

Confirmatory sequential research design for theory building and testing: proposal for construction management research's paradigm and methodology

Oluseye Olugboyega¹

¹Obafemi Awolowo University

April 08, 2022

Abstract

There is an absence of fitting research methodology in construction management research. This has prompted a shortage of theories that are exceptional to the field. Thus, this paper proposes confirmatory sequential research design as a research paradigm and methodology for theory building and testing in construction management research. The method makes qualitative and quantitative techniques reciprocal through a staggered and vigorous interaction. An illustrative course of applying the technique was laid out. It was deduced in this paper that, a confirmatory sequential research design is fundamental for the future and unwavering quality of construction management research. The main contribution made by this paper to mixed method is a systemic mixed method-based research design that the paper presents.

Confirmatory sequential research design for theory building and testing: proposal for construction management research's paradigm and methodology

Oluseye Olugboyega

Faculty of Environmental Design and Management,

Department of Building,

Obafemi Awolowo University, Ile-Ife, Nigeria

oolugboyega@oauife.edu.ng

Abstract

There is an absence of fitting research methodology in construction management research. This has prompted a shortage of theories that are exceptional to the field. Thus, this paper proposes confirmatory sequential research design as a research paradigm and methodology for theory building and testing in construction management research. The method makes qualitative and quantitative techniques reciprocal through a staggered and vigorous interaction. An illustrative course of applying the technique was laid out. It was deduced in this paper that, a confirmatory sequential research design is fundamental for the future and unwavering quality of construction management research. The main contribution made by this paper to mixed method is a systemic mixed method-based research design that the paper presents.

Keywords : construction management, mixed methods, a paradigm for construction management, conceptual model, conceptual framework

Introduction

A theory has been depicted as a bunch of interrelated ideas (concepts), definitions and propositions, an assertion of the speculated connection between and among variables, a gathering of sensibly coordinated laws or connections that establishes clarification in a discipline, a bunch of connections among autonomous and subordinate factors that present a precise perspective on peculiarities by indicating relations among factors, fully intent on clarifying and foreseeing the peculiarities (Gelso, 2006). Theory permits researchers to comprehend and foresee results of interest as well as depict and clarify a process or sequence of events (Kerlinger & Lee, 2000). A theory is connected with and not quite the same as hypothesis, proposition, paradigm, model, concept, and conceptual model. A concept is a psychological picture that sums up a bunch of comparative connections (Bachman and Schutt, 2007). Paradigm on the other hand is an approach to viewing the phenomenal world or a theory. Propositions are explanations that communicate the relationship of at least two ideas. It fits an inductive exploration approach (Cozby, 2009).

Gelso (2006) portrays a hypothesis as a suggestion expressed in an experimentally testable way. It fits an insightful methodology and fills in as the extension between quantitative information and the hypothesis plan. Hypotheses are succinct proclamations about a proposed theory. As per Meredith (1993), a model is a graph for picturing the inter-relatedness of variables showing their causal bearing and nature of the relationship. A conceptual model is a psychological model of a theory (set of connections) introduced in a diagrammatic structure. A conceptual model is regularly utilized in research to delineate connections inside within a theory be that as it may, without help, do not constitute theory until the connections are adequately approved. In light of the above explanation, one might say that a theory responds to the inquiry why portrays causal connections, should be testable, reasonable, generalizable, fills in as law or model, gives edification, and gives an account.

There are three sorts of theories in view of the means of building the theories: hierarchical theory, concatenated theory, and critical theory. The hierarchical theory is a hypothetic-derivation technique for forming theories (on the other hand alluded to by scholars as nomothetic, positivism, postpositivism, empirical-analytical, or hierarchialism). This system is useful where a theory is needed to be generalizable across populaces and it is worried about testing or affirming hypotheses (Sprenger, 2011). The concatenated theory is an inductive- amalgamation technique for planning theories (then again alluded to as idiographic, grounded hypothesis, constructivism, or interpretive hypothesis). The framework is useful where the objective of the exploration is to all the more likely get what is happening in a particular setting and how different partners figure out the extraordinary components under perception (Zhu et al., 2019). Critical theory is on the other hand alluded to as extremist, neo-Marxist, or social justice theory. The focal point of critical theory is to reveal realities about power relations that are dark or deliberately jumbled to citizenry determined to change political, social, and financial disparities. In this system, issues of double-dealing, strength, and enslavement are frequently investigated to make social entertainers mindful of these imbalances and work with liberation from them (Gehman et al., 2018; Gay and Weaver, 2011).

Construction management is a somewhat new and set up research region that is encountering a shortage of theories. The shortage of construction management theories is because of the absence of fitting research philosophy. Construction management as a research area is conflicted between management and engineering field. Both management and engineering require the validation of existing theories and the formulation of new ones to channel new directions in the fields. Construction management is a result of these two fields that require the adaption of engineering laws and management theories, and all the more significantly the detailing of construction management-specific theories. This paper seeks to remedy the shortage of construction management-specific theories by proposing a research design for theory building and testing in construction management research. This paper also has a double concentration. The initial segment of the paper inspects the process of research as it connects with the development and testing of theory. It suggests that management theory, with its catholic point of view, is a significant reference discipline for construction management. It proceeds to depict a research design that holds a critical guarantee for construction management research topics.

Literature review

This segment explores the role of theory in construction management research, the transaction between grounded theory and theory building in construction management research, and the value of mixed methods in construction management research.

2.1 Role of theory in construction management research

Construction management is a moderately new field that draws from both the natural and social sciences. Attributable to its situation as the mid-point between engineering and management, researchers in the field are confronted with the adoption of an objective (engineering) paradigm - where the attention is on discovering something genuine with regards to the world it centers around, or a subjective (social science/management) paradigm - where the goal is to see the way that various truths are established (Lauri, 2008). As a result of this quandary, positivism and quantitative techniques have been in the ascendancy in construction management research (Dainty, 2007). Nonetheless, the discussion about the role of theory in construction management research began during the 1990s and was driven by Seymour and Rooke (1995), Rooke et al. (1997), Loosemore et al. (1999), Dainty (2008), and Seymour et al. (1998).

The discussion was significantly started on the contention that the research methods taken on by the construction management researchers have directed the focal point of the field however gave a limited advance in the comprehension of industry peculiarities (Phelps et al., 2010). In the following discussion, a portion of the researchers contended that the ‘object’ of most construction management research is people; while some argued otherwise. The result of the discussion prompted the agreement that the culture of research should change if researchers were to impact the industry (AlSehaimi et al., 2013). Rather than restricting construction management research to quantitative or qualitative methods; endeavors ought to be made to pick research philosophy as indicated by the nature of the investigation and expected contribution to knowledge.

As indicated by Gay and Weaver (2011), unique research ought to add to the assemblage of knowledge in the appropriate discipline or space. Since the theory is the cash of academic exploration, theory-building and testing are the best methods to contribute to knowledge (Hughes, 1999; Corley and Gioia, 2011). The degree to which research fabricates new theory and the degree to which existing theories are validated determine the extent to which a theoretical contribution to knowledge could be made (Colquitt and Zapata-Phelan, 2007). Theory building and testing will be a huge step forward for construction management because the development of theories and advancement of knowledge proceeds from them (de Valence, 2012). This suggests that construction management is an alternate set of management and by so it requires theories and principles formulated from theoretical contributions and implications. Nonetheless, there is an innate intricacy in the construction industry and the majority of the research in this field is still issue-centered.

2.2 Grounded theory and theory building in construction management research

Grounded Theory (GT) includes an iterative course of gathering and investigating information to assemble a theory concerning how research participants decipher their daily realities (Suddaby, 2006). GT is created through the extraction of ideas and their interdependencies that are acquired from analyzing qualitative data (e.g. interview transcripts). There are three methodologies in embracing GT, which are recorded as follows: Straussian approach (Strauss & Corbin, 1990), glaserian approach (Heath and Cowley, 2004), and constructive approach (Charmaz, 2000). Researchers ought to pick their procedure of GT, compatible with their mental style. Likewise, it has been underlined, not to combine various methodologies of GT as one.

GT is a significant strategy for information examination that empowers the efficient development of theory from the data through inductive and insightful reasoning. GT explicitly focuses on (i) the significance of long haul field studies to find what is truly happening; (ii) the presence of intricacy and fluctuation in human activity; (iii) an acknowledgment that individuals act because of significance and that the significance is characterized and reclassified through communication; (iv) an aversion to the significance of the advancing and unfurling nature of occasions; and (v) attention to the interrelationship between conditions, structure, activity, cycle, and outcomes (Walker and Myrick, 2006).

As indicated by Phelps et al., (2010), GT is reasonable for construction management research since construc-

tion comprises of activities that include the absolute most complex specialized frameworks that should be planned and built by various specific individuals in friendly frameworks that we know as project teams. The idea of GT permits the evoked information to be ceaselessly evolved, refined, and connected until a theory is assembled. This suggests that theories from GT rise out of information gathered from social climate in its full reality, as well as result in knowledge and understanding that would not be imaginable through different techniques. Likewise, it proposes that GT prompts more prominent agreement and the improvement of constructs that interface them to make a theoretical construct in regards to the repeating idea of what data-sharing practices mean for the advancement of trust and learning within project teams. With GT, construction management scientists could concentrate on peculiarities, for example, (i) practices that emerge because of social conditions; (ii) practices that are not coordinated toward the fulfillment of hierarchical or administrative objectives; and (iii) mental exercises such as critical thinking and other team-oriented activities that in any case would not be imaginable because of systemic restrictions.

Various construction management studies have utilized GT to construct theory. For example, Shojaei and Haeri (2019) proposed an extensive supply chain risk management approach for construction projects that uses, GT, fuzzy cognitive mapping, and grey relational analysis. A true contextual analysis is introduced in the review to show the pertinence and viability of the proposed approach. Different risk mitigation situations are created and assessed by the proposed approach. Kulchartchai and Hadikusumo (2010) dissected the obstructions that forestall the development of a safety culture in Thailand's large construction industry from various managerial points of view. Subjective exploration techniques were utilized by playing out a progression of semi-structured interviews of eight case studies selected from six prominent construction firms to investigate the obstacles they face. Glaser's catchphrase coding from GT was utilized to decrease the data load after the interviews. A study by Olugboyega and Windapo (2019) inspected the aspects and parts of construction safety culture and whether the use of BIM technologies to the dimensions of construction safety culture improves the safety maturity levels among construction workers. The study utilized a systematic literature review and GT in accomplishing the research objectives. These examples affirmed the convenience of GT in construction management studies.

2.3 Mixed methods in construction management research

A research methodology is a philosophical structure and crucial suppositions directing the research. It covers the particular strategies of data collection and analysis. Research methods involve qualitative, quantitative, and mixed-method. A mixed-method is a way to deal with the request that joins the remarkable procedure and strategies for both qualitative and quantitative research approaches. Mixed methods research is officially characterized as the class of exploration where the specialist blends or joins quantitative and subjective examination procedures, techniques, approaches, ideas, or language into a solitary report (Johnson and Onwuegbuzie, 2004). Mixed methods consolidate the qualities and resolve the weaknesses of qualitative and quantitative research. For instance, quantitative research has been known to give a portrayal of one particular moment and don't catch how perspectives and qualities may change over the long run.

Moreover, the method has impediments of expecting respondents to accommodate their responses inside a restricted scope of replies. As far as strength, subjective technique empowers the perception of peculiarities in their regular setting. As indicated by Aramo-Immonen (2013), mixed methods designs give researchers, across research disciplines, a thorough way to deal with responding to research questions. Caruth (2013) added that mixed methods can add insight and understanding that may be missed when only a single research design is utilized. This infers that mixed methods give more exhaustive proof to concentrating on an exploration issue. Additionally, with mixed methods, a comprehensive comprehension of the peculiarity can undoubtedly be developed by combining the inductive and rational information got in the epistemological interaction. Also, in mixed methods, the aftereffects of the two informational indexes go about as cushion and a check against exaggerating the case for ends got from either approach alone.

No matter what the advantages of mixed methods are, research methods should be chosen in light of the research question, the quality expected (where the qualities of both qualitative and quantitative methods are capitalized on to work on the dependability of the examination result), the subtleties and intricacies of

the peculiarity being investigated, the profundity of comprehension required, and research setting. Notwithstanding, the reception of mixed methods by construction management researchers has been educated by the intricacy and profundity of comprehension needed by the greater part of the construction management phenomenon. The utilization of mixed methods has been very much reported in the construction management literature (Bowen et al., 2012; Korkmaz et al., 2011; Gilbert et al., 2017; Ebekozi, 2019; Ostadalimakhmalbaf et al., 2019). This demonstrates that mixed methods are suitable for most research problems in construction management research, particularly theory-building research. With mixed methods, construction management researchers can assemble theories, sum up the theories to different populaces, profoundly comprehend the unique collaboration and view of the partners associated with the peculiarity, clarify and comprehend human conduct, and produce reciprocal bits of knowledge.

Mixed methods cannot be attempted without a research design. A research design addresses the activities of a researcher in a given research method. Mixed methods research design incorporate (i) exploratory sequential design (a mixed-method research design where qualitative data are gathered and utilized as a correlative variable in deciphering and upgrading discoveries from quantitative data), (ii) explanatory sequential design (where qualitative data are gathered to verify and develop quantitative information and to help improved quantitative information. quantitative and qualitative data will be gathered and deciphered independently while results will be coordinated after translation of discoveries), (iii) convergent concurrent design, (iv) concurrent triangulation design (qualitative and quantitative data, in general, have similar weight during the integration phase and they are gathered at the same time to cover each other's shortcomings), (v) concurrent nested design (qualitative and quantitative data are gathered simultaneously and analysis of types of data will occur together), and (vi) concurrent transformative design (quantitative and qualitative data are gathered simultaneously and mixed during analysis phase)(Guest, 2012; Alavi and Habek, 2016; Leech and Onwuegbuzie, 2009; Schoonenboom and Johnson, 2017).

Proposed paradigm and methodology: Confirmatory sequential research design

This method is a variation of exploratory sequential research design. It was created by drawing upon the attributes of exploratory sequential research design and the realities of the construction industry to advance the comprehension of the fact of construction management practices according to the points of view of the experts in the sector. Not at all like the exploratory sequential research design; confirmatory sequential design presents a full strategy for mixing the discoveries of qualitative and quantitative analysis. Discoveries are not mixed at the interpretation phase, however, mixed systematically through theory formulation. This builds up the requirement for GT in confirmatory sequential research design. The time direction for the design is not simultaneous but consecutive, where qualitative data collection and analysis go before the quantitative part. In this design, the status or level of priority of qualitative and quantitative methods is not an issue. None dominates the other, yet equivalent status or need is offered to both methods. The ideal paradigm for this method is pragmatism. This is on the grounds that the method is a research design method within mixed methods.

The proposed confirmatory sequential research design includes five successive stages: (i) theory building, (ii) first stage theory confirmation, (iii) second stage theory confirmation, and (iv) revision of the theory. These steps are displayed in Figure 1. Figure 1 shows several arrows leading from steps 1 to steps 2, 3, and 4 demonstrate that the research design includes a cyclical and interactional process of building and confirming theories. It is a staggering research plan that efficiently incorporates or blends the discoveries of both qualitative and quantitative methods. Every one of the stages should occur inside a single study.

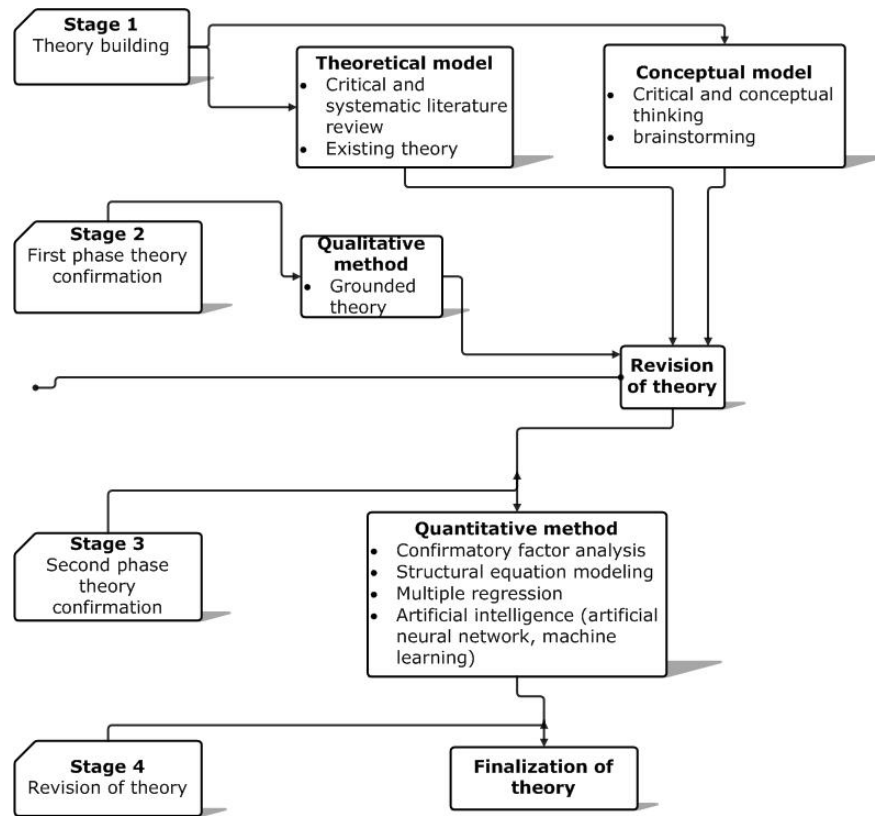


Figure 1: confirmatory sequential research design

In confirmatory sequential research design, the research begins with a conceptual model (a preconceived explanation of or suppositions about the phenomena of interest generally got from conceptualizing, decisive reasoning, and applied reasoning) or a theoretical model (clarifications or assumptions about the phenomena of interest as gotten from systematic literature review or existing theories). The final activity in stage 1 is to break down the model into question-like statements. Stage 2 commences with qualitative data collection in view of the formulated questions in stage 1. The main activity in stage 2 is GT. A GT analysis should be performed on the collected data to produce theories that clarify what's going on. The theories from GT will provide insights to address the proposed connections and factors in the conceptual or theoretical model. This progression will empower a controlled and centered exploration. It will likewise empower the perception of a particular populace or phenomenon in their natural setting.

The detailed experiences gathered from the interviewees during these long durations provide researchers a rich comprehension of mind-boggling peculiarities that happen inside that particular social climate so analysts can foster comprehension of something other than the unequivocal importance of words, activities, and antiques. This is particularly significant in the construction sector where knowledge is tacit and not explicit. Furthermore, GT gives a huge chance to approve the researcher's understanding of observations and implications as postulated in the conceptual or theoretical model. The new bits of knowledge that GT gives will approve the researcher's understanding of the phenomenon of present irregularities that challenge it. If the GT validates the proposed model, then the researcher can move to the next stage; but theory amendment or alteration of the model is fundamental assuming the GT challenges the model.

Validation with theory or hypothesis testing is the next step (that is, stage 3). The hypotheses should be formed as articulations of realities from the changed or approved model in stage 2. Where the model is validated by the GT analysis, the question-like statements in stage 1 are transformed into hypotheses. New

hypothesized relationships that conform to the revised model are to be formulated assuming changes were made to the proposed model. The normal techniques for testing hypothesis and theory are Chi-square, linear regression, Confirmatory Factor Analysis, multiple regression, Structural Equation Modelling, and Artificial Intelligence. These methods have been utilized for theory and hypothesis testing in construction management research (Olugboyega and Windapo, 2021a, b; Olarenwaju et al., 2021; Windapo et al., 2019). Validation of the theory or model is fundamental to guarantee that theory being developed is exact, important, significant, solid, generalizable, and has more extensive application. Validity necessitates that the researcher gives sufficient detail to persuade others that the populace has been adequately perceived. The unwavering quality cycles that accompany hypothesis or theory testing give security and consistency to the model under comparative conditions. Reliability additionally gives sufficient setting and subtlety that others will get what parts of the remarkable circumstance are generalizable to comparable circumstances. In the last stage (that is, stage 4), the outcomes acquired in stage 3 are employed to finalize the model or theory. Only the validated hypotheses with empirical backings are included in the model or taken as the established theory.

Confirmatory sequential research design is a method that makes qualitative and quantitative methods complementary through a staggered and hearty interaction. It is a technique that is vital for the future and dependability of construction management studies. According to Dainty (2007), the future development of construction management research will rely on the readiness of its research community to consider qualitative and quantitative research to be integral rather than cutthroat and totally unrelated. Love et al., (2002) noticed that post-modernity and multi-level research methods are fundamental to broadening the extent of construction management. Love et al., (2002) likewise noticed that a powerful research method is needed to successfully address the intricacy and various difficulties in the construction sector. This suggests that understanding the phenomenon that impacts hierarchical, project, individuals, innovation, and interaction performance in the construction sector requires a vigorous research method.

The utilization of qualitative or quantitative methods is regularly not satisfactory to empower comprehension of the perplexing connections that lead to a significant number of the construction industry's inescapable social and specialized issues. A definite method for tending to these impediments is for the construction research community to supplement prevalent quantitative and case study methodologies with qualitative theory-building methodologies (Phelps et al., 2010). Construction management is a sociotechnical science that requires the use of empirical methods to quantifiably improve on reality to show and foresee its cycles and peculiarities. In any case, without an equivalent accentuation on social, behavioral, and cultural factors to fabricate a thorough comprehension of these peculiarities, the outcomes from experimental and quantitative examinations alone will be constantly lacking (Phelps et al., 2010; Zou et al., 2014). Puddicombe and Johnson (2011) exhibited that a cycle that expands on theory and that utilizes approaches from management research holds a critical guarantee for research in construction management. This large number of contentions make confirmatory sequential research design applicable in problematic situations which require the successful connecting of judgment and investigation. Likewise, confirmatory sequential research design will fill in as research methods for theory-focused research in construction management.

Contribution to mixed method research

The contributions of this paper to mixed method are of different sorts - a theory building process, utilization of grounded theory in mixed method technique, a data gathering interaction, and data investigation process. This paper has underlined the significance of mixed method research in construction management research and broadened the mixed method-based research design choices that could be utilized by mixed method users.

Conclusion

This paper has introduced an elective viewpoint on how construction management researchers may plan their research projects later on. The paper proposed confirmatory sequential research design as the system of theory building and testing in construction management research utilizing GT and mixed methods. The system empowers a methodical advancement of theory from the data through inductive and insightful reasoning and

perception of phenomena in their natural setting. The system gives a powerful strategy for concentrating on complex specialized frameworks and working on reality to model its processes and phenomena. Through this system, construction management researchers will actually want to make a significant contribution to knowledge and effectively recognize the theoretical and practical implications of their research works.

The critical strength of confirmatory sequential research design is its provision of systematic mixing of the findings of qualitative and quantitative analysis through theory formulation. Unlike, exploratory sequential research design where qualitative and quantitative findings are mixed at the interpretation phase, confirmatory sequential research design blends the discoveries successively from theory building to theory testing and confirmation. Additionally, in confirmatory sequential research design, the degree of priority of qualitative and quantitative methods is not an issue.

Construction management studies will find confirmatory sequential research design valuable in their works, as it outlines the practical strides to be taken for theory building and testing. Through this research design, distinct theories will rise out of construction management studies and the construction management field will have its exceptional theories that address the eccentricities and nature of the construction sector. Albeit this paper didn't show the utilization of confirmatory sequential research design, studies that have applied its fundamental parts like GT and mixed methods have been discussed. What is presently required is its inescapable use in construction management studies.

References

- Alavi, H., & Habek, P. (2016). Addressing research design problem in mixed methods research. *Management Systems in Production Engineering* .
- AlSehaimi, A., Koskela, L., & Tzortzopoulos, P. (2013). Need for alternative research approaches in construction management: Case of delay studies. *Journal of Management in Engineering* ,29 (4), 407-413.
- Aramo-Immonen, H. (2011, September). Mixed methods research design. In *World Summit on Knowledge Society* (pp. 32-43). Springer, Berlin, Heidelberg.
- Bachman, R. & Schutt, R. (2007). The practice of research in criminology and criminal justice (3rded.).ThousandOaks, CA:Sage.
- Bowen, P., Edwards, P., & Cattell, K. (2012, September). Corruption in the South African construction industry: A mixed methods study. In *Proceedings of the 28th Annual ARCOM Conference, Edinburgh, United Kingdom* (pp. 521-31).
- Caruth, G. D. (2013). Demystifying mixed methods research design: A review of the literature. *Online Submission* , 3 (2), 112-122.
- Charmaz, K. (2000). Grounded theory: Objectivist and constructivist methods. *Handbook of qualitative research* , 2 , 509-535.
- Colquitt, J. A., & Zapata-Phelan, C. P. (2007). Trends in theory building and theory testing: A five-decade study of the Academy of Management Journal. *Academy of management journal* , 50 (6), 1281-1303.
- Corbin, J. M., & Strauss, A. (1990). Grounded theory research: Procedures, canons, and evaluative criteria. *Qualitative sociology* , 13 (1), 3-21.
- Corley, K. G., & Gioia, D. A. (2011). Building theory about theory building: what constitutes a theoretical contribution?. *Academy of management review* , 36 (1), 12-32.
- Cozby, P. (2009). Methods in behavioral research. Boston: McGraw Hill Higher Education.
- Dainty, A. (2007, November). A call for methodological pluralism in built environment research. In *Proceedings of the third Scottish Conference for postgraduate researchers of the built and natural environment* (pp. 20-22). Glasgow: Glasgow Caledonian University.

- Dainty, A. (2008). Methodological pluralism in construction management research. *Advanced research methods in the built environment* ,1 , 1-13.
- de Valence, G. (2012). A theory of construction management?.*Australasian Journal of Construction Economics and Building*, The ,12 (3), 95-100.
- Ebekozien, A. (2019). Unethical practices in procurement performance of Nigerian public building projects: mixed methods approach.*Theoretical and Empirical Researches in Urban Management* ,14 (3), 41-61.
- Gay, B., & Weaver, S. (2011). Theory building and paradigms: A primer on the nuances of theory construction. *American International Journal of Contemporary Research* , 1 (2), 24-32.
- Gehman, J., Glaser, V. L., Eisenhardt, K. M., Gioia, D., Langley, A., & Corley, K. G. (2018). Finding theory–method fit: A comparison of three qualitative approaches to theory building. *Journal of Management Inquiry* , 27 (3), 284-300.
- Gelso, C. J. (2006). Working alliance: Current status and future directions: Editor’s introduction. *Psychotherapy: Theory, Research, Practice, Training* , 43 (3), 257.
- Gilbert, G., Cattell, K., Edwards, P., & Bowen, P. (2017). A sequential mixed methods research approach to investigating HIV/AIDS intervention management by construction organisations in South Africa. *Acta Structilia*, 24(1), 27-52.
- Guest, G. (2013). Describing mixed methods research: An alternative to typologies. *Journal of mixed methods research* , 7 (2), 141-151.
- Heath, H., & Cowley, S. (2004). Developing a grounded theory approach: a comparison of Glaser and Strauss. *International journal of nursing studies* , 41 (2), 141-150.
- Hughes, W. (1999). *ARCOM construction management abstracts 1983-1998* . Association of Researchers in Construction Management.
- Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational researcher* ,33 (7), 14-26.
- Kerlinger, F.N., & Lee, H.B. (2000). *Foundations of behavioral research* (4th ed.). Fort Worth, TX: Harcourt College Publishers.
- Korkmaz, S., Riley, D., & Horman, M. (2011). Assessing project delivery for sustainable, high-performance buildings through mixed methods.*Architectural Engineering and Design Management* , 7 (4), 266-274.
- Koskela, L. (2008). Which kind of science is construction management?.
- Kulchartchai, O., & Hadikusumo, B. H. (2010). Exploratory study of obstacles in safety culture development in the construction industry: a grounded theory approach. *Journal of construction in developing countries* , 15 (1), 45-66.
- Leech, N. L., & Onwuegbuzie, A. J. (2009). A typology of mixed methods research designs. *Quality & quantity* , 43 (2), 265-275.
- Loosemore, M. (1999). International construction management research: cultural sensitivity in methodological design. *Construction Management & Economics* , 17 (5), 553-561.
- Love, P. E., Holt, G. D., & Li, H. (2002). Triangulation in construction management research. *Engineering, Construction and Architectural Management* .
- Meredith, J. (1993). Theory building through conceptual methods.*International Journal of Operations & Production Management* .

- Olanrewaju, O. I., Babarinde, S. A., Chileshe, N., & Sandanayake, M. (2021). Drivers for implementation of building information modeling (BIM) within the Nigerian construction industry. *Journal of Financial Management of Property and Construction* .
- Olugboyega, O., & Windapo, A. (2019). Building Information Modeling—Enabled Construction Safety Culture and Maturity Model: A Grounded Theory Approach. *Frontiers in Built Environment* , 5 , 35.
- Olugboyega, O., & Windapo, A. (2021). Modelling the indicators of a reduction in BIM adoption barriers in a developing country. *International Journal of Construction Management* , 1-11.
- Olugboyega, O., & Windapo, A. O. (2021). Structural equation model of the barriers to preliminary and sustained BIM adoption in a developing country. *Construction Innovation* .
- Ostadalimakhmalbaf, M., Escamilla, E., Lewis, P., Dixit, M., & Nichols, J. (2019). Factors Impacting Undergraduate Hispanic Students' Retention in Construction Programs: A Mixed Methods Research Synthesis. In *55th ASC Annual International Conference Proceedings, Denver, CO* .
- Phelps, A. F., & Horman, M. J. (2010). Ethnographic theory-building research in construction. *Journal of construction engineering and management* , 136 (1), 58-65.
- Puddicombe, M. S., & Johnson, B. (2011). Research and theory building in construction management. *International Journal of Construction Education and Research* , 7 (2), 126-142.
- Rooke, J., Seymour, D., & Crook, D. (1997). Preserving methodological consistency: a reply to Raftery, McGeorge and Walters. *Construction Management & Economics* , 15 (5), 491-494.
- Schoonenboom, J., & Johnson, R. B. (2017). How to construct a mixed methods research design. *KZfSS Kölner Zeitschrift für Soziologie und Sozialpsychologie* , 69 (2), 107-131.
- Seymour, D., & Rooke, J. (1995). The culture of the industry and the culture of research. *Construction management and economics* , 13 (6), 511-523.
- Seymour, D., Crook, D., & Rooke, J. (1998). The role of theory in construction management: reply to Runeson. *Construction Management & Economics* , 16 (1), 109-112.
- Shojaei, P., & Haeri, S. A. S. (2019). Development of supply chain risk management approaches for construction projects: A grounded theory approach. *Computers & Industrial Engineering* , 128 , 837-850.
- Sprenger, J. (2011). Hypothetico-deductive confirmation. *Philosophy Compass* , 6 (7), 497-508.
- Suddaby, R. (2006). From the editors: What grounded theory is not. *Academy of management journal* , 49 (4), 633-642.
- Walker, D., & Myrick, F. (2006). Grounded theory: An exploration of process and procedure. *Qualitative health research* , 16 (4), 547-559.
- Windapo, A., Olugboyega, O., & Adediran, A. (2019). Procurement strategies influencing small and medium contractor development in South Africa. *Proceedings of the Institution of Civil Engineers-Management, Procurement and Law* , 172 (6), 253-263.
- Zhu, H., Xiong, Z., Magill, S., & Jagannathan, S. (2019, June). An inductive synthesis framework for verifiable reinforcement learning. In *Proceedings of the 40th ACM SIGPLAN Conference on Programming Language Design and Implementation* (pp. 686-701).
- Zou, P. X., Sunindijo, R. Y., & Dainty, A. R. (2014). A mixed methods research design for bridging the gap between research and practice in construction safety. *Safety science* , 70 , 316-326.