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THE IMPERATIVE OF TRIANGULATION IN RESEARCH

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Abstract
This study examined the concept of triangulation, its various forms as well as its influence on research (i.e. benefits). The data for this study were acquired through reviewing extant literature on triangulation; this is achieved via surfing search engines as well as databases such as Google Scholar, ERIC, EBSCO, and PROQUEST. Hence, the keywords were searched individually as well as in combinations, which incorporate; triangulation, mixed methods, types of triangulations. It is evident that triangulation involves the integration of multiple theoretical perspectives, methodological approaches, data sources, investigators, or data analysis methods. The essence of triangulation is to reduce or offset the limitations/shortcomings of a single strategy, thereby enhancing the capacity to interpret the findings. In addition, deploying triangulation strategy does not right nor enhance a study that is fundamentally flawed. Therefore, it is recommended that should different philosophical positions and research traditions aid to answering research question(s) most robustly, then the use of triangulation is imperative. Nonetheless, researchers should clearly articulate the rationale for employing this strategy and its contribution(s) to the study.

Keywords: Triangulation, Research Methods, Mixed Methods, Data

Introduction

Unanimously, researchers endeavour to conduct studies that offer diverse views of the phenomenon while also yielding comprehensive, valid data that may be interpreted with a satisfactory level of confidence (Bans-Akutey&Tiimub, 2021; Flick, 2004). The underlying objective of researchers is to develop a study that exhibits robust internal and external validity and reliability, incorporates a complete multidimensional approach (Boyd, 2000), and deploys measures to mitigate any biases in the research (Noble, & Heale, 2019). Utilizing triangulation approaches can enhance the validity, robustness, and interpretative capacity of a study, mitigate investigator biases, and offer diverse views (Ritzer, 2007; Denzin, 2017). Triangulation has increasingly gained prominence as researchers have got more adept at developing and evaluating theories (Bans-Akutey&Tiimub, 2021). What is the value of study with unreliable and erroneous findings? Responses to research questions should strive to approximate reality as closely as possible, even if absolute accuracy is unattainable.

Researchers have discovered a means for generating dependable outcomes through the deployment of triangulation.

Triangulation denotes the integration and deployment of various research methodologies to examine the same phenomenon. This concept, analogous to the act of constructing a triangle, can be traced to ancient Greek origins in modern geometry. It was introduced into the social sciences in the 1950s, subsequently facing substantial criticism in the 1980s (Silverman, 1985; Lincoln and Guba, 1985; Guba and Lincoln, 1989; Campbell and Fiske, 1959). In the 1990s, triangulation is regarded as a post-positivist methodological strategy(Flick, 2004). Recently, it has regained prominence as a new breed of scholars embraces a mixed or multi-method approach to social inquiry (Creswell, 2011; Teddlie and Tashakkori, 2003).Thus, it is in the quest to achieve validity and credibility in research that propels researchers to deploy triangulation in research.

The objective of this study is to delineate the concept of triangulation as deployed, while examiningthe various forms of triangulation and their influence on research. The data for this paper were acquired through reviewing extant literature on triangulation; this is achieved via surfing search engines as well as databases such as Google Scholar, ERIC,EBSCO, andPROQUEST. Hence, the keywords were searched individually as well as in combinations, which incorporate; triangulation, mixed methods, types of triangulations, etc.

Concept of Triangulation

Linguistically, triangulation is conceived as a procedure that use trigonometry to ascertain an unknown point or place by utilising the positions of two fixed points separated by a known distance (OED,2024; MWD, 2024). The triangulation metaphor employed in research originates from construction, surveying, and maritime navigation. The concept involved utilising two established points to determine the location of an unknown third point by constructing a triangle (Britannica, 2000). The objective of research is to employ multiple means to enhance the design, hence improving the capacity to interpret the results (Thurmond, 2001). Triangulation involves the integration of many data sources, investigators, methodological approaches, theoretical views, or analytical techniques within a single study (Bans-Akutey&Tiimub, 2021; Tashakkori&Teddle 2003). These combinations yield data triangulation, investigator triangulation, methodological triangulation, theoretical triangulation (Denzin, 20 17; Patton, 1990), or analytical triangulation (Kimchi et al., 1991). When numerous types of triangulation are employed, such as two or more data sources in conjunction with two or more investigators, this intricate triangulation is termed multiple triangulation (Denzin, 20 17; Kimchi et al., 1991; Patton, 1990).

The word, when introduced in research, notably in the social sciences, served as a conduit between quantitative and qualitative epistemologies. This was perceived as a means to enhance the rigour of qualitative researchers, potentially enabling them to confront a methodological inferiority linked to a "stepchild complex" (Kamberelis& Dimitriadis, 2004: 2). Proponents of mixed-methods research contend that it enables them to address enquiries that singular research approach cannot. Additionally, Teddlie and Tashakkori (2003) contended that triangulation offers overriding inferences ensuing from the integration of diverse perspectives.

The application of various research approaches in a survey to mitigate the limitations or biases inherent in a singular approach is referred to as multiple operationalism. In the social

sciences, triangulation has emerged as a metaphor for the methodological integration of the post-positivism. The metaphor suggests many interpretations, wherein triangulation may represent "(1) a synonym for mixed-methods, multi-methods, or mixed-modeldesigns" (Teddlie &Tashakkori, 2003: 11, 14); (2) a validation technique; (3) an integration of diverse mixed-methods techniques; (4) a method for integrating quantitative and qualitative methodologies within a single study (Erzberger& Kelle, 2003).

Nonetheless, the historical context of the word, along with its applications and interpretations, is fraught with ambiguities (Denzin, 2017). For instance, Richardson (2000) maintained that some authors differentiate triangulation from multiple-methods research influenced by post-structuralism and cultural studies. In this parlance, multiple realities exist for comprehending the social world (epistemological relativism)... thus, diversity and contradictions must be integrated into research narratives (Denzin, 2017). Conversely, Saukko (2003) notes that the "classical aim of triangulation is to combine different kinds of material or methods to see whether they corroborate one another" (p. 23).

Necessity for Triangulation

Qualitative research is fundamentally multi-methods in nature. Triangulation, or the employment of various methods, signifies an effort to attain a comprehensive understanding of the subject under investigation. Objective reality can never be fully apprehended.Our understanding of an entity is solely derived from its representations.From this perspective, critical or interpretative triangulation serves not as a validation tool or method, but rather as an alternative to validation. The integration of diverse methodological methods, empirical materials, viewpoints, and observers within a single study is optimally seen as a strategy that enhances authenticity, trustworthiness, credibility, rigour, breadth, complexity, richness, and depth in any investigation.

The social realm is socially produced, and its significance to both observers and the observed is ever evolving.Consequently, no single research methodwill ever encompass all the evolving characteristics of the social phenomenon being examined. Every research method entails a distinct perception of reality and proposes many courses of action that the researcher may pursue during the research process. The significance of methodologies is ever evolving, and each researcher applies distinct interpretations to the research methods employed. Consequently, an effective exploration for robust interpretations of the social world (realm) utilises triangulation approaches.

Forms of Triangulation

Although it is widely believed that triangulation involves employing numerous methods to examine the same phenomenon, this is but one variant of the strategy. There exist four fundamental forms of triangulation: (1) Data triangulation, encompassing time, space, and persons; (2) investigator triangulation, involving multiple observers instead of a single one; (3) theory triangulation, utilising multiple theoretical frameworks for phenomenon interpretation; (4) methodological triangulation, employing various methods, which may include within-method or between-method approaches. In addition, there are multiple and interpretive triangulations, the former occurs when the researcher integrates several observers, theoretical viewpoints, data sources, and procedures within a single investigation; the latter (interpretive triangulation) may be regarded as an alternative to conventional post-positivist validation methods. Interpretive triangulation facilitates discussions regarding how a text validates or legitimises itself through the deployment of many voices and representational forms. Various forms of triangulation have been recognised, including reflective, structural, and multi-purpose varieties.

Data Triangulation

Data triangulation entails gathering information from diverse demographics, such as individuals, groups, families, and communities,etc across different times and space to obtain varied perspectives and validate the data.There are three categories of data points: time, space, and person (Denzin, 2017). Data points (sources) may differ according to the time context, geographical location, or the individuals from whom the data were collected (Denzin, 2017). Conversely, longitudinal studies aim to detect changes across time; hence, they are not classified as triangulated. Time triangulation refers to the collecting of data at several intervals to ascertain the consistency of findings (Kimchi et al., 1991). Diversity in events, situations, dates, locations, and individuals enhances the study by potentially uncovering anomalous data or recognising analogous patterns, hence bolstering trust in the results (Thurmond, 2001).

Investigator Triangulation

This entails the involvement of two or more researchers in the same study to yield diverse views and conclusions. This form of triangulation can provide both validation of results and diverse viewpoints, enhancing the scope of the phenomenon under investigation. In other words, investigator triangulation connotes employing multiple observers, interviewers, coders, or data analysts within the research. The validation of data across researchers, conducted independently without prior communication or collaboration, enhances reliability and credibility of the findings (Denzin, 2017).

Theoretical Triangulation

Theoretical triangulation involves employing different/ multiple theories or hypotheses to analyse and interpret a phenomenon or data (Denzin, 2017). The objective is to undertake the investigation using many perspectives and inquiries to either corroborate or challenge the findings. Theoretical triangulation involves utilizing perspectives or hypotheses that may be either connected or contradictory, contingent upon the researcher's objectives (Denzin, 2017). Theoretical triangulation can be employed to evaluate many hypotheses by examining data from a singular data set (Boyd, 2000).

Methodological Triangulation

The initial category of triangulation is method triangulation, which entails employing various data collection methods to investigate the same phenomenon (Carter, 2014). Methodological triangulation is often referred to as multi-methods, mixed-methods, or methods triangulation (Denzin, 2017;Boyd, 2000; Kimchi et al., 1991). Methodological triangulation, as discussed in the literature, can be rather ambiguous (Goodwin & Goodwin, 1984) since it may pertain to either data collection methods (techniques) or research designs (Thurmond, 2001). Some scholars have examined methodological triangulation in terms of qualitative and quantitative methods, suggesting a paradigmatic relationship (Barbour, 1998; Greene &Caracelli, 1997). Others have mentioned qualitative and quantitative data collection methods, along with their analysis and interpretation, rather than philosophical positions (Goodwin & Goodwin, 1984). Accordingly, Mitchell, (1986) contended that the researchers use various ways to mitigate the "deficiencies and biases that arise from any single method" (p. 19), hence "potentially counterbalancing the flaws or weaknesses of one method with the strengths of another" (p. 21).

In addition, methodological triangulation can be categorised into two types: within-method triangulation and between- or across-method triangulation. Researchers employing within-method triangulation utilise a minimum of two data collection processes from the same methodological framework (Kimchi et al., 1991). Quantitatively, it may involve the distribution of survey questionnaires and the utilisation of previous data from a database,

while qualitatively; non-participant observations may be integrated with focus group interviews. Researchers utilising between- or across-method triangulation incorporate both qualitative and quantitative data collection techniques in the same study (Denzin, 2017;Thurmond, 2001; Mitchell, 1986).An illustration is the integration of interviews and questionnaires within a single study or the employment of participant observation or questionnaires (Denzin, 2017).

Benefits of Triangulation

The significance of triangulation must not be overlooked in guaranteeing the dependability and validity of data and findings (results).

The first benefit of triangulation is its ability to validate research findings. When a researcher employs diverse methods, such as quantitative and qualitative approaches, and is fortunate to obtain data from all methods that converge in a specific direction, the results are thereby validated. This verifies that the job completed is precise. It must, however, be emphasised that employing triangulation to validate research findings does not imply that the collected data is beyond scrutiny. It is essential to consistently scrutinise obtained data to enhance research and augment current knowledge (Bans-Akutey&Tiimub, 2021). However, quantitatively gathered data in a triangulation can validate qualitative data when the triangulation is meticulously planned and expertly deployed by researchers who possess a clear understanding of their objectives.

The second benefit is when researchers employ many sources or methods in a study, the shortcomings of one approach are mitigated by the advantages of another. When both quantitative and qualitative methods are employed concurrently in a study, thereby utilising mixed methods, the researcher can validate qualitative findings, examine relationships, and statistically represent results, while simultaneously grasping the context of the findings and addressing complex issues arising from the quantitative data. In many cases, quantitative and qualitative research methods typically enhance one another.

The third benefit of triangulation is that it yields additional insights that assist researchers in elucidating a phenomenon more effectively. In instances of theoretical triangulation, researchers utilise many theories to elucidate research findings. This assists researchers in analysing data in relation to various ideas for enhanced comprehension. It is important to acknowledge that theoretical triangulation can be complex and necessitates that researchers possess a thorough understanding of the theories employed in the study and their applications. However, there is no universally correct method for conducting triangulation. Triangulation is conducted in the most effective manner known to researchers.

The fourth benefit of triangulation is to facilitate the identification of conflicting data, allowing for cleaning or expunging. A researcher cannot arbitrarily reject data for a specific study, as this would be unethical and could adversely affect the research outcomes. In investigator triangulation, where multiple researchers, interviewers, or data analysts are employed, contradicting data can be readily identified and excluded to prevent adverse effects on the study's conclusions. Errors are readily identifiable and can be rectified or eliminated entirely.

Ultimately, triangulation enhances the credibility and validity of the research. Utilising numerous data sources mitigates study biases in sampling, procedural bias, and researcher bias, hence enhancing validity and trustworthiness. Even when faced with contradicting findings during triangulation, researchers remain assured and can readily articulate the reasons for these discrepancies. Enhancing the reliability and validity of research through

triangulation bolsters researchers' confidence. Nonetheless, the validity of any research cannot reach 100%, and so, the acquired data may always be subject to scrutiny (Social Sciences Research Laboratories, 2018).

Conclusion

Triangulation primarily aims to validate study results, enabling stakeholders to make informed decisions based on the research findings. Validity, which signifies the accuracy with which a research method assesses a reality, can be categorised as internal, external, or construct. All three forms of validity can be attained through systematic triangulations using methodological, data, investigator, theoretical, multiple triangulation. Although triangulation demands significantly more resources from researchers and necessitates a high level of expertise, it offers some advantages that render it attractive to researchers. Triangulation aids in validating research findings, mitigating shortcomings from a singular method or source, offering other insights, promptly identifying and rectifying inconsistent data, and enhancing the validity and credibility of the study. Ultimately, study triangulation enhances researchers' confidence in their findings.

Finally, when utilised correctly, triangulation can augment the comprehensiveness and validation of data in research findings. Employing both quantitative and qualitative methods within a single study is a feasible approach to acquire complementary results and fortifyresearch outcomes. The golden advice is, should different philosophical positions and research traditions aid to answer research question(s) more robustly, then the use of triangulation is imperative. Nonetheless, researchers must clearly articulate the rationale for employing this strategy and its contribution(s) to the study.

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