions via prolong engagement, persistent observations and triangulation to rule out rival interpretations of the data [20,22]. There is thus no one definition of validity or reliability that is accepted in qualitative research whilst all conceptualisation of validity and reliability are useful for certain qualitative research designs [22]. Having said that however validity and reliability can be argue as the right concepts to attain rigour in qualitative research [3].

In the broadest sense validity in qualitative research can be said to refers to the integrity and application of the methods undertaken and the precision in which the findings accurately reflects the data [23]. Patton [26] noted that there are also no straightforward test or absolute rules to establish validity and reliability in qualitative research as it is impossible to replicate a researcher's thought processes. Sandelowski [17] agrees with this affirming that human experience is unique, and experiences may not necessarily be accessible to validation. Regardless of this, there are some best practices in qualitative research design to enhance rigour as it remains important that every qualitative enquiry be assessed fairly and carefully for what the data reveals in terms truth value, applicability, consistency, neutrality, dependability, credibility, confirmability, transferability, generalisability and the likes [17,22,27].

Some more commonly used but not necessarily always agreed to concepts in qualitative research to determine the rigour and quality of qualitative research for certain qualitative research designs are construct validity, internal validity (or credibility), external validity (or transferability or generalisability) and reliability (or dependability) and objectivity (or confirmability, neutrality) [5,20]. Construct validity deals with identifying the correct operational measures for the intended concepts being studied. This is to say that there is a need for the careful development of the study instrument to ensure that it measures what it is supposed to measure [26]. A research instrument is thus said to be valid when there is confidence that it measures what it was intended to measure [17]. Internal validity on the other hand, especially for explanatory studies or causal studies tries to establish a causal relationship different from spurious ones. It is the truth value, applicability, dependability or credibility of interpretations and conclusions about a setting or a group [22]. There are many ways on how internal validity objectives could be met in qualitative research and such ways must be developed within the specific features of a particular qualitative research [28]. External validity seeks to see if a study can be generalised to other settings, applications, populations, contexts and times and deals with the transferability of findings and conclusions [22,23]. Reliability looks at the repeatability, dependability or consistency of analytical procedures and methods and the results of a study including that to account for research method bias that could have influence the findings [23]. Objectivity focuses on a researcher's means to ensure an audit trail, triangulation of data and reflexivity in undertaking the research accounting for and acknowledging that findings are linked to the researchers' philosophical position, experience and perspective in qualitative research [23].

2.2. Pilot Study in Qualitative Research

A detailed and properly conducted pilot study is important to ensure good quality qualitative research results [11]. It should be viewed as a very important part of the research design process [29,30]. It also helps provides an opportunity for researchers to assess the success of the study's methodology [6]. However many authors have highlighted the fact that methodological reports on the conduct of pilot studies be it feasibility studies or pre-testing are rare and have received limited empirical attention in the qualitative research literature along with minimal guidance being offered by most textbooks, this is even so when the undertaking and reporting of pilot studies is highly recommended for qualitative research projects such as those involving semi-structured questionnaires [9,11,14,30-32]. Underreporting is also prevalent when reporting is actually made with very brief and simple mention of the pilot study undertaken without much detail of the processes and outcomes of the pilot study that will be useful to other researchers considering similar methods and instruments [30]. As argued by Van Teijlingen and Hundley [30], qualitative researchers have the ethical obligation to detail all their research experience as best they can including the pilot phase of their study which can inform future researchers about of the best research process and possible outcomes.

The lack of reporting or underreporting of pilot studies may be because pilot studies are not generally intended to produce results. They also carry inherent difficulties and ambiguities including the fact that most qualitative studies are of emergent or progressive design where changes to the research plan, research instrument and data analysis are made while undertaking the study itself to improve the study [29]. However, such pilot results, difficulties and other ambiguities are usually not an issue for pilot studies as qualitative research is less concerned about "contamination" of the main study by pilot results due to the emergent design of most qualitative studies. The outcomes of certain pilot studies thus can be used in the main qualitative study especially when well established and validated tools are utilised or when respondents are limited and exclusion may impact the main study [30]. Regardless of the justification for the lack of reporting or underreporting of pilot studies, there seems to be a greater need for awareness of the importance of pilot studies in qualitative research especially in its detailed methodological reporting for guidance to other researchers especially on improvements that have been made

as a result of the pilot study [6,11,30,33].

2.3. Importance of Pre-testing in Qualitative Research

Authors have highlighted that for pilot studies, pre-testing or instrument pre-testing in specific ensures that a study achieves a greater degree of construct validity or instrument trustworthiness and reliability [5,34]. Pre-testing is also generally regarded as important in certain qualitative research objectives involving questionnaires due to its impact on construct validity and reliability [14] as rigour is the desired goal regardless of differences of what validity or reliability means or the nature of the difference between the qualitative and quantitative paradigms and its respective verification processes [3,34]. Although pre-testing represents work to establish construct validity and reliability for semi-structured interview questions at the beginning of qualitative research, Hayashi, Abib and Hoppen [34] makes a point that at least for validity it should be seen from a processual approach where it is a recursive and on-going process from the start of research incorporating pilot studies to the publications of results and not seen as an isolated activity with a defined approach. Pre-testing is thus just the first step and one of many steps in determining validity in the entire qualitative research process. Figure 1 depicts pre-testing and where it sits in the typology of pilot studies and the key issues it addresses.

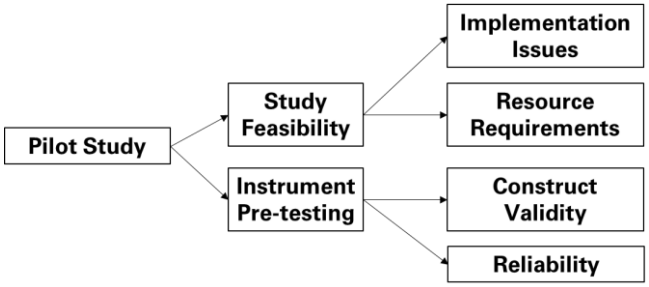

Figure 1. Pilot Study Typology and the Issues Addressed

2.4. Methods for Conducting Pre-testing

There are several methods that can be used to pre-test interview questions such as focus groups, cognitive interviews, conventional pretest, behavioral coding, and expert panels [12]. Willis, Schechter and Whitaker [35] showed that the various pre-testing techniques appears to exhibit a reasonable degree of consistency particularly between expert reviews, cognitive interviews, and behaviours coding. Some methods like expert review which is frequently used [14] may detect most problems in survey interview questions but as Willis, Schechter and Whitaker [35] makes clear that the "more is better" argument ignores the possibility that a highly sensitive method can have poor specificity, and produce a large number of false positives. There is largely no consensus however if any one method is better at spotting more problems as different studies have had different outcomes [12]. Having said that the evidence seems to suggest that using these methods together will enhance instead of cause conflicts in pre-testing due to their different natures. Therefore these methods can be "stacked-up" such as starting with the expert review and then following up with cognitive interviews as a means to improve the questionnaire development process although there is no reason to choose one method over another [35]. A multi-approach method of pre-testing interview questions is thus the best course of action [12]. In this paper we propose a stacking on two pre-testing methods which are the expert review and cognitive interview methods which allows for better issue triangulation with regards to the proposed semi-structured interview questions.

3. Methodology

3.1 Development of Semi-structured Interview Questions

In developing a good semi-structured interview protocol or interview guide, it is important to ensure that the semi-structured interview questions which will guide the interviews are valid and reliable to the extent possible. This paper aims to report on two pre-testing methods, namely expert review, and cognitive interview used together to pre-test semi-structure interview questions. Figure 2 shows the suggested process flow in which pre-testing can be undertaken to enhance both construct validity and reliability.

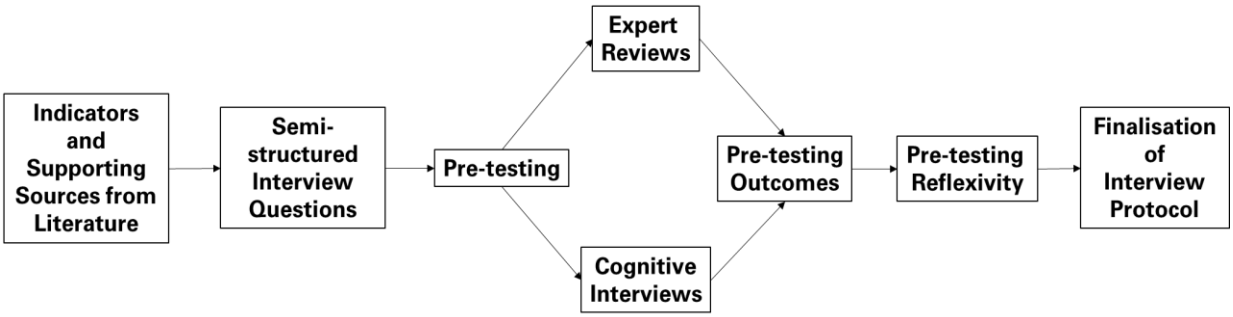

Figure 2. Suggested Pre-testing Process Flow

A conceptual model must first be developed to answer the research question(s) and achieve the objective(s) of the main study where required. The process started by determining indicators and supporting sources for the semi-structured interview questions from the literature, drafting the questions itself, then pre-testing the semi-structured interview questions using both expert review and cognitive interview methods. As pre-testing in qualitative research is a cognitive activity driven by the researcher as an instrument of enquiry and not just by data or any possible algorithmic approach [36], pre-testing outcomes from both the expert reviews and cognitive interviews will need to be evaluated along with the reflective insights of the researcher in order to finalise the semi-structured interview protocol prior to data collection in the main study.

As noted the semi-structured interview questions should ideally be developed based on a survey of literature to identify indicators and supporting sources relevant to research context to enhance construct validity. These indicators and supporting sources can be used to develop a conceptual model of the main study and the research question(s) and objective(s) of the main study. It is best to keep the semi-structured interview questions short, small in numbers, to the point and engaging as pointed out by Ikart [14]. If a long list of initial semi-structured questions were developed, it must be refined and reduced after pre-testing with the help of the pre-testing outcomes. It is always better however to have more questions before pre-testing that can be refined as a result of pre-testing.

3.2. Expert Review

A modified coding scheme questionnaire based on Willis and Lessler [37], Question Appraisal System or QAS-99 can be employed to obtain systematically structured feedback during the expert review. The modified version of the QAS-99 coding scheme focuses only on the cognitive processes involving "clarity," "assumptions," "knowledge/memory," "sensitivity/bias," and "other problems." Table 1 summarises the issue types based on cognitive processes of the modified QAS-99 coding scheme. In addition to using the modified coding scheme for question-by-question issue identification, the experts should also be asked to identify at least three of the most important specific issues in the proposed semi-structured interview questions and identify the questions affected, and three of the worse questions and why, similar to Ikart [14].

Table 1. Problem Types by Issue Codes
Source: Adapted from Willis and Lessler [37]

CLARITY: -
Wording: Question is lengthy, awkward, ungrammatical, or contains complicated syntax.
Technical term(s) are undefined, unclear, or complex.
Vague: There are multiple ways to interpret the question or to decide what is to be included or excluded.
Reference periods (e.g., "during the past month") are missing, not well specified, or in conflict.
ASSUMPTIONS: -
Inappropriate assumptions are made about the respondent or about his/her situation.
Assumes constant behavior or experience for situations that vary.
Double-barreled: Contains more than one implicit question.

KNOWLEDGE/MEMORY: -
Knowledge may not exist: Respondent is unlikely to know the answer to a factual question.
Attitude may not exist: Respondent is unlikely to have formed the attitude being asked about.
Recall failure: Respondent may not remember the information asked for.
Computation problem: The question requires a difficult mental assessment/ calculation/computation.
SENSITIVITY/BIAS: -
Sensitive content (general): The question asks about a topic that is embarrassing, very private, or that involves illegal behavior.
Sensitive wording (specific): Given that the general topic is sensitive, the wording should be improved to minimize sensitivity.
Socially acceptable response is implied by the question.
OTHER PROBLEMS: -
Other problems not previously identified with other Issue Codes.

Two groups of expert reviewers can be involved in pre-testing, namely academic experts, and practitioners if necessary. Expert reviewers in both groups should be identified by means of literature survey where possible. The academics experts can be selected based on their areas of expertise and their publication record in relevant research areas. Whereas the practitioners can be selected from their experience in the area in focus or individuals who are subject matter experts.

It is important to determine the degree of reliability of the experts when reviewing the semi-structures interview questions. Generally, inter-rater reliability for percentage agreement can be accepted if it is 70% or greater where at this point adding more expert reviewers will add little extra information to the whole review process and is a waste of resources [38]. Graham, Milanowski and Miller [39] also noted the same where an average of 70% inter-rater percentage agreement being the minimally acceptable standard, although more agreement is always better than less, they surmise that it is not possible or cost effective to achieve perfect agreement.

3.3 Cognitive Interview

In addition to the expert review method and for issue triangulation purposes pre-testing can also be undertaken using the cognitive interview method. Cognitive interviews rely on a small number of individuals that will be "stand-ins" for actual respondents and provides a window into the mind of the actual respondent to evaluate the questions in a draft questionnaire [40]. The semi-structured interview questions can be evaluated based on the four-stage cognitive model by Tourangeau [41]. This model focuses on a respondent's comprehension of a question, retrieval from memory, judgement/decision/estimation, and response to a question. The assumption in the cognitive interview pre-testing method is that answering questions involves these four series of complicated and interrelated cognitive tasks [42]. Table 2 highlights the definition of the four cognitive interview stages and their issue areas.

Table 2. Cognitive Interview Stages, their Definitions, and Issues Areas
Source: Adapted from ISTAT [13]

Cognitive Stages	Definition	Issue Areas
Comprehension	Respondents understand and interpret the question	Difficulties in understanding
		Suggest replacing word(s) or phrase(s)
Retrieval	Respondents search memory for relevant information to answer	Difficulties in recalling
Judgement/Decision/ Estimation	Respondents evaluate and/or estimate while deciding on an answer	Question is hard or complex
		Question creates embarrassment
Response	Respondents provide information in the requested format	Response not related to purpose of question
		Change answer after probing

Sampling for the cognitive interviews must be representative of the main study's target population [43] and be different from the experts who participated in the pre-testing involving the expert reviews. It is important to allows for variety and diversity however in the sampling frame so that different interpretations can be explored as recommended by Collins and Gray [43] and Willis [16].

A small number of interviewees representing at least one round of testing is adequate as cognitive interviews are qualitative in nature where it does not strive for any numerical goal for statistical estimation or evaluation by simply counting the number of interviews in which a problem occurs. The number of respondents required is thus small where findings can be based on just one interview that explains why respondents answers questions the way they do and the construct or set of constructs a question captures [16,44,45]. Cognitive interviews can however continue until no new problems or serious problems or other patterns of interpretation are discovered which may require more than one round of testing [13,46]. Increasing the number of interviewees for the cognitive interview method may also reduce the number of respondents available for the main study.

A cognitive interview questionnaire suggested by ISTAT [13] along with concurrent probing [16,40] based on verbal probes identified by ISTAT [13] can be used to gauge comprehension of the question, retrieval from memory, judgment/decision/estimation and response to the question. The verbal probing technique is suggested to be used due to its relative ease. Different verbal probes on the semi-structured interview questions can be used based on the interviewee's response and reaction to each interview question. Generally, interviews lasting about one hour is the optimal length for cognitive interviews [16] to review the issues related to the four cognitive stages. As the objective of the cognitive interviews was to identify cognitive issues inherent in the structure of the semi-structure interview questions and not to code or analyse the actual responses or answers, transcriptions of the interviews are generally not required.

3.4. Pre-testing Reflections

In undertaking the pre-testing using both the expert review and cognitive interview methods, the post pre-testing reflections of the researcher is important in finalising the semi-structured interview protocol. Issues encountered can help refine the semi-structured interview questions and the final interview protocol for the main study. This reflective account will also be useful to understand the issues researchers may encounter or matters which the researcher must keep in mind during the main study. Reflections can range from question related to issues such as technical terms, presumptions made or effectiveness of probing question to more practical matters such as the interview process, interview settings, mindfulness of body language during the interview, clarifying questions the respondents used and examples the main study respondent may require for clarity during the main study interview.

3.5. Finalising the Semi-structured Interview Protocol

The outcomes from the various issues raised in the expert reviewers and from the cognitive interviews for each question along with the reflective insights by the researcher must then finally be reviewed in detail as a necessary step. The semi-structured questions must then be finalised into a semi-structured interview protocol which will answer the objectives of the study based on the extensive outcomes and insights obtained from the pre-testing procedures.

4. Conclusion

This methodology paper has detailed how a semi-structured interview protocol can be developed using both the expert review and cognitive interview pre-testing methods and the resulting researcher's reflections on semi-structured interview questions in qualitative research especially for multiple case study research. In doing so it provides a practical contribution of a methodological guide for qualitative researchers on how to conduct pre-testing using these two pre-testing methods particularly in finalising a semi-structured interview protocol. The general process of undertaking pre-testing using both the methods of expert review and cognitive interview can be utilised in a similar fashion by any qualitive researchers using semi-structured interview questions. This methodological paper thus expands on the framework for the development of a qualitative semi-structured interview guide as described by Kallio *et al.* [6] and adds to the limited body of literature on pilot studies in qualitative research.

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