

# DESIGNING CASE STUDY RESEARCH IN CONSTRUCTION MANAGEMENT

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## ABSTRACT

Research methodology is an important and indispensable element in research design. However, designing research strategy such as case study has proven to be a difficult task among research students. Case study is one of the most frequently used qualitative research methodology in the field of construction management; however the design and implementation of case study remains a complex and contentious issue among researchers. Consequently, many students select case study strategy without understanding the array of factors that can affect the outcome of their research. This paper presents a practical, experience-based, step-by-step guide to select, conduct and complete a case study research in construction management. The paper justifies the rationale for adopting case study, explored the various stages in designing case study spanning from the theoretical framework, constructing research themes, data collection and analysis through to validity and reliability issues. This paper contributes in expanding the knowledge of upcoming researchers in the built environment on the design, applications, advantages, disadvantages as well as limitations of case study in construction management researches. The study recommends the research design for students undertaking construction management related studies.

**Keywords:** Designing, Case study, Research, Construction, Management

## 1. INTRODUCTION

In life, there are diverse problems; consequently there are diverse approaches to identify and solving those problems. It is indicative therefore, that there is no hard rule as to how a research must be designed to solve a particular problem rather; it should be structured such that it will guarantee optimal achievement of the purpose of the study. A good research design is expected to indicate the link between the theoretical underpinning, research questions and methodology for the study (Churchill and Saunders, 2007). However, determining an appropriate research methodology which involves approach to the entire research process spanning from data collection, analysis and development of solution to the problem is a difficult step in research (Wedawatta, Ingirige and Amaratunga, 2013). Understanding the components of research methodology is key to robust research design and one important component of research methodology is research strategy. Researchers have explored different strategies in designing studies in various fields including construction management; one of such strategies is the case study.

Case study as a research strategy has emerged as an obvious option for researchers who seek to undertake a modest scale research or to compare limited number of organizations (Rowley, 2002). The strategy has evolved over the years and has grown in reputation as a useful tool and effective methodology for investigating and understanding trends and complex situations in many scientific disciplines (Shuttleworth, 2008; Harrison, Birks, Franklin and Mills, 2017). As a result, case study has grown in sophistication to become a valid form of enquiry to explore broad scope of complex issues, particularly when human behavior and social interactions are central to understanding topics of interest (Harrison et al, 2017). Furthermore, case study has been found to allow investigator retain the holistic and meaningful characteristics of real life events and in complex situations such as construction management (Yin, 2003; Sutrisna and Barrett, 2007). Construction management denotes the process of planning, coordinating, monitoring and controlling construction projects with the view to deliver the asset on time, within project and at the predetermined quality (Miller, 2021). Projects such as housing production which, like other construction projects implore all the processes of project management can be investigated using case study to determine specific and general issues relating to such projects. For instance, case study strategy can be used to determine the risks associated with housing development in order to determine case specific and general risks factors affecting such projects.

However, due to the contentious nature and meaning of the strategy, research students select case study strategy without proper grasp of the subject and the underlining factors that can affect the outcome of their research (Rashi, Rashid, Warraich, Sabir, and Waseem, 2019). This often leads to confusion and wastage of valuable time which affect the overall research findings. For instance, where the strategy is erroneously applied in subjects that ordinarily could be investigated using other research strategies, such results are often unreliable and misleading. There is the need therefore, to broaden the understanding of upcoming researcher especially in complex disciplines like construction management regarding the basic necessities in adopting and designing case study research. In specific terms, research students who seek to investigate issues such as methods of housing production, causes of time and cost overruns in construction projects, specific risks associated with housing projects, costs and quality of road projects using case study need to acquire the basic knowledge of the strategy.

Researchers in the field of construction management have adopted case study strategy in providing solutions to construction related problems. Zou, Zhang and Wang (2007) explored case study in identifying the key risks in construction projects. Case study had also been used to investigate PPP in transitional lands and market in Bulgaria and Russia (Lynch, Brown and Baker, 1999). In Nigeria, case study strategy had been adopted in a study on managing risks in private financed markets (Awodele, Ogunlana and Motawa, 2009). The strategy had also been used in assessing housing provision through PPP in Nasarawa State (Ahmed, Mohammed and Abubakar, 2010). Case study was also used to examine the application of PPP in housing provision in Ogun State (Ibem and Aduwo, 2012). Several other studies in which the strategy was applied abound in the literature.

Despite evidences of adopting case study strategy construction management researches, studies have shown that, few have been written on the process and procedures of designing it as well as the specific steps researchers may use to conduct an effective case study research (Gagnon, 2010; Hancock & Algozzine, 2016). This study therefore seeks to fill this gap by providing a step-by-step case study design for construction management studies with the view to broaden the understanding of research students and professionals in the built environment on the subject. For the purpose of clarity, the paper focused on public private partnership (PPP) housing projects as the objects of study. PPP is viewed as a cooperative venture between the public and private sectors, built on the expertise of each partner that best meets clearly defined public needs through the appropriate allocation of resources, risk and rewards (Canadian Council for Public Private Partnership, 2011). Housing production, regardless of the method of procurement follows the basic processes of project management and those projects are unique and best studied within the environment they are located. The objectives of the study therefore were to: determine the rationale for adopting case study strategy in research; examine the various stages involved in designing case study research and determine the reliability and validity of the design using the various tests available for addressing such issues in case study research. The paper presents a step-by-step case study design of a doctoral research on managing risks in public private partnership (PPP) housing projects in Abuja, Nigeria.

## **2. CASE STUDY RESEARCH – A REVIEW**

Over the years case study has grown to become an acceptable research strategy and has been adopted by researchers in various fields for investigation into real life problems; however the definition of the concept remains contentious among researchers owing to variations in perceptions and the context in which it is applied. For instance, Merriam (1998) viewed case study as a tool for gaining understanding of a situation where the process of inquiry rather than outcome of the research are of interest to the investigator. In this definition, the attention is more on the design of the case study, the procedure of conducting the study including the methods and materials rather than the end product of the research. However, Stake (1995) suggested that researchers should view case as a bounded system and inquire into it as an object rather than a process; it should be seen as a specific, a complex, a functioning thing and an integrated system which has a boundary and working parts and purposive. In what seemed as the synthesis of these positions, Alpi (2019) stressed that case study is a strategy in which the investigator explores a real-life, contemporary bounded system (a case) or multiple bounded systems (cases) over time, through detailed, in-depth data collection involving multiple sources of information, and reports a case description and case themes. This definition focuses on the entire study inclusive of the process, the object studied and outcome of the research. Regardless of the perception, context or perspectives from which it is viewed, case study remains a research strategy for investigating complex phenomena in their real life situations that permits the in depth study of the subject(s) been investigated.

Like other research strategies, case study has both strength and weaknesses. The merits and demerits of adopting case study strategy has been reported by researchers (Rowley, 2002; Yin, 2003; Yin, 2003; Walshe et al, 2004; Wedawatta, Ingirige and Amaratunga, 2013; Hyett, Kenny and Dickson, 2014; Ebneyamini and Moghadam,

2018; Gaille, 2018) as summarised in Table 1. These shortcomings notwithstanding, Yin (1981) argued that they can be corrected through refinement and standardisation of research techniques and instruments. There is therefore the need for outmost carefulness in the use of case study strategy if the research purpose or objectives is to be achieved.

Table 1: Advantages and disadvantages of case study strategy

Advantages	Disadvantages
Case study has the ability to investigate into a phenomenon in its context and therefore is considered as a valuable research tool looking at the world around us	The range of different approaches within the strategy means that determining agreed quality criteria is difficult.
Case studies have the capacity to be used in addressing complex social situations or interventions where multiple variables exist	Case study lacks of rigour and is susceptible to bias reportage because the researcher/data collector determines what is fact and what is not.
Case study strategy accommodates both qualitative and quantitative data allowing the researcher to get rich mix of data for the study	Case study requires a small sample size to be effective which makes it difficult to generalize the research findings.
The strategy offers a considerable level of flexibility than other qualitative approaches such as grounded theory or phenomenology	The process of information collection takes longer because there is enormous amount of data involved, hence it takes too long to complete.
Case study is also capable of accommodating different research techniques giving the researcher the opportunity to choose from available techniques that best address the research questions.	Researchers are required to personally participate in every aspect of data collection; hence case study generates too much stress due to the degree of energy required in conducting it
Case study strategy affords the researcher an opportunity to identify what is common and what is specific within and without chosen cases.	Case study requires more skills and has few conventions for the researcher to rely upon as a guide against self-delusion or adopting invalid conclusions.

The case study strategy is subject to a number of criticisms that borders on the management and maintaining the quality of the research. It is therefore necessary to establish the validity and reliability of case study research in order to guarantee the acceptability of research findings. In order measure the quality of case studies, Wedawatta, Ingirige and Amaratunga (2013) suggested four tests to be conducted; these include construct validity, internal validity, external validity and reliability. Construct validity relates to identifying correct operational measures for the concepts being tested to address the criticism that case study investigators often fail to develop sufficient operational measures and that ‘subjective’ judgments are used to collect data; internal validity tests the truism of the relationships between the research variables as established by the research; external validity is concerned with defining the appropriate domain to which a study’s findings can be generalised which has been a major challenge of case study research; and reliability refers to the possibility of repeating the operation of a study and obtaining the same results (Yin, 2009). Several tactics have been used by researchers in dealing with validity and reliability issues when case study is to be used as presented in Table 2.

Table 2: Case study tactics for four design test

Tests	Case study	Phase of research in which tactics occurs
Construct validity	<ul style="list-style-type: none"> <li>▪ Use multiple sources of evidence</li> <li>▪ Establish chain of evidence</li> <li>▪ Have key informants review draft case study report. (Creswell and Millerm 2000)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Data collection</li> <li>▪ Data collection</li> <li>▪ Composition</li> </ul>
Internal validity	<ul style="list-style-type: none"> <li>▪ Do pattern matching</li> <li>▪ Do explanation building</li> </ul>	<ul style="list-style-type: none"> <li>▪ Data analysis</li> <li>▪ Data analysis</li> </ul>

	<ul style="list-style-type: none"> <li>▪ Address rival explanations</li> <li>▪ Use logic models (Gibbert, Ruigrok, &amp; Wicki (2008))</li> </ul>	<ul style="list-style-type: none"> <li>▪ Data analysis</li> <li>▪ Data analysis</li> </ul>
External validity	<ul style="list-style-type: none"> <li>▪ Use theory in single-case studies</li> <li>▪ Use replication logic in multiple-case studies (Cook and Campbell 1979)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Research design</li> <li>▪ Research design</li> </ul>
Reliability	<ul style="list-style-type: none"> <li>▪ Use case study protocol</li> <li>▪ Develop case study data base (LeonardBarton, 1990).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Data collection</li> <li>▪ Data collection</li> </ul>

Source: Yin (2009)

### 3. METHODOLOGICAL CONSIDERATIONS FOR DESIGNING CASE STUDY RESEARCH CONSTRUCTION MANAGEMENT

Case study research has been used in different fields as such; there are different approaches to case study design. Merriam (1998) presented the following stages for designing case study research: reviewing related literature, theoretical framework, formulating research problem, stating research question, and selecting sample. Similarly, a five-component design had also been presented comprising of research questions; propositions; units of analysis; logic linking the data to the propositions; and criteria for interpreting the findings (Yin, 2003). However Rose, Spinks and Canhoto (2015) presented a more detailed step by step structure of designing case study research (Figure 1) which was adopted in designing this paper because of its logical presentation, clarity and ease of understanding

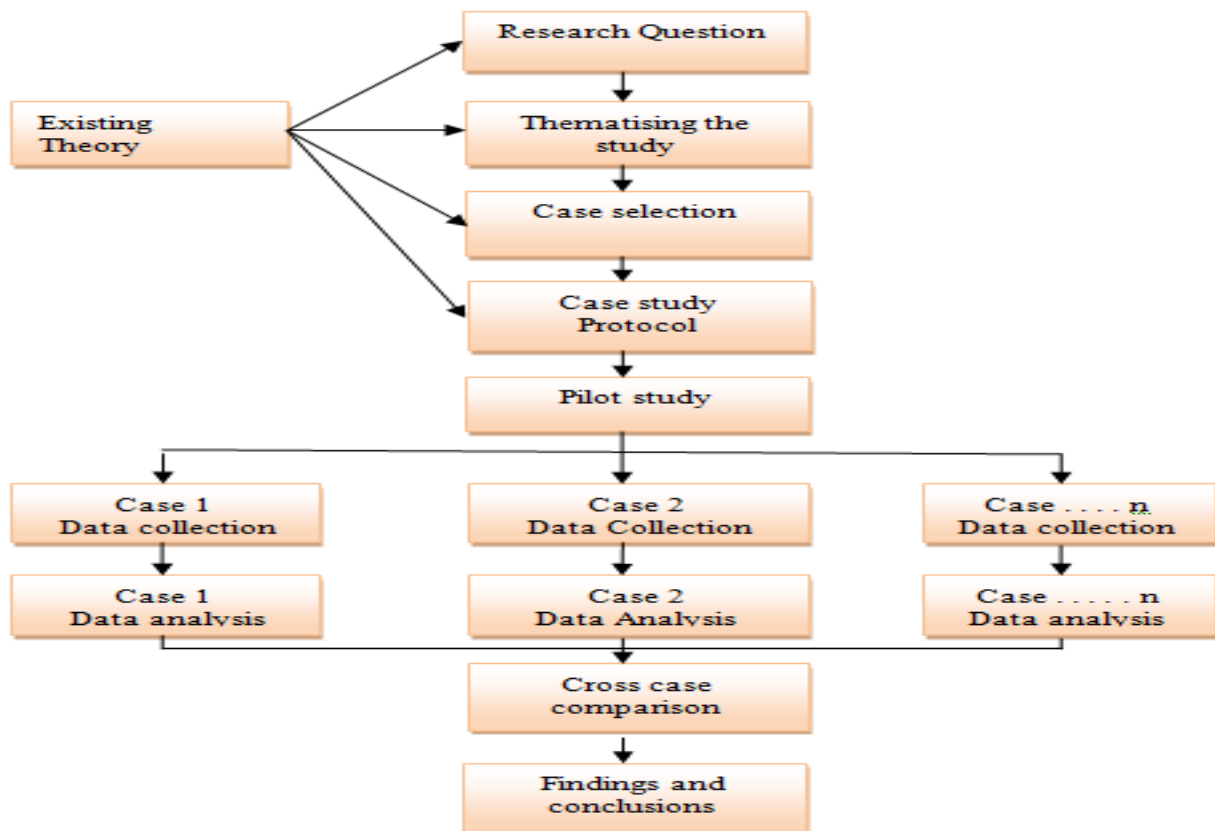


Figure 1: Steps in Multiple-Case Study Research Design  
Source: Rose, Spinks and Canhoto, 2015.

The appropriateness or otherwise of adopting a case study strategy depends on the nature of the research. The nature of the doctoral study which focused on managing risks in public private partnership (PPP) housing projects qualifies it for the adoption of case study strategy. It has been reported that case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident (Yin, 2009). Risk is a contemporary phenomenon which continues throughout the project life cycle; it cannot be separated from the environment which it occurs and must be studied in context-specific approach because risks vary from one project to another. The decision as whether case study is suitable for a particular research is dependent on the degree of focus on contemporary as opposed to historical events, the type of research questions and the extent of control of behavioural events (Rowley, 2002). The research questions for the doctoral thesis were the 'why' and 'how' types (discussed under the design section) which are consistent with case study research (Yin, 2006; Yin, 2009). In addition, risks in construction projects are often occasioned by events that the researcher has little or no control over.

Having determined the appropriateness of adopting the strategy, the first step in designing case study is constructing the theoretical framework for the study. The theoretical framework of the study was a synthesis of three relevant theories that explained the challenges of PPP relationships and ways to address such challenges. For instance, the Agency Theory propounded by Michael C. Jansen and William H. Meckling states that in every agency relationships such as PPP, conflict of interest is inevitable thereby resulting to risks (Delves and Patrick, 2010). This theory however fails to provide strategies for addressing such risks. The Stakeholders' Theory developed by Edward Freeman in 1984 postulates, that these challenges can be addressed by aligning the diverse interests of the stakeholders (Freeman, 2010). However, these efforts done by the principal to curtail the unprofessional behaviours of the agent are not costless; they introduce transaction costs which will influence the overall cost of the project. Positive Perspective Theory which uses contract structuring to reduce the possibilities of parties behaving in divergent ways was explored to address the transaction costs introduced by the Stakeholders' Theory. In summary therefore, these theories explain the relationships in PPP projects, predict the expected challenges and proposed means for addressing them. These were captured in formulating the research questions for the study which also guided the researcher in selecting the cases.

Next to construction of theoretical framework is formulating appropriate research questions that will shape the structure of the study. The pertinent research questions for the doctoral research were: what are the risks associated with Public Private Partnership (PPP) housing projects in Abuja, Nigeria? How do risks impact on achieving the objectives of PPP housing projects in the Abuja, Nigeria? What are the measures used in preventing and mitigating risks in Public Private Partnership (PPP) housing projects in Abuja, Nigeria? What are the drivers and barriers to effective implementation of risk management in Public Private Partnership (PPP) housing projects in Abuja Nigeria? And how can risks associated with public private partnership (PPP) housing projects be effectively allocated among contracting parties? Case study strategy can be used in either explanatory (which addresses the 'how' and 'why' questions) or descriptive (which addresses the 'what' questions) studies (Yin, 2018). The descriptive case study was used to describe the risk factors at work in the selected cases; explanatory case study was used to explain the success or failure of those PPP in the context of the described risks. The exploratory type of case study was adopted to explore the concept of risk management in the context of PPP housing in Nigeria. Closely related to formulating the research question is 'thematizing' which involves engaging with existing theory and is considered indispensable in case study research (Kvale and Brinkmann, 2009). The research questions formulated served as the major themes through which the study findings were explained.

Sequel to thematizing the study is case selection. However, before selecting the case, there is the need to define the 'cases' to be studied whether they are individuals, organisations, or events (Rose, Spinks and Canhoto, 2015). There are two stages in selecting sample in case study design: selection of the case to be studied, and sampling of the people within the sample frame; next is the decision on whether to do a single case study or multiple-case study (Merriam, 1998). A single case is often used where it represents a critical case; an extreme case; unique or typical case; revelatory case; or longitudinal case (Yin, 2009). Multiple-case strategy on the other hand is used when there is the need to establish whether the findings of the first case occur in other cases and, as a consequence, the need to generalise from these findings (Sounders, Lewis and Thornhill, 2009). The research used multiple case studies and included three housing estates constructed through PPP approach in order to determine whether or not the associated risks cut across the selected projects. PPP has been adopted in Abuja for the production and delivery of housing projects; many housing estates have been developed and more are under construction which presents a perfect ground for choosing Abuja as an example for discussion. The selected cases were Mount Pleasant Estate, Capital Estate and CITEC Villas, all in Abuja, Nigeria. These housing units were selected because a PPP projects, they present a perfect avenue for assessing the risks occasioned by the relationship between the Public sector and the private agencies as predicted by the theories earlier reviewed. The unit of analysis comprises the stakeholders involved in the construction

of those housing units which were carefully selected using purposeful sampling technique.

Having selected the case(s) the researcher designs a study protocol which serves as a project plan for the case study field work. The study protocol consisted of semi-structured questions covering the major themes of the study geared towards extracting information on the subject of study. In the doctoral research, the study protocol covered the responsibilities of stakeholders in PPP arrangements, the type of risks encountered, the impact of those risks on project objectives, measures adopted in preventing and mitigating risks and how those risks were addressed or allocated among the contracting parties. A carefully drafted study protocol should allow for anticipating potential problems in the proposed research so that strategies for dealing with those problems can be worked out in advance. However, before embarking on actual collection of field data using the study protocol, there is the need to carry out a pilot study to explore both substantive topic and method issues which will help to sharpen the focus of the research as well as ensure the effectiveness of the field procedures (Yin, 2009). The study protocol designed was pilot tested among 6 top officials (2 from each case) of the selected cases considered to be custodians of information in their organisations. During the test interview, 5 items were considered irrelevant to the study were eliminated from the instrument; 4 items relevant to the themes of the study were observed to have been omitted which were later included in the final draft.

Next to case study protocol is collection of data. The process of data collection in case study focuses on the skills of the investigator; the ability to ask questions, to listen actively, to adopt to unforeseen circumstances that may arise, to grasp the issues being addressed, and to identify personal bias (Brown, 2008). Data for case study research may be collected using techniques such as interview, observation (direct and participants), administrative documents, structured survey, and physical artifacts (Schell, 1992; Yin, 2006). The data for the study were collected on case basis using interview protocol in which information related to the study themes were obtained. In collecting case study data, the main idea is not that any particular source be used, rather the intention is to triangulate or establish converging lines of evidence to make the research findings as robust as possible (Yin, 2006). During the interview session, the interviewer took note of the interviewee responses while recording same where permitted.

Sequel to collection of data from the selected cases is data analysis. The analysis should first be carried out on case by case basis after which cross-case analysis would follow. In the study, the data collected during the interview was analysed on case basis in line with the major themes of the study after which cross-case comparison followed. The essence of these comparisons of the finding between cases was to identify the similarities and differences in the results between and among the selected housing units. For instance, information obtained from the selected housing projects were compared to determine case-specific risks and risk factors that cut across all the selected cases. Similarly, the impact of risks on PPP housing project, measures of preventing and mitigating risks and the drivers as well as barriers to implementation of risk management in PPP housing were analysed and comparisons made within and between the selected cases. Following the analysis, the findings of the study were reported according to the research objectives and conclusions were drawn from the findings.

Despite the robustness of data and novelty of the research findings, there was the need to determine the validity and reliability of the results because case study has been criticized from various fronts by different researchers on these issues. In attempt to proffer solutions to these criticisms Yin (2009) had suggested four tactics (Table 2) for improving the reliability and validity issues in case study. In order to achieve construct validity, data covering study themes were collected from three selected housing estates and the preliminary case study report was validated by professionals in the built environment. In the course of analysing the interview results, identified risk factors, measures for preventing and mitigating risks, and drivers as well as barriers to implementing risk management were cross-matched and explanations were provided for divergent responses to ensure that internal validity is achieved. In order to achieve external validity, the study explored case study designs available in the literature and related methodologies adopted in addressing similar research problems in the construction industry to serve as guide. Study protocol was used as interview guide in the selected housing estates for the purpose of achieving reliability.

#### **4. CONCLUSIONS**

Effective management of construction processes is a complex phenomenon and very critical to the successful delivery of construction projects. Case study research strategy has been regarded as an important strategy for investigating complex situations in many fields of study including construction management. This paper presents case study design for construction management related studies with the intend to broaden the understanding of research students and professionals in the built environment on the subject. Given the capacity of the strategy, case study can be used to address wide range of problems relating to why, what and how questions which will assist the researcher

to explore, explain, describe and in some cases theorise about complex issues in context. Case study can be applied in studying the cost and quality of road construction projects in specific areas. This would help the researcher carry out an indepth investigation of the specific and general challenges associated with road construction that would impact on cost and quality of roads in the selected study area. Case study can also be adopted in assessing the risks associated with PPP projects which would lead to an indepth understanding of relationships among contracting parties, behaviours of parties in PPP arrangements; and processes and practice of risk management in construction. However, the strategy is often a victim of negative criticism due to differences in perceptions of researchers. This study has shown that that the major objections to case study research are invalid and can be corrected with meticulous and rigorous design which are often not followed by researchers. In this paper, the rationale for selecting case study consistent with existing theories was explored and the components of case study design were discussed; a step-by-step process of designing case study research in construction management was presented. It has been suggested that enhanced understanding of case study as a research tool will contribute towards the application of the concept in the field of construction management. This study therefore is an attempt towards advocating for the adoption of case study in construction management studies.

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