

Research Design and Methods: A Systematic Review of Research Paradigms, Sampling Issues and Instruments Development

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Abstract

This study is aimed at to contribute a detailed systematic review on research paradigms, sampling and instrument development issues in the field of business research. This study has reconnoitered the levels of theory and their implications in academic literature. With accession to this the methods of quantitative and qualitative research have been discussed. The main contribution of this study was to explore the sampling size issues. A meticulous review has bared the exact sample size that is supported by different researchers. In line with measurement scale has also been discussed based on previous literature support. Finally, the problems faced during scale development and items generation are discussed in detail.

Keywords: Research methods; Sampling issue; Research paradigms; Scale development process

Introduction

The term ‘paradigm’ described as essential collection of beliefs shared by scientists, a set of agreements about how problems are to be understood, how we view the world and thus go about conducting research [1]. Thus, these paradigms contain a basic set of beliefs or assumptions that guide our inquiries for a particular research [2]. In views of this, author like Myers and Avison [3] have stated that for defining a valid research the most recommended method is to follow the research paradigm. This is essential because by selecting a specific paradigm researcher does not dwell in his own philosophical know-how and get a better stance chosen in relation to other alternatives. There are mainly four paradigms that have been widely used in information system research include Positivism, Interpretive, Advocacy and Pragmatism [4]. Positivist, Interpretive and Advocacy paradigm are discussed below in Table 1, as Pragmatism is the combination of Interpretive and Positivism.

The positivist paradigm

The supporters of this paradigm believe that true knowledge can be obtained through observation and experiment. So Positivists normally select scientific method to produce knowledge. Positivism is also called Scientific Method, Empirical Science, Post Positivism and Quantitative Research. Levine et al. [5], discussed that in positivism reality remains stable and can be observed or described through an objective. A strong debate is available on the issue of using positivist paradigm that whether it is appropriate for social sciences or not [6].

The interpretive paradigm

The supporter of interpretive paradigm believes on the deep understanding of a concept and explores the understanding of the world in which they live. They develop subjective meanings of their experiences or towards certain objects or things. This paradigm is also called Constructivism, Social Constructivism or Qualitative Research paradigm. Interpretive believe that true knowledge can only be obtained by deep interpretation of subject.

The advocacy/participatory paradigm

The supporters of advocacy paradigm claim knowledge through an advocacy paradigm. This paradigm is also known as critical paradigm. A debate started during the 1980s and 1990s from individuals who

felt that positivist paradigm does not adequately address on social and political issues. In views of this, authors like Fay [7], Kemmis and Wilkinson [8] have arose the importance of advocacy paradigm in their studies. These researchers believe that inquiry needs to be entangled with political and social issues. In accession of this research should contain the agenda of reform that ultimately address the issues of empowerment, inequality, oppression, domination, suppression, and alienation.

The pragmatism paradigm

The aim of this paradigm is to find the weaknesses in the study and to strengthen it by using mix method approach [9]. The supporter of this paradigm believes that true knowledge can be obtained by mix method approach. Instead of method being important, the problem is most important and researchers should use all approaches to understand the problem statement [10]. Pragmatism is not affiliated to any system or philosophy. The researchers are free to use both quantitative and qualitative approaches; the essential is to find the best techniques and procedure of research that solve problem statement.

Philosophical assumptions

There are seven different philosophical assumptions comprise Ontology, Epistemology, Axiology, Rhetoric, Methodology, Strategies of Inquiry and Methods that follows all four paradigms. Ontology deals with the nature of reality about the concept of knowledge whereas Epistemology deals with the connection between the researcher and that being researched [11].

Levels of Theory

Theory is a standardized principle on which basis we can explain the relationship between two or more concepts and variables. There

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Research Paradigm/Knowledge Claim Positions	
Positivist	Constructivism
<ul style="list-style-type: none"> • Determination • Reductionism • Empirical observation and measurement • Theory verification 	<ul style="list-style-type: none"> • Understanding • Multiple participant meanings • Social and historical construction • Theory generation
Advocacy/Participatory	Pragmatism
<ul style="list-style-type: none"> • Political • Empowerment issue-oriented • Collaborative • Change-oriented 	<ul style="list-style-type: none"> • Consequences of actions • Problem-centered • Pluralistic • Real-world practice oriented

Table 1: Depicts key functionalities of all paradigms posited by Creswell [1].

are two levels of theory first abstract level that follows inductive theory approach and second is empirical level that follows deductive theory approach.

Inductive level

Collis and Hussey [12] defined inductive approach this approach elaborate a process where theory is developed by observation that what researcher has observed during his research more over it may called a process where you induce or inferences your thought about a specific object or variable. In accession to this Collis and Hussey have explained the induction process in which a relationship between meanings and actions of human subjects are used to be observed and investigated.

Deductive level

According to Collis et al. deductive approach where you don't get theory from observation theory already existed and proved by researchers moreover you can explain a research that based on empirical observation and theory generated on conceptual and theoretical structure. Generally researcher intends to test a theory by collecting the fresh data from respondents and observe the findings by applying various statistical tests. This method is generally recommended for specific studies in which researcher work on particular concept by creating assumptions and then verifying those assumptions.

Research Methods

Despite the existence of much research method classification quantitative and qualitative methods are the most dominating methods. Detailed descriptions of these two methods are stated below.

Qualitative method

Qualitative method is used to collect the in-depth details on a particular topic. This approach assumes a single person represents the group feelings and emotions of a person are equally important to interpret which are ignored by the quantitative method. This approach is usually used by the interpretive. Authors like Tashakkori and Creswell have explained that this approach is used when researcher wants to observe or interpret an environment with the intention to develop a theory.

Quantitative method

Quantitative method is a scientific method and its grounds can be identified in positivist paradigm [13]. This method focuses on fresh data collection in accordance to the problem from large population and analysis of the data but ignore an individual's emotions and feelings or environmental context. Similar to this have discussed that the quantitative strategy works on objective and measure it through the actions and opinions which helps researcher to describe the data rather to interpret the data.

Research objectives and classification

There are three basic forms of research objectives that include exploratory research, descriptive research, and explanatory research. The purpose of exploratory research is to seek new insights and find out what is happening. There is an attempt to ask questions and assess phenomena in a new light. This type of research is usually adopted in early stages of research where the concepts are not clear enough to develop an operational definition. A more qualitative approach often underpins this sort of inquiry and the focus is on obtaining new insights into current situations and issues. Descriptive method of research refers to the type of research that aimed at obtaining information on current state of phenomena. This type of research sets out to provide an accurate profile of situations, people or events. Similar to this accession author like Polit et al. [14] have stated that descriptive research seeks to observe and document an occurring phenomenon which cannot be ascribed an objective value. Cohen et al. [15] have posited that explanatory research helps this type of study for instance explanatory research helps to find out the reasons behind the occurrence of a particular phenomenon. Explanatory research explains a situation or problem usually in the form of casual relationships. This type of research helps one to get fresh insight into a situation in order to build, elaborate, extend or test a theory. The prime objective of explanatory research is to identify issues and key variable in a given research problem. This approach is much relevant to quantitative.

Research strategy

Research Strategy defines it is a process of collecting and interpreting of data with a clear objectives. Easterby-Smith et al. [16] have stated that, research strategy is a general plan like how to answer the research question that has been set by researcher. Yin [17] has posited that, based on three conditions-research question, control on behavioral events, and focus on contemporary events there are five key research strategies in social sciences. These are: experiment, surveys, archival analysis, histories and case studies.

Experiments: The experimental method involves the process of variable testing where the impact of one variable can be seen with other variables. Similar to this accession Malhotra et al. [18] have opined that this strategy is used when researcher examine cause and effect relationships among variables.

Survey: The survey strategy is popular in social sciences and associated with deductive research approach [19]. In this research strategy information is collected by interviews or pre-designed questionnaire.

Archival analysis: The archival strategy reports the incidence and prevalence relates to a specific phenomenon. However it is difficult to use this strategy when it comes in research area.

History: This research strategy is used to explore past issues. This strategy is adopted especially when no relevant person is alive to give answer or to report about particular issue.

Case study: The case study strategy is a written description of a problem or a situation. It presents small group problems or focus on a particular issue. Case study preferred when researcher has little control on events.

Population and Sampling

Population can be defined as all people or items that one wishes to understand while sampling is the process of selecting segment of the population for investigation. It is a process of selecting a sample of units from a data set in order to measure the characteristics, beliefs and attitudes of the people [20]. Sampling survey involves structured questionnaire to evaluate people beliefs and attitudes. Collected data via structured questionnaire can be enumeration of a selected population or subgroup. Authors like Malhotra and Birks [21] have explained that a smaller group of population has ability to make an inference about a larger group of population. This type of selection is also beneficial to reduce the work burden and cost that would have been involved in studying the whole target population. Similar to this Cooper et al. [22] have posited, there are several reasons for sampling including: better speed of data collection, results accuracy and cost efficiency. Selection of sampling method depends on the nature of the research study. It may include theoretical and practical issues. There are broadly two types of sampling methods, probability sampling and non-probability sampling. The following describes the main sampling techniques and sampling method usually used in business studies.

Probability sampling: Probability sampling is a sampling approach in which each unit has an equal chance of probability to be selected. Probability sampling is further divided into four categories including: simple random sampling, systematic random sampling, stratified random sampling, cluster sampling and Multi-stage Sampling.

Simple random sampling: In line with the definition of randomization, it is a sampling process in which each unit of the population has an equal probability of inclusion in the sample. It can be calculated with sampling fraction that is n/N where n stands for sample size and N for the population size. In this method researcher develop a numeric list of all sample size and by using computer program generate random numbers.

Systematic random sampling: Probability sampling technique where initial sampling point is selected at random and then the cases are selected at regular intervals. For instance in this method researcher systematically choose the first number that is 5 and then the other cases will select at regular interval- 25, 35,45,55 so forth.

Stratified random sampling: It is a process of sampling in which each subgroup called strata is given equal chance to be selected randomly. It gives equal proportionate representation to each stratum.

Cluster sampling: Sampling technique where researcher derive sample out of aggregations of population that are geographically dispersed and possibly unable to access at the same time. It could be 10 banks in cluster from all around the world.

Multi-stage sampling: Multi-stage sampling or Multi stage cluster sampling involves a sequence of stages [23]. First stage is to select the random sample of the entire region in cluster. The second stage is to select a specific region and at final stage to select relevant objects for sample size.

Non-probability sampling

Non-probability sampling is the sampling approach in which the chance or probability of each unit to be selected is not known or confirmed.

Convenience sampling: Convenience sampling defines a process of data collection from population that is close at hand and easily accessible to researcher. Convenience sampling allows researcher to complete interviews or get responses in a cost effective way however they may criticized from selection bias because of the difference of the target population.

Snowball sampling: In snowball sampling technique the researcher makes initial contract with a small group of people who are relevant to the research topic and then uses them as referrals to contact with others.

Quota sampling: It defines the strata of the population and to set a quota for sample element from each stratum. The findings from this type of sampling technique cannot be generalized because the element is not selected by using a probability sampling method.

Judgment sampling: Defines a process where researcher use own judgment to select a group of people who knows about the problem. Judgmental sampling is also called purposive sampling because it involves a particular purpose. This type of sampling technique is convenience and cost effective.

Sampling frame

Sampling frame defines a frame where a sample of target population can be drawn. Similar to this accession authors like Creswell and Clark, have stated that, a sample frame can be defined as a list of all units in the population from which research sample will be selected.

Determine sample size

There is an extensive discussion existed in academic literature on sample size. Selection of a correct sample size is still a big challenge for researchers. Sample size needs to be carefully considered as statistical techniques are strongly affected by it. Similar to this accession authors like Collis and Hussey have posited, sample size which is based on analysis method for instance structural equation modeling that further analyze confirmatory factor analysis, casual modeling with latent variables, structural path analysis and multiple regression analysis must be treated carefully. In light with these arguments, sample size for this study was selected by following most important rule of thumb quoted in academic literature. Authors like Krejcie and Morgan [24] have stated that if the given population was 1000000 then the required sample size would have to be 384. Further, if this rule is applied in abc study which deals a population of 1800000 units then, the sample size would have to be 384.

$$s = X^2 NP(1 - P) \div d^2 (N - 1) + X^2 P(1 - P).$$

s =denote required sample size.

X^2 =denote the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841).

N =denote population size.

P =denote population proportion (assumed to be .50 since this would provide the maximum sample size).

d =denote the degree of accuracy expressed as a proportion (.05).

$$S = \frac{3.841(1800000 \times 0.50)(1 - 0.50)}{0.50(1800000 - 1) + 3.841 \times 0.50(1 - 0.50)}$$

$$S = \frac{1728450}{4500} = 384$$

Authors like Cochran proposed a sampling formula. Stated that of the population is larger an ideal sample size would have to be 267. Following is the detail description of mathematical formula proposed by Cochran.

$$n_0 = \frac{z^2 \times p(1-p)}{e^2}$$

Where

n_0 is the sample size

Z is the two tailed area under the normal curve where $\alpha=0.05$ and the z value is 1.96

e is the acceptable sampling error

p is the population of a proportion with a desired attribute (assumed to be 0.5 which maximises the sample size to be determined)

Given these values and an acceptable sampling error of 6.5%, the sample size is determined as: This gives the acceptable sample size to be approximately 267.

In case of analysis method research where structural equation modeling applied following recommendation should be in account. According to Schikorski and Stevens [25], 15 cases per construct are ample when multiple regression analysis is required. If this formula applies in this study, 10 constructs multiplied by 15, equals to 150 sample size. Whereas Bollen [26] stated that ration of five sample per variable. Jöreskog and Sörbom [27] stated that sample size must be 10 observations per parameter to perform CFA. Another study by Tabachnick and Fidell [28] suggested that sample size should be 300 valid responses for factor analysis study. According to Joseph F Hair stated, research that required factor analysis procedure in order to determine the dimensionality for the employed items, the sample size that should be obtained is five times greater (minimum) or ten times greater (maximum) than the items that want to be analyzed. Similar to this Hair posited that a minimum sample size of 200 is required for structural equation modeling. In light of this simple random sampling approach was used and data collected via online survey. Finally, Comrey and Lee [29] stated that sample size of 50 is very poor, while 100 is poor, 200 is reasonable, 300 is good, 500 is very good and 1000 is brilliant for structural equation modeling.

Data collection method

Data was collected via email service. A help was taken from third party (Mail Chimp) to get response on self-administered questionnaire. The main objective to use third party (mail chimp) was to make this study non-contrive. In non-contrived research setting researcher influence becomes minimum unlike contrive research. From list of 1.8 million internets banking customers 1000 customers was selected via simple random sampling approach. Simple random sampling is the most favorable and supportive technique in quantitative studies where individuals get equal opportunities to participate in the study. By following factors that influence on internet banking adoption in Pakistan a cross sectional approach was adopted. In Cross sectional study data could be collected once at a time. The overall data collection method went through three distinct steps: includes designing of instrument, sample size and implementation of survey via using online

services of mail chimp. As the nature of this study is quantitative and researcher is following positivist paradigm data collection through questionnaire deemed most appropriate approach.

Data type and sources

Generally there are three types of data sources include primary, secondary and tertiary. Primary data usually represent publications, Reports, Theses, Emails, Conference reports, Company reports or some government publications. Primary data is the most influencing technique in quantitative method.

Instrument Development and Measurement Scale

Study that was conducted under positivist philosophical aspects, in that quantitative method was the best for data collection. Survey questionnaire is used to measure respondents liking, how they feel or do in a group or individual.

Items development

In views of authors like Churchill Jr [30] stated that item developed by two steps. Primarily, specifying the domain of construct where the items were adopted to ensure the validity of the content. Secondly, generation of item scale where the item scale selected by literature review.

Questionnaire design

Authors like Pinsonneault and Kraemer [31] have stated there are three main objectives for conducting research with survey questionnaire when: 1) Data of the research is based on quantitative methods, 2) Instruments are used in research must be pre-defined, 3) Research work that requires to analyze finding of a sample to whole population.

Measurement scale

In survey questionnaire Likert-type scales are commonly used to measure observations and attitudes [32]. These rating scales contain either five or seven response categories and have their own pros and cons. Supporter of 5- point Likert-type scale states that, it was used to increase response rate and quality with special focus of reducing respondent frustration level. Literature suggests that a five-point scale is readily comprehensible to respondents and enables them to response their views in a better way [33]. However few researchers prefer to do analysis with seven-type Likert scale. Symonds [34] was the first to propose that reliability is optimized with seven-type Likert scale. In line with Miller, [35] stated that human mind has span of absolute judgment that can differentiate objects till seven categories beyond seven might be useless. Author like Thomas and Lewis [36] posited that seven-point scales depicted better correlations with t-test results. Seven-point Likert scale appears to be more suited in electronic survey [37]. Literature confirms that data from Likert items becomes significantly less accurate when the number of scale drops five or above seven [38]. Authors like Hair JF, Black WC, Babin BJ, Anderson RE, Tatham RL [39] have stated that if the focus of the research is on individuals behavior then five to seven-point Likert can be selected to measure the items. In light of findings there is some support with seven-point scale but the popularity of five-point Likert scale seems to be less justified [40-45].

Conclusion

This study accomplishes a systematic review on research

paradigms, sampling and instrument development process. A set of beliefs of different researchers on paradigms was weighed up in detail. Meanwhile, the research methods were also explored with different supporting arguments. For quantitative study, levels of theory are the most important factors so in this regards researcher has enlightened inductive and deductive approaches of a theory. Sampling is the critical issue in every study that has been conducted with primary data so to overcome on this, following study proposed two formulas to determine sample size. Furthermore, opinions of different authors have been quoted regarding selection of sample size. Finally, measurement scale and items generation process were also conferred in this study that will support to get exact picture of quantitative studies.

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