

Association of Researchers in Construction Management

## ARCOM DOCTORAL WORKSHOP

### **Advancing Theory Development in Construction Project Management Research**

Construction and Infrastructure  
School of Engineering and the Built Environment  
University of Wolverhampton, UK

**5<sup>th</sup> March 2008**



Workshop Chairmen: Professor David Proverbs  
Professor Paul Olomolaiye

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# PROGRAMME

## ARCOM DOCTORAL RESEARCH WORKSHOP

### Advancing Theory Development in Construction Project Management Research

Wednesday 5<sup>th</sup> March 2008, 10.00 – 3.45, University of Wolverhampton

09.30 – 10.00 am	Registration and coffee/tea	
10.00 – 10.30 am	Welcome	
10.30 – 11.00 am	The nine schools and a theory of project management	<b>Professor Rodney Turner</b> Editor of International Journal of Project Management
11.00 – 11.30 am	The extent of theory development in project management research: Observation from the literature	<b>Dr Divine Ahadzie</b> University of Wolverhampton
11.30 – 11.50 am	Research approach to investigate the relationship between waste generation and procurement systems	<b>Withana Gamage</b> Loughborough University
11.50 – 12.10 pm	The relationship between theory, methodology and construction practice in research into business performance of medium-size contractors	<b>Kumudu Swarnadhipathi</b> Birmingham City University
12.10 – 12.30 pm	Habitus: a theory for the search of a responsive green urban architecture in Ghana	<b>Rexford Assasie Oppong</b> University of Liverpool
12.30 – 1.30 pm	<i>Lunch Break and Networking</i>	
1.30 – 2.00 pm	Theory and practice in project management: beyond the dichotomy	<b>Professor Stuart Green</b> University of Reading.
2.00 – 2.30 pm	Getting the balance right - The importance of knowledge sharing between industry and academia	<b>Dr Mark Sharp</b> Construction Industry Research and Information Association, (CIRIA), London
2.30 – 2.50 pm	Grounded theory approach towards assessment of affordable housing quality in the United Kingdom	<b>Nelson Okehilem</b> University of Wolverhampton
2.50 – 3.10 pm	Project management: complex mathematical model	<b>Peter Tate and Peter Farrell</b> Bury Metropolitan Borough Council University of Bolton
3.10 – 3.30 pm	Application of analytic network process in real estate development risk assessment	<b>Sukulpat Khumpaisal</b> Liverpool John Moores University
3.30 – 3.45 pm	Wrap up session	

# AN INTRODUCTION

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## CONTEXT OF THE WORKSHOP

Over the last decade researchers have undertaken some soul searching to help promote debate on what constitutes the theory of project management and whether as an academic discipline the theoretical base is rigorously developed (cf. Seymour et al, 1997; Soderland, 2002; Jugdev. 2004). This soul searching is not unusual in the metamorphosis of many academic disciplines forging for credibility in a “scientific” dominated arena (Raftery, 1997). For instance, in the early 1990s, the social science discipline (e.g. sociology and social psychology) faced the same scenario, which generated prolonged debates. These debates eventually helped in the development of new paradigms which has helped enrich the social science discipline with a wider choice of methodologies for research (Raftery et al, 1997). The debate in the project management discipline could therefore be the beginning of a new search for the way forward. This ARCOM doctoral workshop is focussed on reinforcing that drive with some pragmatic debate.

The workshop brings together doctoral students, researchers and practitioners interested in sharing their knowledge of the use of theories in project management research. It is refreshing to note that the editor of the *International Journal of Project Management* (IJPM), Professor Rodney Turner will be opening the workshop with an address of the nine schools and a theory of project management. His presence here today signifies the role that the IJPM, as one of the leading journals in the discipline, is making towards promoting the theoretical base of the discipline. Also present is Professor Stuart Green, Director of the Innovative Construction Research Centre (ICRC) of the University of Reading. Prof Green has a reputation for challenging accepted orthodoxy in research methodology and it is hoped that this would be a motivation for researchers to be assertive in challenging the status quo in the drive towards advancing theory development in project management research. His address will be focussing on theory and practice in project management beyond the dichotomy.

Apart from two keynote speakers, the workshop is a compilation of eight papers. Six of these papers have been produced by doctoral candidates who are undertaking research projects with a focus of theory development in the UK. A scene setting paper inspired by a recently completed doctoral study and an “industry” perspective represent the other contributions to the workshop. Also speaking later today would be Dr Mark Sharp of the Construction Industry Research and Information Association, (CIRIA). The topic of his address will be the importance of knowledge sharing between industry and academia.

### **Setting the scene**

Drawing mainly from the literature, a synthesis of the extent of theory development in project management research is provided (Ahadzie et al, 2008). The main objective of this presentation is to provide a preamble or scene setting to signify the justification of the theme of the workshop and the merit on which it was adopted. Definitional positions of the terms theory and project are also argued including issues relating characteristics of a good theory. Information is also provided on the contribution that construction management research is making towards mainstream project management research and the implication for advancing the cause of theory development. It is noted that as an academic discipline, the theoretical base of project management is weak and construction management researchers as leading stakeholders need to provide a more assertive discourse in promoting this agenda.

### **The working papers**

The first two papers give readers some useful definitions and/or explanation of the term theory from different perspectives (Gamage et al, 2008; Swarnadhipathi and Boyd, 2008). In attempting to develop a theory that can explain the relationship between waste generation and procurement systems, Gamage et al, (2008) identify four classifications of a theory which could influence their research design. The classifications are namely, grand theories, formal theories, middle range theories and substantive theories. Subsequently, Gamage et al (2008) outline the key stages of the research approach they intend adopting. Alternatively, Swarnadhipathi and Boyd (2008) discuss the relationship between theories, methodology and construction practice in undertaking PhD research into the business performance of medium-size contractors. In so doing they bring forth three constituent elements in a theory – ‘what’, ‘how’ and ‘why’. An important viewpoint expressed was that while theories may work well at the conceptual level, at the empirical level they might fail due to pragmatic reasons based on their inadequacies of value, space and time at its formulation. Swarnadhipathi and Boyd (2008) therefore contend that empirical validity is one requirement that a theory should satisfy among other requirements such as sense making, believability (credibility), adaptability and coherence. Using a theoretical framework based on European Foundation of Quality Management (EFQM) enablers an interpretive approach was established to generate the relevant data.

The next two papers bring into focus the use of grounded theory and how it could be used from different perspective for theory development (Oppong and Dunster, 2008; Okehilem et al, 2008). Informed by *habitus*, a social theory, Oppong and Dunster want to use grounded theory to help understand how taste and the perceptions of project clients influence the promotion or lack of green urban architecture. Ultimately, Oppong and Dunster want to use their research design to develop informed design models for sustainable architecture and eventually project management practice on urban architecture in Ghana. In the same respect, Okehilem et al, (2008) are seeking to use grounded theory to help develop a quality assessment model for affordable housing in the UK. Okehilem et al (2008) make use of this methodology in two distinct phases of their research design and the process involved is highlighted.

The fifth paper comes with the view that theory development is not only important in project management research but that there is the potential to develop a mathematical

model based on the concept of “fractal” (Tate and Farrell, 2008). However after relying on the holistic integration of mechanical function and human dynamics, Tate and Farrel (2008) caution that it is difficult to develop a singular mathematical theory encompassing the field of project management. They have therefore recommended that further research is needed to develop a better understanding of the complex mathematical dimensions in an attempt to develop project management theory.

The sixth and final paper discusses the application of Analytic Network Process (ANP) theory to help real estate developers in dealing with potential risk areas in every project management phase (Khumpaisal and Chen, 2008). Using a case study of residential and commercial mixed-use projects in Liverpool city centre, the effectiveness of the theory is demonstrated. Khumpaisal and Chen, (2008) contend that the ANP model is valid and can therefore be used for business risk assessment in real estate development scheme.

## **REFLECTION**

From the working papers compiled, a variety of ideological issues pertaining to the definition, use and development and research methodology of theories have emerged that are worth reflecting on. In particular, the first two papers appear to highlight the varied interpretation that could apply to the definition of a theory. Moreover, it is interesting to note that the definition used in setting the scene also reflected a different perspective. The implication is that there is the need for project management researchers to establish a consensus on the appropriate definitional position of this terminology if future debates are to be confronted on a common forum. What is also emerging is that, there appears to be some confusion whether the mere gathering of literature as a body of knowledge constitutes a theory or should the term be used strictly in its scientific sense. Fellows and Liu (2003) have drawn attention to this confusion when they tried to distinguish what constitute “literature”-based framework from “theoretical” framework. The use of grounded theory emerged in two of the papers albeit contrasting applications (Oppong and Dunster, 2008 and Okehilem, 2008). While the former intended to use grounded theory underlined by a theoretical assumption, the latter attempts to explore what Creswell (2003) consider as “forward looking”. That is, allowing a theory to be discovered without any prior assumption. Khumpaisal and Chen’s (2008) ANP also offer some food for thought in its potential for theory development. Drawing from an experimental case study, Khumpaisal and Chen contends that the ANP could be an effective support to developers in making informed risk assessment. The contribution by Tate and Farrel (2003) towards mathematical modelling of project management theory is a bold attempt, especially if one considers some of the entrenched subjective issues the discipline has to confront. Given that mathematical formulae have the power for reducing complex issues to simple understanding; it will be interesting to see how this study is taken further. After all, the some of the greatest existing theories are based on mathematical models (e.g. Einstein is equation of relativity).

Appreciation goes to all the presenters at this workshop. Generally the working papers have revealed that theory development in project management research could be addressed from many interesting perspectives. Thus, there is the potential that if this

debate is continued on a more assertive agenda, it may bring to the fore many untapped areas that could help enrich the theoretical base of the discipline.

## **ACKNOWLEDGEMENTS**

We are grateful to the following persons for the various ways they assisted in making this a success Dr. Rod Gameson, Dr. Nii Ankrah and Carly Rose, Neelam Grewal. We also thank the ARCOM committee for making the workshop a reality.

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# **THE EXTENT OF THEORY DEVELOPMENT IN PROJECT MANAGEMENT RESEARCH: OBSERVATION FROM THE LITERATURE**

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## **ABSTRACT**

The dilemma of what constitutes the theoretical base of the project management discipline has been debated from different perspectives. Drawing mainly from the literature, a reflexive discourse of the trend and the story so far is elucidated. The consensus reached indicates that the research focus on theory development lacks far behind other contributions in the hierarchy such as those labelled as insights, new techniques, model testing and/ or building. That is, the evidence heavily reflects research based on “practitioner-led normative approaches” as against testing or developing theories. It is noted that construction management research is arguably the influential contributor. It is therefore contended that if there is any agenda towards advancing theory development in project management research, the construction sub-sector has an importantly significant role to play.

**Keyword:** Construction, project management research, theory, theory development

## **INTRODUCTION**

Mediation over theory development in project management research is not a recent development. In the late 1990s, some researchers (e.g. Seymour et al (1997) and others) vigorously debated and brought the issue to focus in the construction management realm. This recent call (e.g. Jugdev, 2004) in mainstream project management literature is therefore a reflection of how far the issue has lingered on to date. Indeed, the project management discipline is not the only field of knowledge that has in its progression fallen into this trap of reinforcing its theoretical base as an academic discipline. In the early 1960s, the social science discipline (e.g. sociology and social psychology) faced the same dilemma and were confronted with the choice of adopting appropriate methodologies to gain credibility (Raftery et al, 1997). Whether the debate was worth it or not, it appears the social sciences have been able to overcome the challenges and now can boast of a strong theoretical base which other disciplines now draw on (Cresswell, 2003). A positive aspect of the debate in the social science domain is that the field is now enriched considerably in the development of new paradigms creating much wider choice of research methodologies (Raftery et al, 1997). It is interesting to note that in the 1990s when Seymour et al (1997) and others were debating in the project management realm, other emerging disciplines relating to the Journal of Property Research had also embarked on a similar agenda. Thus, it appears that for relatively new disciplines such

as project management to break grounds as a rigorous academic discipline, the debate over its theoretical base is unavoidable.

However the question is, is it really fair that project management as an academic discipline has a weak theoretical base or is there really a case for arguing that there is the need for a theory of project management. Or is the project management discipline being over zealous in asking these questions? Alternatively one may ask what actually constitutes theory or makes a discipline theoretically strong. Many of these questions have lingered on since the debate by Seymour et al (1997) and others first started (cf. Chau et al, 1998) and there appear to be a state of trepidation among researchers of the potential implication (cf. Turner, 2006). It is therefore not surprising that, recently some researchers have attempted to allay some of the fears (e.g. Turner, 2006) but as to whether this is enough to calm the nerves of researchers remain to be established.

Here, the literature is revisited to help "recap" what the trend has been in addressing these concerns since the debate first started. It is hoped that this would help readers to make their own judgement whether there is a case for arguing the need for theory development in the discipline. First of all, the definitional position of the terms theory, project and project management theory is given in the context of the discussion. This is then followed by an overview of some relevant project management articles that have addressed the issue of a lack of theory development. Thereafter observations made concerning the extent of theory development are revealed including the contribution that the construction management domain has made towards this agenda. Emerging issues from the discourse are presented and the conclusion provides a reflective summary.

## **WHAT IS THEORY?**

It is noted that during the debate by Seymour et al (1997) and others, one of the controversial issues that came up was on the definition of a theory. Here theory is seen largely as a scientific principle that facilitates prediction and offers explanation for a phenomenon as against a body of knowledge. In this respect a theory as defined in the natural sciences involves empirical verifications based on direct observations and experience as per laws or a scientific typology that helps to organise things, explain past and predict future events and also explain or help with understanding of the causes of events and their potential controls (Jugdev, 2004).

Alternatively in the social science realm, theory could be defined as a narrative that describes social process (citing DiMaggio, 1995 cited in Jugdev, 2004). That is a theory is a narrative that consists of relationships that account for patterns and/or interaction between and among various types of phenomenon (Goulding, 2002). Creswell (2003) also notes that theory is an interrelated set of constructs which when formed into hypothesis can help explain the relationship among variables particularly in terms of magnitude and direction. In a construction related text, it is observed that Fellows et al (2003) also defines theory as "a system of ideas for explaining something; the exposition of science". In particular, Fellows et al (2003) make a clear distinction between what constitutes theory and literature. They argue that, theory is the established principles and laws, which have been found to hold, (e.g. Einstein's theory of relativity and theories of the firm) whereas literature concerns findings from

research, which have not attained the status of theory (principles and laws). Thus, it could be argued that while a theory would definitely have to be established by undertaking a literature review, the mere undertaken of literature review however may not constitute the development of a robust theoretical framework. Indeed according to Strauss and Corbin (1994) a theory provides the best comprehensive, coherent and simplest model for linking diverse and unrelated facts in the literature. Thus theories should transcend descriptions and have the potential to demystify common stereotypes and myths (Olszewski-Walker and Coalson-Avant, 1995). Furthermore theories should enable researchers to produce findings which show how variables in a study are hypothesised to interact in a particular situation (Fellows et al, 2003). Thus to qualify as a theory, the concept must emanate from the philosophy of science, and must have the potential for predicting and explaining the trend in a social or scientific phenomenon. To this effect, the following characteristics are worth noting (Arnoult cited in Jugdev 2004). That is:

- A theory should have testability by clearly ascertaining wrong predictions
- A theory should have power by correctly explaining a variety of phenomena
- A theory should offer new ideas to explore further
- A theory should be simple in which case it should be elegant and parsimonious.

## **THEORY DEVELOPMENT**

Theory building is a process and not an event (cf. Soderland, 2004). Theories develop when researchers test a prediction many times in different settings (Creswell, 2003). Instead of testing hypothesis longitudinally theories could also be discovered (Flick, 2006). Proponents of this type of theory development favour the grounded theory approach which gives priority to the data and field under study over theoretical assumptions (Goulding, 2002: Creswell, 2003: Flick, 2006). Thus, while theory development involves different ontologies and epistemologies, what is clear is that during theory development, models (paradigms) evolve and help refine the theories (Jugdev, 2004). Also, theories do not need to be complete to make significant contributions to knowledge; even partial theories could be useful as they could help develop a framework for theory construction (Jugdev, 2004; Soderland, 2004). Testing a theory involves one of more of the following (Popper, 1972 cited in Fellows et al, 2003)

- Establishing the level of consistency in the logical comparisons of the conclusions drawn from the theory.
- Investigating the logical form of the theory in terms of whether it has the character of an empirical and scientific theory
- Comparing the theory with other theories to establish how best it survives the test of time
- Testing the theory by way of the potential empirical application of the conclusions drawn from it.

However, in developing new theories, Jugdev (2004) proposes “analogies” as a useful conceptual technique. This involves using metaphors, similes and analogies to

encourage research to look at clues elsewhere and draw on symbolic constructs to help explain reality. In this respect Jugdev (2004) used the example of a scientist trying crack the biochemical code for each chromosome to determine human characteristic to inspire her to also attempt to unlock the genome of a company's competitive advantage (see Jugdev's resource lens view approach for theory development).

## OVERVIEW OF PAPERS

The literature is drawn mainly from articles published in the Construction Management and Economics (CME), International Journal of Project Management (IJPM) and the Project Management Journal (PMJ). While these journals may not be totally representative of the numerous journals that deal with project management issues, they are among the top leading journals and therefore influential (cf. Kloppenborg and Opfer, 2002)

### SOME DETAILS FROM THE LITERATURE

Tables 1 to 6 provide a summary of the trend identified. The findings reveal that while there was some significant improvement in producing empirical based research (e.g. Table 1), theory development lags behind other research themes in the hierarchy (refer Tables 2 to 4). Thus, the evidence indicates that between 1982 to 1993 theory development in both CME and IJPM recorded 3% (Tables 2 and 4) contribution as against, for instance, research developing insights which recorded 71% and 61% respectively. Insight as used here means that the contribution lies largely in the data presented and the papers do not generate new models or theories (Seymour et al, 1997). New techniques as used in Table 4 refer to research largely based on reporting new experiences while model testing involves testing of statistical and organisation models without any theoretical assumption (cf. Bett and Lansley, 1995; Seymour et al, 1997)

**Table 1:** Classification of papers by source

Source	Number of papers	Percentage proportion
Reviews	74	31.8
Case studies	91	39.1
Empirical data	68	29
Total	233	100

*Source: Betts and Lansley, 1993*

**Table 2:** Classification of papers by contribution

Source	Number of papers	Percentage proportion
Model testing/fitting	53	22.7%
Model building	45	19.3%
Systems building	45	19.3%
<b>Theory building</b>	<b>11</b>	<b>4.9%</b>
Insight	79	33.9%
Total	233	100%

*Source: Betts and Lansley, 1999*

**Table 3:** Classification of papers by source

Source	Number of papers	Percentage proportion
Reviews	196	58
Case studies	103	31
Empirical data	38	11
Total	337	100

*Source: Betts and Lansley, 1995*

**Table 4:** Classification of papers by contribution

Source	Number of papers	Percentage proportion
Model testing/fitting	8	2%
Model building	41	41%
Systems building	18	18%
<b>Theory building</b>	<b>11</b>	<b>3%</b>
Insight	207	61%
New Techniques	52	52%
Total	337	100

*Source: Betts and Lansley, 1995*

While these data is up to 1993 or thereabout, there appears that there has been no change in the trend as evidenced in the recent call for better theory generation in the discipline in the PMJ (Morris et al, 2000; Meredith, 2002; Kloppenborg and Opfer, 2002 Engwall, 2003; ) (all cited in Jugdev, 2004). See also Turner, 2006)

## THE CONTRIBUTION OF CONSTRUCTION MANAGEMENT RESEARCH

Given the emphasis of this workshop on construction project management, construction management researchers in particular need to reflect on their contribution to the perception or reality that there is a lack of theory development in project management research. This is because construction is the subject of most cited or published papers in the discipline (refer table 5). Evidence provided by Pinto and Slevin (1988), Themistocloous and Wearne (2000), Zobel and Wearne (2000) also support this trend. So far the only study that seems to contradict this result is by White and Fortune (2002). However, their conclusion is based on the influence of sample choice and not publication size. Thus the recognition is that, research from the project management discipline is heavily influenced by articles emanating from the construction management domain (Crawford et al, 2006). The implication is that if the theoretical base of project management research is to be developed the construction management community have a stake in reflecting on the contribution that it can make towards advancing this cause.

**Table 5:** Contribution to project management research by sector discipline

Sector Discipline	Papers	Percentage
Construction	104	54
Agriculture	3	2
Facilities/Utilities	16	8.3
Process Industries	25	13
Manufacturing	16	8.3
Information/Service industries	27	14
Total	191	100

*Source: Adapted from Betts and Lansley, 1995*

**Table 6:** Contribution to project management research by sector discipline

Sector Discipline	Percentage
Construction	21
Information systems	21
Education	8
Manufacturing	5
Research and Development	4
Utilities	3
Telecommunications	1

*Source: Kloppenberg and Opfer, 2002*

## EMERGING ISSUES

Is there really a case for arguing that there is a need for a theory of project management? While this statement could be subjected to further debates from various other perspectives, the observations from the literature suggest that there is perhaps a case for project management researchers to re-examine the issue. Given that the construction industry is at the forefront of promoting knowledge in the discipline, there is no doubt that construction management researchers have an importantly significant role to play if the desired to enrichment of the theoretical basis of the discipline is to be achieved.

## CONCLUSION

The use of previous published papers has been used to re-ignite the debate whether there is a case for arguing that very little has been done to promote theory development in project management research. Here, theory is defined as a phenomenon that has the potential of facilitating prediction and also offering explanation of the interrelations amongst variables. Theory development is defined by testing hypotheses over a longitudinal study or being discovered. The literature revealed that there is the credibility that while the scope of research has expanded considerably there is concern amongst researchers that theory development has not been given the attention needed. Within the context of the workshop it is contended that construction management researchers as leading stakeholders in project management research have a significant role in any theory development agenda that is considered.

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# RESEARCH APPROACH TO INVESTIGATE THE RELATIONSHIP BETWEEN WASTE GENERATION AND PROCUREMENT SYSTEMS

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## ABSTRACT

Recent figures published by the UK Government reveal that construction and demolition activities produce approximately 32% of total waste generated, three times the waste produced by all households combined. Construction procurement plays an effective role in attaining sustainability by giving due consideration to the environment, community and social conditions in delivering built assets. Little research has been done in the evaluation of the impact of procurement systems on construction waste generation; however, literature emphasised the need of research in this context. The aim of this paper is to discuss the rationale behind the theory and research approach for the adopted research methodology for an ongoing doctoral study to develop a procurement waste minimisation framework by establishing the relationship between procurement systems and waste generation. The paper introduces the definitions of theory; discusses the role of theory in research; explores the links between theory and research approaches, design and data collection methods; and examines the selected research approach, research design and data collection methods in line with role of theory. The paper concludes with a brief discussion on the importance of understanding the role of theory; and outlines the key stages of the selected research approach for the study.

**Key words:** Construction procurement, data collection, research approaches, theory, waste minimisation.

## INTRODUCTION

Construction and demolition activities in the UK produce approximately 32% of total waste generated, three times the waste produced by all households combined (DEFRA, 2006) and produce 109 million tonnes of waste every year (DEFRA, 2007). Construction procurement plays an effective role in attaining sustainability by giving due consideration to the environment, community and social conditions in delivering built assets. Current and ongoing research in the field of construction waste management and minimisation focuses mainly on onsite waste quantification, source evaluation (Ekanayake and Ofori, 2000; Bossink and Brouwers, 1996; McDonald and Smithers, 1998) and waste minimisation through design (Keys *et al.*, 2000; Osmani *et al.*, 2007). However, little research has been done in the evaluation of the impact of procurement systems on construction waste generation; nevertheless, literature emphasised the need of research in this context (McDonald and Smithers, 1998;

Ekanayake and Ofori, 2000; Jaques, 2000). Hence, this research sets out to develop a procurement waste minimisation framework by establishing the relationship between procurement systems and waste generation (Gamage *et al.*, 2007).

This paper, part of a doctoral study, focuses on research methodological issues pertaining to theory and research. The role of theory helps to decide particular research approach and the research design (Saunders *et al.*, 2007). Thus, the extent to which the researcher is clear about the theory at the beginning of the research guides the design of various aspects of the research such as research approach, design, data collection methods etc. The paper introduces the definitions of theory; discusses the role of theory in research; explores the links between theory and research approaches, design and data collection methods; and examines the selected research approach, research design and data collection methods in line with role of theory.

## **RESEARCH THEORY AND APPROACHES**

### **Research Theory**

One of the characteristics of a mature discipline is the presence of a sound theoretical base (Betts and Lansley, 1993). Although a number of studies (Flinders and Mills, 1993; Blaikie, 2000) argued that precise definition of theory is difficult to put forward, the term ‘theory’ has been explained and defined in many ways depending on the different philosophical stances. Blaikie (2000) analysed different definitions of the term ‘theory’ from different perspectives: First, definitions that identify theory with the ‘current state of knowledge about why some thing happens’. For instance, inline with the general definitions Bryman (2004:5) explained theory as “an explanation of observed regularities”. Second, theories provide explanations by establishing connection between the subject of interest and other phenomena. Third, definitions concentrated on theory as a set of propositions that state relationship between concepts. Thus, theory aims to link concepts; and it may be right or wrong, yet, it is only a supposition that requires empirical testing (Tan, 2002). Having said that, Grill and Johnson (2002: 229) defined the term ‘theory’ as “a formulation regarding the cause and effect relationships between two or more variables, which may or may not have been tested”. This definition dictates aforesaid many characteristics of a theory such as ‘cause and effect relationships’, ‘link between concepts/variables’ and ‘requirement of testing’. The next section debates the relationship between theory and research.

### **Role of Theory in Research**

There are two main issues to address when examining the relationship between theory and research: what form of theory (i.e. middle range theories or grand theories); and whether data/facts are collected to test or to build theories (Tan, 2002). The latter query will be discussed in the forthcoming sections using terms of ‘inductive’ and ‘deductive’ approaches. In addressing the former, Denzin (1970) proposed four main levels:

- *Grand theories* or system theories, present a master conceptual scheme that is intend to represent features of a total society or large scale social phenomena;
- *Formal theories* are based on contested idea that universal explanations of social life and these comprise a syntheses of commonalities in different phenomena into unified theory (Blaikie, 2000);

- *Middle range theories* “consist of limited set of assumptions from which specific hypothesis are logically derived and confirmed by empirical investigation”(Blaikie, 2000: 147); and
- *Substantive theories* can apply to specific problem areas (i.e. race relations).

Later stated both type of middle range and substantive theories that the level a researcher can use. More over they can be combined. Thus, Middle range theories and substantive theories play significant role in research, since they focussed to limited set of assumptions or to address specific problem areas.

### **Theory and Research Approaches**

The role of theory helps to decide particular research approach as well as the research designs (Saunders *et al.*, 2007). In exploring the relationship between theory and research it is necessary to debate whether the theory or data comes first. In other terms, the role of theory in research is either the use of hypotheses to be tested, or theory that is generated in the course of research (Blaikie, 2000). This debate raises the two approaches to the research as being: deduction and induction. Deduction is data/facts test to theories, while induction is the vice-versa application of deduction that is the movement or generalisation from the data/facts (observations, empirical world or reality) to theory (Tan, 2002; Saunders *et al.*, 2007). The significant difference between both approaches relates to ‘knowledge’; while inductive reasoning occurs within the existing boundaries of ‘knowledge’, the inductive reasoning is extending or overcoming boundaries to current knowledge (Fellows and Liu, 2003).

#### **Deduction**

The deductive research approach entails the development of a conceptual and theoretical structure prior to its testing through empirical observation (Gill and Johnson, 2002). In this approach the researcher may have deduced a new theory by analysing then synthesising ideas and concepts already present in the literature (Remenyi *et al.*, 1998). Therefore, the deductive approach is used to search for causal relationships between variables through deducing a hypothesis. Saunders *et al.*(2007: 117) defines a hypothesis as “a testable proposition about two or more concepts or variables”. Similarly, Gill and Johnson (2002) emphasises the importance of determining which concepts present important aspects of the theory or problem under investigation. Additionally, Robson (2002) noted five sequential stages through which deductive research progresses deducing a hypothesis from the theory; expressing the hypothesis in operational terms; testing the operational hypothesis; examining the specific outcome of the inquiry; modify the theory in light of the findings (if necessary). At the end of the study the results are expected to be generalised to the population (Saunders *et al.*, 2007). In a deductive research approach, research is expected to pursue the principles of scientific rigour and researcher should be an independent observer.

#### **Induction**

Inductive research is reverse appeal approach of deduction, it is the movement from data/ facts to theory. Blaikie (2000) characterised four main stages of a inductive approach: all facts are observed and recorded with out selection; collected facts are analysed, compared and classified with out using hypotheses; from the analysis, generalisations are inductively drawn as to relation between the facts and generalisations are subjected to further testing. However, generalisation of the theory

will not be expected with the inductive approach due to context specific nature of the research (Saunders *et al.*, 2007). Because of the context specific nature ‘theory that is inductively developed will be fitted to the data, thus more likely to be useful, plausible and accessible to practitioners’ (Gill and Johnson, 2002: 40). In an inductive approach, the independence of the observer is not strictly observed, instead the researcher is considered to be part of the research process.

Although the research approaches are divided into two main groups; combining both inductive and deductive approaches is possible as it enables the researcher to gather benefits from both approaches. (Saunders *et al.*, 2007; Yin, 2003; Gill and Johnson, 2002).

### **Theory, Research Design and Methods**

In both deductive and inductive approaches ‘data/facts’ are the key factor either to test theory or build theory. In deduction, most occasions hypothesis tests by collecting quantitative data aiming large population sample. This is not to say that a deductive approach may not use quantitative data (Saunders *et al.*, 2007). Further, deductive approach concepts in the hypothesis(es) that have been deduced from the theory determine the data that need to be collected (Blaikie, 2000). On the other hand, researcher using inductive approach is likely to be concerned with the context of specific events. Thus, a study may be based on small sample, but need different type of data in order to establish different views of phenomena and more likely to work with qualitative data (Saunders *et al.*, 2007; Easterby-Smith *et al.*, 2002). The inductive approach requires collection of large quantities of data, possibly the measurement of many concepts in order to justify the generalisation. In contrast, The deductive approach only requires measurement of specific concepts in hypothesis (Blaikie, 2000). The type of data and nature of quantity of data determines which approach, deductive or inductive, will be most appropriate relevant to a research study. Therefore, it is important to decide on the way in which the data will be collected, which will justify the need of research design and method. Saunders *et al.* (2007) named ‘research design’ as ‘research strategies’ located in to seven strategies: experiment, survey, case study, action research, grounded theory, ethnography, archival analysis under the spectrum of research deductive and inductive research approaches. Out of these experiments and surveys are predominantly the uses for theory testing, action research, grounded theory, ethnography for theory building and case studies can be used for both approaches. Bryman (2004) indicated that grounded theory is an iterative process which includes elements of both induction and deduction. However, research designs can be used interchangeably in both approaches. On the other hand, research methods can be identified as techniques for data collection, which can involve a specific instrument (i.e. questionnaire, structured interview schedule, observation techniques). Hence, research methods can be associated with different kinds of research designs both inductive and deductive approaches. Research methods can be identified according to the type of data (i.e. qualitative data or quantitative data) produced. For instance Blaikie (2000) attempted indicate data collection methods that produce quantitative data: structured observation, questionnaire (self – administered), structured interview, content analysis of documents and quantitative data: observation, observation (participant, semi structured and unstructured), interviews (focussed, in depth), oral/life histories, focus group interviews, content analysis of documents. In summary, theory and research approaches provide clear link to determine the research design, research methods.

The next sections explore the best fit research approach concerning theory to assess the relationship between procurement systems and waste generation in construction aiming to develop a procurement waste minimization framework.

## **SELECTED RESEARCH APPROACH TO INVESTIGATE THE RELATIONSHIP BETWEEN WASTE GENERATION AND PROCUREMENT SYSTEMS**

An extensive literature survey on construction waste, procurement systems, sustainable procurement and lean principles was undertaken to explore theoretical basis of relationship between waste generation and procurement systems. The literature presents no clear evaluation or research studies of the impact of procurement systems on construction waste generation instead it has emphasised need of research in this field (Gamage *et al.*, 2007). However, based on the theories on different waste driving characteristics of procurement systems and waste origins and causes (Gamage *et al.*, 2007) three basic research questions were raised: first, what characteristics of procurement systems influence the waste generation?, second what is the relationship between waste driving variables and procurement systems? Third, what is the correlation between waste driving variables, procurement systems and waste causes? These questions have been deduced analysing and synthesising ideas and concepts presented in the literature. Further, the aforesaid questions search for causal relationships between variables in the two areas of procurement systems and construction waste in terms of waste generation. Therefore, the research presents key characteristics of deductive approach as the research begins with analysing and synthesising theories in related literature and also research to explore causal relationships between variables related areas. Yet, the approach into this study is deductive approach. Having said that, the aforementioned three questions are hypothesised into as *'there will be a significant correlation between waste driving variables of procurement systems and waste causes in construction'* and will be tested using the deductive approach. This deductive process will form the basis for a 'develop-refine' procurement waste mapping framework, which will dictate of the impact of different procurement systems on waste generation. Prior to the Framework development, a review of literature on framework methodologies (i.e. soft methodology) will be conducted and a suitable method will be selected, tested, and validated using the deduction approach.

In testing the deduced hypothesis, data will be collected through survey design destined for construction procurement professional experts: contract and procurement managers, project managers, contractors. The selected sample frame is appropriate and suitable for theory testing and proved to measure specific contents in the hypothesis. The proposed procurement waste mapping framework will be carried out using case study design as it can be used in both theory testing and theory building, more importantly it provides sound basis for an in-depth study (context specific) to analyse and modify the developed framework. Additionally, data collection will be carried out based on the questionnaire survey, interviews, and in-depth analysis of case studies. However, research is expected to collect both qualitative and quantitative data in terms of addressing different issues pertaining to the study such as identify potential procurement systems for waste generation, expert views about relationship

between waste generation and procurement systems and assessment of waste driving variable against waste causes.

## **CONCLUSIONS AND FUTURE WORK**

This paper discussed theory and its impact on research approaches. Understanding the relationship of the theory and research is a significant assessment in an investigative study, as it determines particular research approach followed by the type(s) of research design and data collection techniques. The next stage of this research is to move from theory to data. Thus a deductive approach will be followed by research designs such as surveys and case study design. Data collection techniques will consist of questionnaires, interviews and in depth analysis of case studies. For first level data collection, a questionnaire survey will be used to identify waste driving variables of procurement systems.

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# THE RELATIONSHIP BETWEEN THEORY, METHODOLOGY AND CONSTRUCTION PRACTICE IN RESEARCH INTO BUSINESS PERFORMANCE OF MEDIUM-SIZE CONTRACTORS

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## ABSTRACT

This paper discusses the relationship between theory, methodology and construction practice in PhD research into the business performance of medium-size contractors. It is argued that this relationship is not trivial and needs challenging for robust research into construction practice. This paper explores the underlying philosophy of research design, its relationship between different stages and how it leads to theory-building. The research has stemmed from a problem located in practice in Construction Management with a view to improving practice; namely the gap between construction business performance and project performance. A method within an interpretivist approach was established to generate data from the practice by using a theoretical framework (EFQM enablers). The study has investigated 9 medium-size construction companies using semi-structured in-depth interviews with directors/chairmen/managers. This method has generated rich description of the complex situation; however, this revealed a distinction between the theories that are valid in practice and in academia. The conclusion is that for the theoretical output from PhD research to have a meaning in practice and further to be capable of improving practice, a study of the way theories transfer from academia to practice is required.

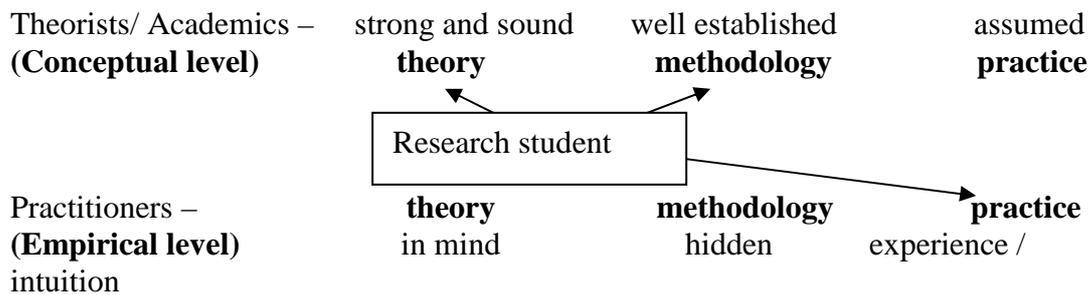
**Keywords:** Methodology, practice, research, theory

## INTRODUCTION

The objective of this paper is to understand the value of theory in wider research practice and its usefulness in improving construction practice. It describes researcher's thought process into this research so far. The paper is written as a PhD researcher's struggle to both undertake a PhD and to improve practice. It describes the challenges undertaken to understand the relationships between practice, methodology, and theory. The order of thinking about these is important. Practice is the most concrete area, as it is in the majority of construction management research, and started the research. The research question was formulated through an unresolved area in the construction practice concerning the gap between contractor's business performance and project performance. Much time was spent in deriving the methodology to

constitute this research because of the PhD researcher's lack of clarity and doubts about interpretive research paradigm. Then the literature review was commenced in line with the chosen area in the construction management discipline to find out what and how other researchers have performed in similar research. The PhD researcher surmised that in positivist research the relationship between theory, practice and methodology is unproblematic being reduced to good procedure but in interpretive research it is part of the problem including debating 'what' is theory and even 'why' theory is used.

The research takes place in the two contexts namely construction practice and academic research practice. This can be presented as two levels, as shown in the figure 1 below:



**Figure 1 – Research Context**

With theory, method and practice appearing at both levels, a student delivering a PhD in construction is expected to have an understanding at both levels but the PhD is at the conceptual level. Theory appears very strong and sound at the academic's conceptual level but diffuse and disconnected in its essence and character at the empirical level, to the extent that practitioners hold theory in their minds (Bannister, 1981) which can be completely different in different people to suit their requirements (Boyd and Wild, 1996). Practice is not visualised in its experiential meaning at the conceptual level and it is sufficient to advance a conceptual theory. Methodology appears less controversial area for a student since it is hidden in practice and it appears well established with alternatives at the conceptual level. In the real world, conceptual thinking and empirical thinking are two different activities however to develop a PhD research in construction management there is a need to connect both rather than confining it to one end. This approach is exemplified by the desire for the PhD to contribute towards improving practice i.e. the business performance of a medium-size contractor. The PhD journey, exploring conceptual methodology, gave the researcher the opportunity to see the inconsistency in interpretive research area. However the process in this study has lessened those inconsistencies and makes this research more robust conceptually and empirically.

## **PHILOSOPHY OF THE RESEARCH DESIGN**

### **The Conceptual View of the Problem in Construction Practice**

As mentioned previously the research question originates at the empirical level but started with a conceptual analysis of a difference between construction project and construction business performance. Winch (1989) concluded that 'the project is a

temporary organisation, while the firm is a continuing capacity to create the built environment'. Phua (2006), Bassioni *et al.* (2005), Dubios & Gadde (2002) and Handa & Adas (1996) described about the disparity between project level performance and the contractor's business performance. They agree that the business performance of contractors is not satisfactory and it is also under-researched. The business environment where these contractors work is highly competitive thus it makes contractors' business performance a very important factor which determines its economical and social success as well as long term sustainability in the industry. Kagioglou *et al.* (2001) criticized financial performance measures to determine sustainability of a company as 'results and decisions based on the past and do not encourage the continuous improvement of the overall performance'. They have considered financial information as a lagging indicator inappropriate for future decision making. Thus the meaning of 'business performance' of a company is much wider than the usual financial measures to gauge a company by its projects performances.

From these conceptual analyses, research suggests that a construction company needs to discover the factors which contribute towards its business performance other than the project performance as a whole. These factors might be its identity as a separate entity such as client relationships, training, innovation, research and development in addition to the project needs and requirements. Furthermore it is the relationship between project performance and companies' business performance that needs to be established. However at the empirical level contractors do not see their world in this way i.e. they do not theorise about the interdependent process between the construction industry, the construction company and the construction projects undertaken by that company. This disconnection in theorising needs to be acknowledged in PhD research where there is a tendency to privilege the conceptual theory.

#### **Application of Academics' Methodology in relation to Methodology in Practice**

Conceptually this research was designed in the interpretive paradigm because of supervisor influence and its appropriateness for investigating the complex social phenomenon of the construction practice. Hence, this study inquired into the perceptions of business performance of company directors/chairmen and senior managers in medium-size construction companies through conducting semi-structured one-to-one recorded interviews.

Methodology in practice refers to the way practice philosophises about its activities and its methods of acquiring and using knowledge. In the majority of construction management research, this methodology is assumed to be comparable to the activity at the conceptual academic level. This is not the case and this can explain why the majority of academic research is not taken up by practice (Morris and Lancaster, 2005).

Thus to introduce a meaningful relationship to methodology at both levels; an existing theoretical framework was used to structure the questions rather than just creating a set of questions. It was decided to use the enablers from the European Foundation of Quality Management (EFQM) framework as a conceptual tool to access data. On one hand, EFQM has been well documented and discussed at academic level and could be regarded as a theoretical framework which can analyse a company's approaches and

even present solutions to improving a company's business performance. On the other hand, EFQM framework also has a meaning at the practice level as it is a tool in use and is reported in business experience. It was surmised that the respondents would be aware of EFQM and so could present their thinking about their business through it. The nightmare between academic language and practitioner language issue would thus be solved. It provided ground for practitioners to talk through their own language and enable the researcher to probe and collect sufficient information; in a manner related to both conceptual and empirical levels. It covers all aspects of operations in an organisation with a direct relationship to results which made probing less traumatised. It also covers: the relationship between leadership and business performance, how business performance (non-financial) is perceived by directors and how it is translated in a company. It made the data generation process less complex by providing access to data and uncovering data based on organisational behaviour with strategic management approach.

However, using a framework for the inquiry can limit data which might be more specific to their companies and useful for analysis. For example - the EFQM framework has a bureaucratic nature which favours administrative managers but not project leaders who are found in construction. Also, Dahlgaard-Park and Dahlgaard (2005) criticise that the model is too simple to handle 'the complexity with its uncertainty and unpredictability in real world'.

From the interview transcripts, narratives are produced for data analysis with a view to developing /improving related theory. The rationale behind the selection of the narrative method comes from 'sensemaking is a committed interpretation' and the sensemaking themes described by Weick (2001, p 11). Also from; 'good stories are central to build better theory' Pentland (1999). The narrative analysis is expected to reveal answers to the research questions to form 'what' and 'how' of theory at the empirical level and the 'why' of a theory with a reasonable connection at conceptual level. So far data has provided a rich picture on their way of doing business, their understanding and beliefs about company performance and project performance and how they handle day to day improvements and future developments.

However the analysis will be problematic in following areas: The chosen framework guided interviewees in a systematic way though it generated a massive amount of data. Other than the recording and transcribing difficulties, large amount of information reveals contradictions in the interviewees' statements. This leads to a difficulty of meaning and coherence in the theory generation process as it is the researcher that selects the evidence to give it coherence to generate conceptual theories. Lemke, (n.d.) said 'the process of transcription creates a new text whose relation to the original data is problematic'. Hence there is a tendency to lose some of the meaning as spoken and written languages are not the same which might be useful for data analysis. Interview data could have been affected due to the location of the interview and the interactional style between the researcher and the interviewee; e.g. would they answer or converse in this way in practice? Thus it limits or adds to the researcher's own interpretations and assumptions which affects the value of the research during theory-building.

### **Theory in research**

As explained previously, the attempt is to deliver a PhD in construction related to both levels. Thus there is a need to understand and apply theory in conceptual level to a problem in empirical level. Bacharach (1989) viewed theory as a set of constructs and variables which are interrelated within researchers/theorists imposed boundary of assumptions of value, time and space. Whetten, (1989) states that there are three constituent elements in a theory – ‘what’ ‘how’ and ‘why’. ‘Why’ of a theory needs to satisfy findings at empirical level with assumptions about conceptual level, thus this may be the most important task. The general perception is that most theories work well at the conceptual level however at the empirical level they may fail due to pragmatic reasons based on their inadequacies of value, space and time at its formulation. Determining this theory of two levels tends to reduce the elegance of the theory at conceptual level thus creates a problem as regards the PhD.

In the case of interpretive research paradigm where this research is based; legitimacy and credibility becomes further complex as the method explores the subject through peoples’ interpretations. It makes the theory-building exercise more uncertain; however, rigorous analysis and thorough explanations are required for such a theory to be recognised. There are different ways of adding value to theory-building in interpretive research such as (1) to be ‘descriptive and provide a sound empirical basis rather than prescriptive’ (Seymour and Rooke, 1995), (2) to generate a deeper understanding of the social actors’ pre-understanding Gummerson (2000 p 62), (3) to expose the reflexivity of the researcher about the subject and the evaluation method by Unique Adequacy requirement of methods described by Rooke and Kagioglou (2007) where importance of familiarity of the research setting and value-free judgment is highlighted and (4) to make sense in organisations by realising the social structure as described by Weick (2001).

### **CONCLUSION**

This paper provides an insight into on-going research, which aims to lead to theory building and practice improvement, through inquiring into the relationship between research methodology, accessing data from practice and theorising from this data. The methodological question arises whether this conceptual theorising has a meaning in practice which is required before practice can be improved by it. It is believed in the majority of PhD research in Construction Management that this is the case but this is seldom substantiated. It was argued that empirical validity is one requirement that a theory should satisfy among other requirements such as sensemaking, believability (credibility), adaptability and coherence. Thus a study of the way theories have meaning in both academia and in practice is required.

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# HABITUS: A THEORY FOR THE SEARCH OF A RESPONSIVE GREEN URBAN ARCHITECTURE IN GHANA

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## ABSTRACT

The search of responsive green urban architecture has become a hot issue in the world as a matter of paramount concern and importance. In Ghana and most African countries; responsive green urban architecture has become complicated and seemingly elusive. There seems to be negligence of culture of floral beautification of villages, towns and cities: nowadays, no more garden cities are being built. There is high rate of light densities development without greening as a major component of architectural designs for green spaces amongst others. Through Aristotelian *phronesis*; this paper contends that the Mixed Methods research design paradigm is appropriate for this research based on *habitus* - social theory. This research seeks to introduce voting as a research strategy fashioned on Grounded Theory construction. For all intents and purposes; research ethics required will be considered and observed. This paper concludes that a better understanding of conflicts and contradistinctions in the search of green urban architecture of African living, underpinned by the *habitus* theory will help generate informed design model(s) to serve as policy rationale for sustainable architecture in Ghana and sub Saharan Africa.

**Keywords:** Green urban architecture; Habitus; mixed method design; Theory; Ghana.

## INTRODUCTION

### Green Case in Ghana

The analysis of the “Green Case” affected Third World by showing how closely grave ecological problems are bound to the Third World’s need for development, and demonstrating the systematic connections between aid, debt, development and the environment. The 1990s saw classical of literary works on “green theory” by a lot of writers including Goodin (1992). In an address entitled “*Give our habitat a greenish, beautiful look*”; the Vice President of Ghana, on 18 September 2002, bemoaned the rate at which the flora and fauna of the Ghana are being depleted as a result of urbanisation. It was noted that the culture of floral beautification of our villages, towns and cities, which in the good old days won for Kumasi-the second largest and commercial city of Ghana; the accolade, the ‘Garden City’ of West Africa has become oblivious. The pertinent questions for this research therefore are: the happenings in Ghana in this regard, perhaps a phenomenon of “structures structured

predisposed as a function to structure structures” or taste (manifested preferences) of people? Do people really understand the “garden city” concept if it ever existed? Is there ‘miscognition’ in Ghana with regards to greening the environment: an act where one acts as if one does not know the rules of the ‘game’ (greening) if any? And above all, does Ghana as a nation have a green policy to guide architectural oriented development? The attainment of sustainable green urban environment is a complex system of urban development and theories; and therefore, a combination of epistemological, and positivist approach underpinned by Aristotelian *phronesis* research into the search of responsive green urban architecture at this stage of Ghana’s development as an emerging economy in sub-Saharan Africa is essential. Following this introduction is a brief account of a theoretical framework for understanding Bourdieu’s *habitus* and its architectural linkage. The next major section discusses also the methodology and the last section draws conclusions based on the analysis presented in this paper.

## **THEORETICAL FRAMEWORK OF RESEARCH**

### **Understanding *Habitus***

*Habitus* is a highly acclaimed sociological theory by Pierre Bourdieu (1930-2002). According to Bourdieu (1984) *habitus* is “structure structured (*opus operatum*) predisposed as a function to structure structures (*opus operandi*)”. In other words, *Habitus* is (Bourdieu,1984) “necessity internalized and converted into a disposition that generates meaningful practices and meaning-giving perceptions; it is a general, transposable disposition which carries out a systematic, universal application – beyond the limits of what has been directly learnt – of the necessity inherent in the meaning conditions”. *Habitus* is acquired through childhood and therefore durable (Bourdieu, 1990). Again, Bourdieu (1984) explains that the *habitus* is both a generative principle of objectively classifiable judgments and the system of classification (*principium divisionis*) of practices. “It is in the relationship between the two capacities which define the *habitus*: the capacity to produce classifiable practices and works, and the capacity to differentiate and appreciate these practices and products (taste), that the represented social world, i.e. the space of life-styles, is constituted” (Bourdieu, 1984).

Furthermore, it is argued that the *habitus* is product of history which produces the individual and collective practices of more history in accordance with the schemes generated by history. *Habitus* is a socially situated concept. It ensures the active presence of past experiences; deposited in each organism in the form of schemes of perception, thought and actions. These actions (Bourdieu, 1990) tend to generate the ‘correctness’ of practices and their constancy over time, more reliably than all formal rules explicit in them.

### ***Habitus* and Architecture**

*Habitus* is homogenous and it is observable in all classes of society and “fields” (Bourdieu, 1990). However, it has not been overtly applied in the field of architecture; perhaps because Bourdieu recognizes architecture as a highly intellectualized field (see Hillier and Rooksby, 2002, eds.). Bourdieu applies his concept of ‘field’ in areas of social life which involved strategies taking place with respect to valuable goods or resources (Baert, 2000). Even though Bourdieu did not directly consider *habitus* in the

field of architecture; it is subsumed in most of his theoretical works of *habitus* and this paper presents a proof of link between architecture and *habitus*. For instance, (Bourdieu, 1984) argues that, *habitus* is systemic and found in all properties with which individuals and groups surround themselves: houses, furniture, painting ... and in the practices in which they manifest their distinction ... only because it is the synthetic unity of the *habitus*, the unifying generative principles of all the practices.

Again, in the field of architecture, Erwin Panofsky is said to have applied *habitus* in his *Gothic Architecture and Scholasticism* (Crossley, 1988). Panofsky argues that the design and construction of gothic cathedral reflects the same intellectual principle or 'habit of mind' as contemporary scholastics: both make their content and design clear ('*manifestatio*'); both reconciling elements into a whole, often in a dialectical manner ('*concordantia*'), and both systematically articulate their compositions with divisions and subdivisions (Crossley, 1988). Panofsky says; "the methods and procedures of gothic design, (borrowing a phrase from St Thomas), 'follows, as ever-*modus operandi* does, from a *modus essendi*; it flows from the very *raison d'etre* of early and high scholasticism. (Crossley, 1988:6)

### **Social Theory and Research**

Bourdieu strongly believes (Baert, 2000) that theory and research are inseparable and theory should grow out of research, theory is a set of tools or directives which helps research which questions ought to be asked. Bourdieu emphasises that without an empirical base, social theory becomes pointless and empty enterprise (Baert, 2000). Architecture as an intellectual discipline is perceived in metaphorical terms and *habitus* (Bourdieu, 1990) is a metaphor of the world of object; endless circles of metaphors that mirror each other *ad infinitum*. This established nexus of *habitus* and architecture reinforces *habitus* as a social theory to guide the search for green urban architecture in Ghana. The next section, therefore, discusses the methodology for this research.

## **METHODOLOGY**

(Bourdieu, 1990) argues that the system of *habitus* can only be accounted for by relating social conditions in which the *habitus* that generated was constituted, to the social conditions in which it is implemented, that is, through the scientific work of performing the interrelationship of these two states of social world that the *habitus* performs, while concealing it, in the through practice is a present past that perpetuates itself into the future by reactivation in similarly structured practices which objectivism cannot account for it. He continues that they tend to reproduce the regularities immanent in the conditions in which their generative principles was produced while adjusting to the demands inscribed as objective potentialities in the situation as defined by the cognitive and the motivating structures that constitute the *habitus*; practices cannot be deduced either from the present conditions which may seem to have provoked them or from the past conditions which have produced the *habitus*, the durable principle of their production. Other writers including (Bergs, 2007; Flyvbjerg, 2001; Mills, 2000) have also asserted that answers to social questions are found through theory based research hinged on prudence, practical wisdom and empiricism. Groat and Wang (2002) in their book *Architectural Research Method* observe that:

Increasingly, researchers in many fields, including architecture, are advocating a more integrative approach to research whereby multiple methods from diverse traditions are incorporated in one study. Because each method of conducting research brings with it particular strengths and weaknesses..., as many researchers believe that combining methods provides appropriate checks against the weak points in each, while simultaneously enabling the benefits to complement each other. (2002:361)

In this research exploratory and explanatory design types will be used (Creswell and Clark, 2007; Groat and Wang, 2002). Thus, the results of the first method (qualitative) will help inform the second method (quantitative) (Creswell and Clark, 2007). Again, it will enable exploration and generalization of results of the *habitus* theory to different categories. Both quantitative and qualitative methodologies will be used sequentially in a comparative manner through the taxonomy development model where the qualitative data will be emphasized. Thus, in the sequential taxonomy development model strategy, qualitative forms of data will be collected and the analysis of which the results will be used to develop the *habitus* theory for testing at the quantitative phase in detail (Creswell and Clark, 2007). The weighted methodology will be the qualitative research paradigm and the philosophical strategies to be used are the case study and grounded theory approaches.

### **Voting as a method**

Apart from the aforesaid qualitative strategies, this research will use voting to observe peoples' independent perceptions about taste and preferences by using visual images in the frame of grounded theory. In Grounded Theory philosophical strategy, a theory of a process, behavior, action or interaction is derived grounded in the views of participants, obtained from different sources in the study (Charmaz, 2006). This will involve the 49.9 per cent of the adult population who are totally illiterate in Ghana (Ghana Statistical Services, 2005). It is important to adapt research methods to the abilities of people: whether or not people have literary skills, the use of visual techniques will be helpful in facilitating the involvement of non-literate people in local context (Laws *et al.* 2003).

## **CONCLUSION**

This research, seeks to depict the connection between individual behavior and collective institutions; construct models with clearly differentiated micro-and macro-levels as well as understanding the various factors or correlates of Kinship, General urban systems, taste/cultural and "my land"- (the notion of where I come from) for a meaningful understanding of a city's or town's development. This paper concludes that a "phronetic" approach is appropriate because a better understanding of the above mentioned factors requires direct; prudent and practical wisdom; involvement of place, people and the public. Considering the foregone, the appropriate research paradigm is the mixed method research design since architectural research requires a multiple approach.

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# GROUNDING THEORY APPROACH TOWARDS ASSESSMENT OF AFFORDABLE HOUSING QUALITY IN THE UNITED KINGDOM

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## ABSTRACT

Improvement of quality Affordable homes in the UK is enormously dogged with the constraint of the budget of every project, vis-à-vis interpretation of 'quality concept'. Often, it results in negligence of quality attribute in achieving Affordable home projects.

This study extensively adopts mixed research methods approach, with greater dominance of qualitative technique for developing a quality benchmark model. The outcome of this research will be built upon a theoretical framework of impacts on Affordable Housing quality. Delphic questionnaire techniques and 'Glaser and Strauss' grounded theory are the main features of this approach. Primary data were obtained from archival; industrial and academic literature. Deduction of theories through analysis will be indicative of prevalence of varying impact factors influencing Affordable Housing quality. Relevant construction toolkits, Key Performance Indicators (KPIs) and Benchmark models were also critically examined as part of the approach toward customizing a toolkit for the proposed model.

This proposed model will be validated by soliciting for opinions from stakeholders in Affordable Housing sector.

**Keywords:** Affordable Housing; Benchmarking; Methodology; Grounded Theory and Quality

## INTRODUCTION

Achieving quality homes with substantial cost reduction has been noted as one of the most difficult challenges facing Affordable Housing delivery in UK. Affordable Housing quality improvement has heavily relied on Local Authorities' in-house approach driven by total quality management initiative (TQM). This exercise is occasionally carried out during traditional housing stock transfer that involves housing audit and assessment.

This study responds to the need for a comprehensive and collaborative national quality improvement system for Affordable Housing in UK. It commenced with an exploratory literature review which identified some Affordable Housing impacts, case studies; benchmark models; and toolkits. Critical and comparative analyses were

conducted on some of these. The outcome of the comparative analysis lead to the development of Key Performance Indicators (KPIs) and subsequently customized toolkit. A questionnaire that is responsive to some streamlined Affordable Housing quality impacts and Key Performance Indicators was also developed for use in a national survey. Data obtained in the national survey will be initially analysed using parametric technique of quantitative analysis. The outcome of this analysis will then be interpreted using positivist/post positivist paradigm of qualitative method leading to new truths and hypotheses.

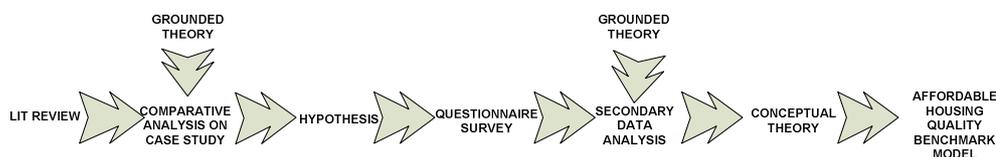
With all information to be gathered through the entire duration of this research Affordable Housing benchmark model will be developed and validated. Part of the validation will be applied through feedback forms that will be served on some Affordable Housing stakeholders.

## PARADIGM IN DEVELOPING RESEARCH THEORY

This research is founded on the premise of inductive reasoning; hence research problems are by no means circumstantial rather than predetermined. Theories are derivatives of data but the essence of the research solutions are validated at the emergence of each new problem. There is a dynamic perception to development of theories in this research. This perception holds true for the ‘comparative analysis on case studies’ that was earlier conducted in this research.

Grounded theory is a term commonly used for both product of research inquiry and a method of research inquiry. It is widely adopted in this research as a mode of analysis. In formulating and developing their perspective of grounded theory in details on social science research, Barney Glaser and Anselm Strauss have consistently argued in favour of inductive discovery of theory grounded in systematic analyzed data. This is contrary to the prevalent hypothetical deductive technique of testing “great man” sociological theories. Table 1 indicates the paradigm within this which this is located. According to Haig (1995), a good grounded theory should be inductively derived from data; subjected to theoretical elaboration; and judged adequately to domain with respect to a number of evaluative criteria.

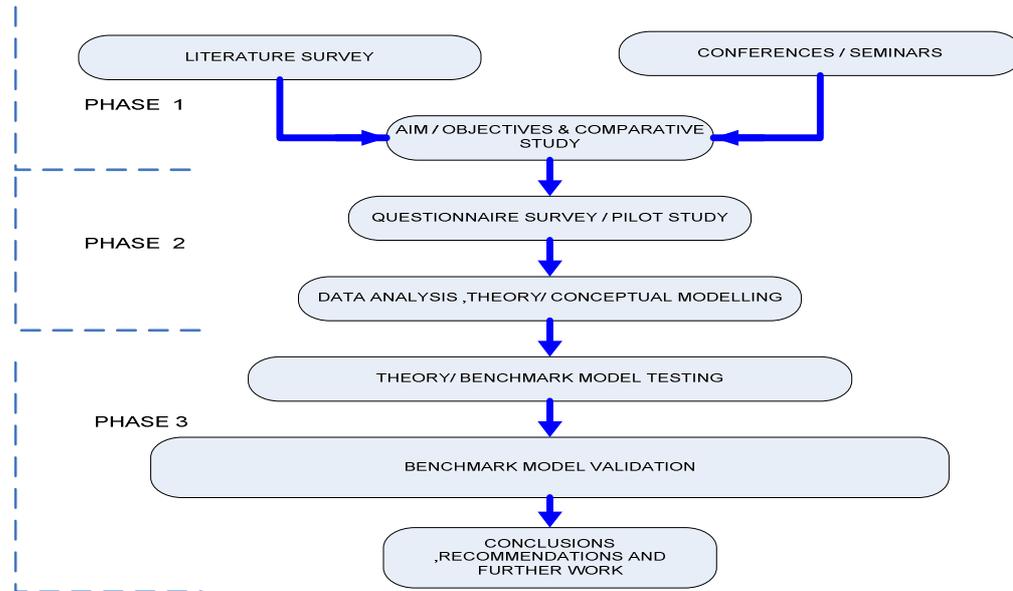
Figure 1: Pathway to Research Theory Development



Theories found under this paradigm evolved through process and continue as an ever-developing entity rather than an end-product. The pathway to theory development in this research is as indicated in figure 1. Theories may however, be empirically-tested at various stages of development with their validity withheld till the end of research. Even, after research, theories still stands to revalidation. Haig (1995), argued that, ‘in taking a theory as given, the hypothetico-deductive method is not itself concerned with that theory’s origin or creation, only with its validation or justification. This is

because the creation of a theory is thought to be a psychological (historical, sociological, etc) event only, whereas as a rational enterprise is properly concerned with testing, because that is considered to be a logical affair'. Even though, Glaser and Strauss did not specify the actual nature of theory-testing they clarified that there is more to theory appraisal than testing for empirical adequacy. However, they proceeded by listing the relevant evaluative criteria for appraisal as: clarity, consistency, parsimony, density, scope, integration, fit to data, explanatory power, predictiveness, heuristic worth, and application

Figure 2: Research Methodology



In this research, Delphic questionnaire techniques and ‘Glaser and Strauss’ grounded theory are the main features of this approach. Primary data were obtained from archival; industrial and academic literature. See figure 2 for research methodology. Deduction of theories through analysis will be indicative of prevalence of varying impact factors influencing Affordable Housing quality in this research. Meanwhile, a comparative analysis has been conducted on some CABA and UNHABITAT Affordable Housing project using Grounded Theory to draw relationship between their parameters. However, the resultant hypothesis needs to clarify the relationship between Quality and cost.

Table1 Interpretive Paradigm

<b>PARADIGM/THEORY</b>	<b>CRITERIA</b>	<b>FORM OF THEORY</b>	<b>TYPE OF NARRATION</b>
Positivist/Postpositivist	Internal, external validity	Logical-deductive, grounded	Scientific report
Constructivist	Trustworthiness, credibility, transferability, confirmability	Substantive-formal	Interpretive case studies, ethnographic fiction
Feminist	Afrocentric, lived experience, dialogue, caring, accountability, race, class, gender, reflexivity, praxis, emotion, concrete grounding	Critical, standpoint	Essays, stories, experimental writing
Ethnic	Afrocentric, lived experience, dialogue, caring	Standpoint, critical, historical, economic	Essays, Fables, and dramas
Marxist	Emancipatory theory, falsifiability	Critical, historical economical	Historical, economic, sociocultural analysis
Cultural Studies	Cultural practices, praxis, social texts, subjectivities	Social criticism	Cultural theory as criticism
Queer theory	Reflexivity, deconstruction	Social criticism, historical analysis	Theory as criticism, autobiography

Source: Norman, K. D. and Yvonna, S.L. (2005) *The Sage Handbook of Qualitative Research*

## **IS QUALITY DIRECTLY PROPORTIONAL TO COST?**

The attributes of quality design are in-exhaustive and sometimes subjective. Bartolo (2000) agreed with Brandon (1984), that, quality in building design will embrace all the aspects by which a building is judged including spatial arrangement, circulation, efficiency, aesthetics, flexibility as well as its functional ability as a climate modifier and as a suitable structure. To ensure realization of these values, periodic impact assessment will be essential to highlight areas of focus for performance improvement which requires interpretation of results through theories for communication purposes. So far, design, energy efficiency, sustainability and delivery processes have

significantly remained dominant impacting factors influencing Affordable housing quality. Housing Corporation standards require new build Affordable homes to satisfy the requirement stipulated in the Schemes Development Standards (SDS). One critical element as proposed by (SDS) is spatial accommodation which is interpreted based on the minimum floor area for any property type relative to the number of allowable inhabitants. However, there are special qualities of housing which are not often recognised in housing market. Usually, these qualities are inevitably obscured in summary references with the general presumption that ‘all housing units are identical’. Having this presumption, there is strong negligence of the highly heterogeneous nature of homes and apartments all of which differ from one location to another or from one geographical housing unit to the other. Detailed analysis reveals varying differences on wide range of impacts from space layout, internal finishes, architectural features, location, age, square footage, adequacy and inadequacy of conveniences, Dacquisto and Rodda (2006).

Despite all these considerations housing quality of new private developments in the whole of England since 6 years ago has been abysmally rated low in a recent national audit conducted by the Commission for Architecture and Built Environment (CABE). This research report from the audit shows that across England only 18 percent of houses audited could be classed as good or very good. 29 percent are low and shouldn't have been given planning consent. Four southern regions of England outperform the national picture with 24 percent of developments classed as good or very good. Developments in the two Midlands Regions are disproportionately classed as ‘poor’. These findings are based on site visits to nearly 300 developments in total – approximately 33 in each of the nine regions, Simmons (2007).

## **CONCEPTUAL QUALITY BENCHMARK MODEL DEVELOPMENT FOR AFFORDABLE HOUSING**

The evolution of ‘dominant development paradigm’ otherwise known as approach for impact assessment emanated from modernism to social development and empowerment. The methodology has overtime transformed from being absolutely quantitative to containing mix of quantitative and qualitative. However, it is closely related to ‘benchmark model development’.

Conceptual Benchmark Model development is the process for developing a proposed model for system application based on the circumstances of research problems, assessment criteria, available data and user's needs. Fellow and Liu (2003) defined modeling as a process of constructing a model, a representation of a design or actual object, process or system, a representation of a reality. A model must capture and represent the reality being modeled as closely as is practical: it must include the essential features of the reality whilst being reasonably cheap to construct and operate and easy to use. This could be effectively carried out through the use of resource base and knowledge earlier acquired from literature review; theoretical framework; case study and survey.

Toolkit development and implementation is highly essential part of a good benchmark model development. It comprises of customization of a suitable set of Key Performance Indicators (KPIs) for measuring performance. These KPI are known as

critical success factors. The resultant toolkit must be responsive to the outcome of quality attributes, and indicative of the level of quality performance in Affordable homes. Hence the KPIs are derived from considered impacts of Affordable Housing. Interpretation of the outcome will be indicative of predisposing situation leading to new truth.

This research has identified many impacting factors within the scope of its limitation to housing. Some of these factors that are critically impacting on Affordable Housing quality were earlier identified and reviewed in the literature as technology, social, economic and environmental. According to Santucci (1995) achieving low-cost and high-value housing development involves a process of first identifying measurable characteristics and then prioritizing their relative importance. A set of measurable characteristics were earlier identified during literature review as 'critical impacting factors' and were later developed into Key Performance Indicators (KPIs) for measuring quality. Resultant (KPIs) developed from these measurable characteristics in this research are: Design Quality; Build Quality; Innovative Quality; Cost-Saving Quality; Socio-Economic Quality and Environmental Quality. They are pivotal to Affordable Housing quality toolkit which is pre-requisite to a benchmark model.

## **CONCLUSION**

So far, findings have shown that grounded theory has been pivotal to development of this research. Comparative study on quality of Affordable Housing projects; some construction toolkits and benchmark models leading to development of hypothesis have been concluded using grounded theory. As this research advances up to the next phase in analysing secondary data from national survey, there will be intensive need for grounded theory to sustain tempo through development of research theory and benchmark model. It is also essential to guarantee consistency of the development process from hypothesis towards theory. Though, thorough assessment of impacts on quality of Affordable housing in UK is essential in this research, the use of the findings of impact assessment study is of greater priority.

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# PROJECT MANAGEMENT: COMPLEX MATHEMATICAL MODEL

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## ABSTRACT

The term “fractal” has often been applied to project management literature, describing systematized functionality in terms of business strategy. The use of this term is generic and unsupported by mathematical models, failing to acknowledge complex functions associated with fractal geometry, causality and quantum. Fractals are dynamic systems which exist in complex planes and produce chaotic, random results. Feedback loops control chaos in dynamic systems, effectively to reduce the impact of causal interference in project management practice. With material recovery creating requirements for feed-forward loops, project management theory must be developed to facilitate a reasoned, yet “Brownian” management process. Without adequate understanding of fractal theory, or the application of mathematical modelling founding a basic understanding of construction project management, it is difficult to provide efficient control functions. A literature review of current project management theory, cybernetics, quantum and chaos theory has been used to create an effective model of reference. Application of complex planes and quantum dynamics, with the impact of causal interference and exogenous variables acting as imaginary parts of complex fields, are used to analyse whether suitable control functions could be created to address inadequacies in management of construction projects. The paper provides the foundation for a PhD study.

**Keywords:** Causality, Complex, Fractal, Management, Model, Project

## INTRODUCTION

Business management is often considered fractal by nature (Abele and Bischoff *et al*, 2001) with finite, complex units created as homologous organizational functions. Similarly, in project management, it may be considered that the actual scheme forms a boundary of coalescing, functional organization that exists to accomplish the client’s goal; whether this represents a fractal structure however, is questionable. Management use of the term is generic and unsupported by mathematical models, subsequently failing to acknowledge the complex functional associations between fractal geometry, causality and quantum.

## Project Management

Walker defines project management as; “*the planning, co-ordination and control of a project from conception to completion (including commissioning) on behalf of a client requiring the identification of the client’s objectives in terms of utility, function, quality, time and cost, and the establishment of relationships between resources, integrating, monitoring and controlling the contributors to the project and their output, and evaluating and selecting alternatives in pursuit of the client’s satisfaction with the project outcome*”. Walker (2002, p.5). The dictionary definition of a fractal; “*a geometrical or physical structure having an irregular or fragmented shape at all scales of measurement between a greatest and smallest scale such that certain mathematical or physical properties of the structure... behave as if the dimensions of the structure are greater than the spatial dimensions.*”(Dictionary.com, 2006). By integration, it is possible to propose a new definition of fractal-based project management; “*The planning, co-ordination and control of fragmented project environs, which utilize the client’s objectives as irregular functions to establish structural relationships between resources, integrating, monitoring and controlling the project contributors, whilst regulating output, evaluating and selecting alternatives in satisfaction of the client’s spatial limits*”. This definition removes specific objectives and substitutes limit boundaries, allowing flexibility whilst retaining focus on client aims. Adaptable internal structures in bounded environments create drivers which assist in establishing the client’s aim through natural, reasoned selection, thus establishing the project’s framework (Nicholls *et al*, 2000, p.128).

## CYBERNETICS AND QUANTUM

Originally a development of Von-Bertalanffy’s General Systems Theory (Weckowicz, 2000), Ross Ashby developed the methodology of cybernetics in 1956, with his book “An Introduction to Cybernetics” (Ashby, 1956). The book provides a theoretical illustration of machine system dynamics and established an understanding of regulating metrics; introducing the concept of integrated function through cohesion and tabulation of “machine” processes, providing relatively consistent, but bound outputs.

Whilst primarily directed at formulating a methodical understanding of unified theory, little is considered in terms of causal interference or the impact of quantum dynamics. Yet, cybernetic systems can be developed to provide a basis for effective project analysis (Dobre, 2007). Poor adaptation, through the inclusion of causal fluctuation and error interference (Love, *et al*, 2007), can be restricted by limiting the same and understanding the effect of necessary, or sufficient, (Nardi and Brachman, 2002, p.17) variables in the project management system.

It is important to consider project fundamentals and not the numerous isolated, inter-connected processes that form the management system. Theoretical tabulation, quantification and optimisation of project output in the realisation of a singular aim is flawed (Jestin and Writer, 2006); In terms of organic input, these systems are erroneous by nature, being based on the consideration of optimising output and not a holistic view of the project, i.e.:

$$C \text{ (operator's ideology)} = O \text{ (Actual output)}$$

Where “C” acts on “O”, effectively creating an output through identical transformation, where any changes to the project are solely in accordance with the operator’s ideas.

## **FRACTALS**

The term “fractal” has often been applied to project management literature, describing systematized functionality in terms of business strategy (Abele, Bischoff *et al.* 2001). Fractals are dynamic systems which exist in complex planes and produce chaotic, random results, producing, through iteration, infinite, analogous spatial structures (Wright, 1996).

Without adequate understanding of complex theory, or the application of mathematical modelling founding a basic understanding of construction project management, it is difficult to determine whether the process is fractal, or whether it is possible to introduce efficient control functions (Dobre, 2007, p.328). As construction material recovery creates requirements for feed-forward loops, project management theory must now be developed to facilitate a reasoned, yet “Brownian” (Lee and Hoon, 2007) management process.

## **COMPLEX SYSTEMS**

As project management is dependent on imaginary variables (Lavelle, 2001, p.4) and “constitutive characteristics...not explainable from the characteristics of the isolated parts” (Von-Bertalanffy, 1968); it is difficult to quantify natural dynamics. Yet, complex systems allow the quantification of qualitative functions to establish a theoretical basis for mathematical modelling (Hubler, 2007).

It can be determined that increased external input in a project pathway increases the probability of subsequent transformation (*T*) (Fixsen *et al.*, 200, p.66), establishing bifurcation and providing additional, significant event points. In stasis, the option to return to an identical transformation remains available; as such, the state remains unbiased and stable. Should quantum, independent and dynamic, become the effector, actual output may be reliant on the influence of exogenous variables, effectively leaving a transformation in superposition until determined (Jenkins, 1996). With positive, negative and neutral bias outputs possible as result of transform bifurcation, the impact on established project limits could be considered significant unless controlled effectively.

Control mechanisms must be designed to allow an open progression of information (Anon, 2007). An absolute positive progression beyond designated limits is considered acceptable. As a visual representation of output possibilities, a mathematical simulation can be determined using Cartesian co-ordinates (Hobson, 2002, p.1), where  $T(++ve) = n + xi$ ; the cumulative addition of exogenous (*ui*) (Pearl, 2007) and quantum (*qi*) interference producing;  $T(++ve) = n \pm xi -(qu)$ .

By applying normal distribution a confidence limit chart can be devised which illustrates an optimal representation of probability where, for example,  $p < 0.05$ . As a balance of output, the potential to achieve relative probability values can be applied to each quartile of the matrix, providing representative results; i.e.  $T(++ve) = 0.025((n \pm xi) - (qu))$  see figure 4.1.

		<b>x</b>	
-ve	47.5%	++ve	2.5%
		<b>i</b>	
2.5%	-ve	47.5%	+ve

**Figure 4.1: Chart depicts complex output matrix with relative values of probability applied. Co-ordinates provide project outcomes as a measure of real (x) and imaginary (i) vectors.**

The consideration that a transformation, by being directional, is not a complete change of the operand ( $n$ ), but a relative change in the origin's nature, allows the formula to be expanded, providing:  $f(p) = P(((n \pm xi) + (a + bni)) - (qu))$

The project pathway ( $p$ ) at that point now being expressed as a function of probability ( $P$ ) the transformation ( $n \pm xi$ ), derived from the origin ( $a + bni$ ) and the interference of causal ( $u$ ) and quantum ( $q$ ) variables.

## CONCLUSIONS

Reliant on the holistic integration of mechanical function and human dynamics, it is difficult to develop a singular mathematical theory that encompasses the field of project management. Additionally, without iterating (Willingale and Raine, 2008) the function, it is not possible to determine whether the process is actually fractal by nature.

Further study, particularly regarding the impact of exogenous, or endogenous variables is essential in determining the effect on project pathways. Transformations increase, or decrease, project scope, inevitably creating a point of bifurcation in the project pathway and meaning effective regulating systems, i.e. feedback, or feed-forward loops, becoming essential methods for providing control (Watson *et al*, 2004, p.4) and efficiently directing output as a product of non-restrictive management.

It is recommended that further research be considered to develop the model and enhance the understanding and impact of complex, mathematical structures in project management theory.

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# APPLICATION OF ANALYTIC NETWORK PROCESS IN REAL ESTATE DEVELOPMENT RISK ASSESSMENT

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## ABSTRACT

An application of a novel analysis approach to support real estate developers in decision-making to deal with potential risks in every project development stage, is introduced in this paper. The analysis model used in this research is the multi-criteria approach based on Analytic Network Process (ANP) theory. To effectively assess risks in the real estate development scheme, criteria for risk assessment are defined based on both literature review and the authors' experience, against environmental, economic, social and technological requirements of the real estate development. A case study of a residential and commercial mixed-use project in Liverpool city centre is used to demonstrate the effectiveness of the ANP model. The experimental case study reveals that ANP is an effective tool to support developers to structure the decision-making process based on risk assessment. The ANP model therefore can be adopted by real estate developers in the case of business needs to assess risks in a real estate development scheme.

**Keywords:** Analytic Network Process (ANP), Real Estate Development, Risk Assessment

## INTRODUCTION

Risks and uncertainties are occurred in all real estate development projects and they can strongly influence to each project stages from the initial project stage, project feasibility analysis, design and planning, bidding and tendering, construction and execution, and handover stage. Those real estate development risks could be arisen by several criteria such as environmental, social, economical, and technological. (Gehner, et al., 2006 and Clarke, et al., 1999) Specifically, those risks can occur at initial stage of a project when developers conduct project feasibility study, design and planning, or bidding and tendering processes. Meanwhile, risks existing in initial stage can also influence the rest project stage and the use of the property.

Risk assessment currently employs the 'Risk Matrix' method, which is accepted as the practical assessment tool for many project types (Kindinger, 2002 and ioMosaic, 2002). This method also accepted in the real estate project, particularly in the real estate investment, for example the investment of hotels. (Younes, et al. 2007)

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However, the data used for matrix calculation derived from either panel discussion or ranking method, which mostly rely on personal opinion rather than using quantitative measurements, and do not use reliable tools or instruments with strong theoretical basis. Other inconvenience is that the risk matrix do not allow the comparison of each criteria, and results calculated by matrix are normally subjective, do not provide the detail of data to help the developers to structure their decision- making process. This is because risk factors are numerous, particularly in large real estate projects, and the ability of humans to assess many factors at the same time is very limited (He, 1995).

According to IPF survey in UK real estate industry (2007), it could be concluded that real estate risks could be managed within an overall framework or risk management processes, those risks shall apply a variety of complimentary approaches, which are grounded in a rigorous and preferably quantitative framework. Therefore, the risk management processes shall include an assorted mix of “Quantitative statistical framework” as well as several techniques such as stress testing and a rigorous analysis of subjective issue. In order to assess the risks and their consequences, it is suggested to use the practical tool, which could analyse risks, their consequences and computed the results in a numerical format. The desirable methodology for this real estate development should allow for the synthesis of the criterion, comparisons of each factors and to help the developers to structure the decision making process (Booth, et al. 2002), and thus, risk assessment process in the real estate development shall be supported by the modern method of mathematical statistics (Titarenko, 1997).

Analytic Network Process (ANP) is suggested as the systematic approach which deal with both quantitative and qualitative factors under multiple criteria (Saaty, 1999). This process deal with a multi criterion analysis and comparison, the outcome of this process also in a mathematic statistics format, which could be adopted for further decision making in regard to the risk response and mitigation.

This paper therefore, aims to introduce an application of ANP model to support the decision-making approach to risk assessment in real estate development. A case study of a residential and commercial mixed-used project in Liverpool City centre is used to demonstrate the effectiveness of the ANP model.

## **METHODOLOGY**

Methodologies adopted in this research include literature review and face-to-face questionnaires with the real estate practitioners to gain information in regard to current situation in risks assessment for real estate development, following by the data analysis to support ANP model, and case study to test the effectiveness of ANP model to support decision-making in feasibility study for real estate development.

## **RISK ASSESSMENT CRITERIA**

Risks assessment criteria, emphasising on risks and their consequences in real estate development is set up, based on literature review and the authors’ experience, the risks assessment criteria included with environmental risk, social risk, economical risk and

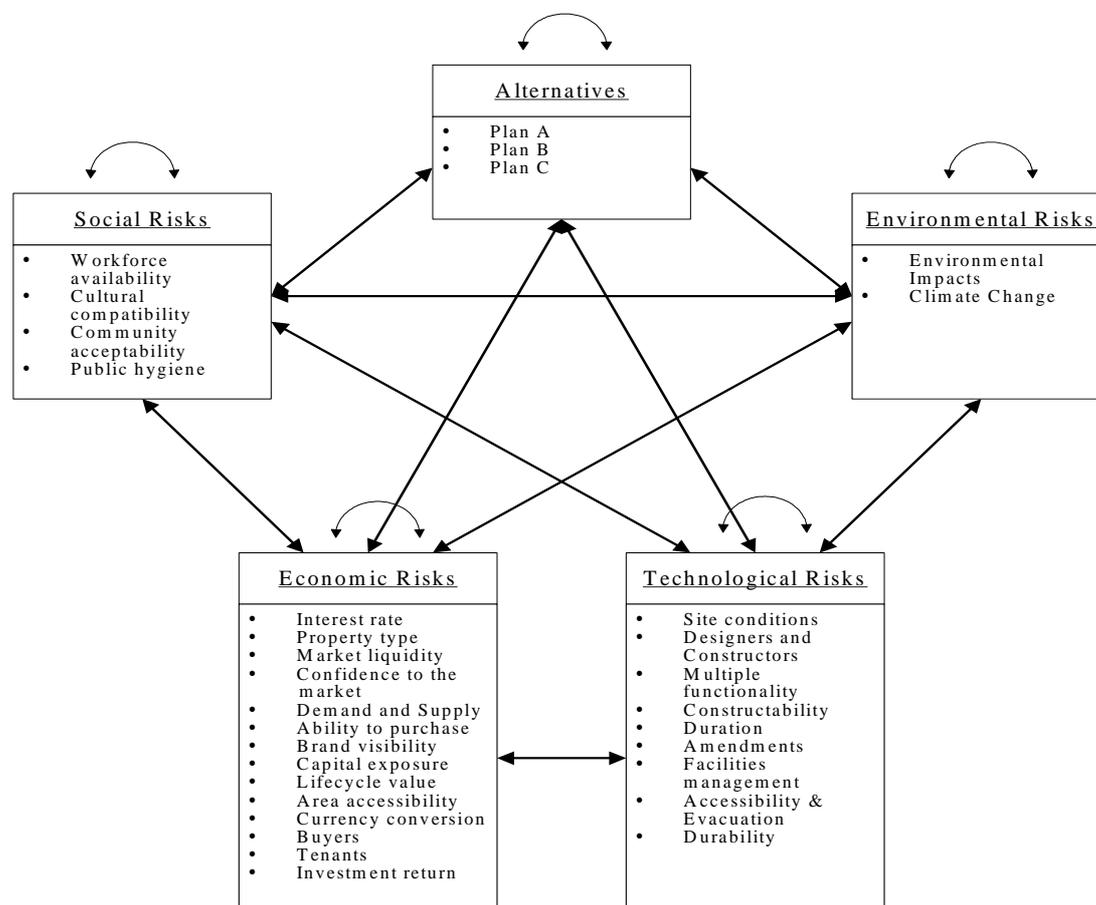
technological risk which are considered in the real estate project feasibility study stage. In this regard, the assessment criteria including each sub-criterion are summarized in the Table 1, this table focuses overall on the quantitative and subjective risks. In addition, it is adopted as the assessment criteria to measure the risks and their impact to the Real Estate Development industry, prior to the Analytic Network Process (ANP) analysis (Chen, et al., 2008). The table includes four major criterion and their sub-criterion (please see the Table 1 below).

**Table 1 Risks Assessment Criteria for the real estate development**

Criteria	Sub-Criteria	Valuation methods	Representative references
1 Environmental risks	Adverse environment impacts	Overall value of the Environmental Impacts Index	Chen, et al., 2005
	Climate change	Degree of impacts to use and value due to regional climatic variation (%)	UNEP, 2007
2 Social risks	Workforce availability	Degree of Developer's satisfaction to local workforce market (%)	Danter, 2007
	Cultural compatibility	Degree of business & lifestyle harmony (%)	Danter, 2007
	Community acceptability	Degree of benefits for local communities (%)	Danter, 2007
	Public hygiene	Degree of impacts to local public health & safety (%)	NHS Standards
3 Economic risks	Interest rate	Degree of impacts due to interest rate change (%)	Sagalyn, 1990; FSA, 2005; Nabarro & Keys, 2005; FSB, 2007; IPF 2007
	Property type	Degree of location concentration (%)	Adair & Hutchison, 2005; IPF, 2007
	Market liquidity	Selling rate of same kind of properties in the local market (%)	Adair & Hutchison, 2005
	Confidence to the market	Degree of expectation to the same kind of properties	Adair & Hutchison, 2005; IPF 2007
	Demand and Supply	Degree of regional competitiveness (%)	Adair & Hutchison, 2005
	Purchaseability	Degree of affordability to the same kind of properties (%)	<a href="http://www.statistics.gov.uk/">http://www.statistics.gov.uk/</a>
	Brand visibility	Degree of Developer's reputation in specific development (%)	D&B, 2007; Adair & Hutchison, 2005; Gibson & Louragand, 2002
	Capital exposure	Rate of estimated lifecycle cost per 1 billion pound (%)	Blundell, et al., 2005; Moore, 2006
	Lifecycle value	5-year property depreciation rate (%)	Lee, 2002; Adair & Hutchison, 2005
	Area accessibility	Degree of regional infrastructures usability (%)	Adair & Hutchison, 2005
	Currency conversion	Degree of impacts due to exchange rate fluctuation	Morledge, et al., 2006; FSA 2005; FSB, 2007
	Buyers	Expected selling rate (%)	IPF 2007
	Tenants	Expected annual lease rate (%)	Booth, et al., 2002
	4 Technological risks	Investment return	Expected capitalization rate (%)
Site conditions		Degree of difficulties in site preparation for each specific plan (%)	Danter, 2007
Designers and Constructors		Degree of Developer' satisfaction to their professional experience (%)	Khalafallah, et al., 2002
Multiple functionality		Degree of multiple use of the property (%)	Danter, 2007
Constructability		Degree of technical difficulties in construction (%)	Lam, et al., 2006
Duration		Total duration of design and construction per 1,000 days (%)	Khalafallah, et al., 2002
Amendments		Possibility of amendments in design and construction (%)	Khalafallah, et al., 2002
Facilities management		Degree of complexities in facilities management (%)	Moss, et al., 2007
Accessibility & Evacuation		Degree of easy access and quick emergency evacuation in use (%)	Moss, et al., 2007
Durability		Probability of refurbishment requirements during buildings lifecycle (%)	Chen, 2007

## APPLICATION OF ANALYTIC NETWORK PROCESS (ANP)

The decision-making model proposed in this paper applies ANP to set up the risk assessment at project feasibility study stage. According to the established risks assessment criteria in Table 1, the ANP model herein based on these 29 defined risk assessment criteria. The model is set up using Super Decisions software for decision-making, created by the Creative Decisions Foundation; and implemented by Professor Thomas Saaty (2005). ANP model comprises 5 clusters and 29 nodes, which are set up accordingly to the criteria and sub-criteria in Table 1. The Alternative cluster is used to comprehend alternative plans to be evaluated against risk assessment criteria in a case study; and there are 3 nodes which represents 3 alternative plans for a specific real estate development. ANP method provides an effective mechanism for developers to quantitatively evaluate interrelations between either paired criteria or paired sub-criteria; and this enables the developers to use their expertise to the assessment of all defined risks (see Table 1) occurred in real estate development industry (Chen, et al., 2008).



**Figure 1 ANP Model for real estate development risk assessment**

The ANP model, as illustrated in Figure 1, consists of 5 clusters which are Alternatives, Environmental Risks, Social Risks, Economic Risks, and Technological Risks. There are 32 nodes inside this ANP model; amongst them, there are 3 nodes inside the Alternative cluster, which are Plan A, Plan B, and Plan C, represent alternative plans for a specific real estate development in Liverpool (please see case

study and results), in regard to select the most appropriate plan; and other 29 nodes are located in differenced 4 clusters in accordance with their belongingness to those clusters as described in Table 1 (Chen, et al., 2008). Two-way and looped arrow lines in Figure 1 describe the interdependences that exist between paired clusters as well as nodes (Saaty, 2005). In other words, there are fixed interrelations between paired clusters, meanwhile there are fixed interrelations between paired nodes inside one cluster as well as from two different clusters.

In order to measure all interrelations inside the ANP model quantitatively, the questionnaire survey to compare the relative importance between paired clusters and nodes is required. According to the questionnaire survey, it can be expected that experts' knowledge in each specific domain is collected and concentrated into an ANP model as a result, the ANP model can perform as a decision-making support tool based on knowledge reuse. In this paper, the ANP model is set up by the authors only; and the model will be further developed based on questionnaire survey after a pilot study through the experimental case study to be described below.

The ANP model as illustrated in Figure 1, structuring and quantifying all possible interdependent relations inside the model, pair-wise comparison is adopted using subjective judgments made in regard to fundamental scale of pair-wise judgments (Saaty, 2005) (see Table 2). Table 2 generally describes how to conduct pair-wise comparison between paired clusters as well as nodes in regard to their interdependences defined in the ANP model (see Figure 1) and relative importance based on their specific characteristics and experts' knowledge. The ANP model is set up based on the risks assessment criteria to make judgments to quantify interdependences for 29 risk assessment criteria inside cluster 2 to 5 (see Figure 1), and specific characteristics of alternative plans, which used to make judgments in quantifying interdependences for alternatives in the experimental case study (Chen, et al., 2008).

**Table 2 ANP Judgements between paired clusters/nodes**

Clusters/Nodes		Scale of pair-wise comparisons								
		±1	±2	±3	±4	±5	±6	±7	±8	±9
Cluster I	Cluster J	✕	✕	✕	✕	✕	✓	✕	✕	✕
Node I <sub>i</sub>	Node J <sub>j</sub>	✕	✕	✕	✕	✕	✓	✕	✕	✕

Note:

1. The fundamental scale of pair-wise judgments: 1= Not important, 2= not to moderately important, 3= Moderately important, 4= Moderately to strongly important, 5= Strongly important, 6= Strongly to very strongly important, 7= Very strongly important, 8= Very strongly to extremely important, 9= Extremely important.
2. The symbol ✕ denotes item under selection for pair-wise judgment, and the symbol ✓ denotes selected pair-wise judgment.
3. I and J denote the number of Clusters, whilst i and j denote the total number of Nodes.
4. The symbol ± denotes importance initiative between compared Nodes or Clusters.

## CASE STUDY AND RESULTS

A case study of a residential and commercial mixed-used project in Liverpool city centre is used to demonstrate the effectiveness of the ANP model in regard to select the most appropriate plan for a specific real estate development project. A case study

is conducted based on information collected from an ongoing real estate project in Liverpool City Centre. Some scenarios such as alternative plans in regard to the requirements of comparison study using ANP are made as the assumption. The proposed real estate development locates in central Liverpool with the site area of 40 acres, located between main retail areas, city central business district (CBD), residential areas, walk streets, main roads, and the historical Albert Dock. The Developer partnering with the City Council to revitalise this area for long-term investment in accordance with the Northwest regional and Merseyside County's economic strategies. To complete the experimental case study purposes, three development plans are considered in this research, which are: Plan A, a retail-led mixed-use inner CBD development; Plan B, an office-led adjacent inner CBD development, and Plan C, an entertainment-led adjacent inner CBD development. The scenario assumed based on the philosophy of local urban regeneration, which aims to attract more population and customers back to Liverpool City Centre, as well as to maximum utilize of the provided transportation and infrastructures. (Mynors, 2006). Therefore, specific assumptions are made in regard to normal characteristics of each kind of plans; and details of those assumptions are summarized in Table 3 below.

**Table 3 Assumptions of alternatives development plan**

Criteria	Sub-Criteria	Unit	Alternatives		
			Plan A	Plan B	Plan C
Environmental risks	Environment impacts	%	-124	-108	-180
	Climate change	%	40	50	60
Social risks	Workforce availability	%	100	90	90
	Cultural compatibility	%	80	70	90
	Community acceptability	%	100	100	100
	Public hygiene	%	80	100	60
Economic risks	Interest rate	%	70	80	60
	Property type	%	80	80	80
	Market liquidity	%	90	80	100
	Confidence to the market	%	90	80	100
	Demand and Supply	%	100	70	90
	Purchaseability	%	100	100	100
	Brand visibility	%	100	90	90
	Capital exposure	%	90	85	75
	Lifecycle value	%	-5	-5	-5
	Area accessibility	%	90	80	70
	Currency conversion	%	30	60	20
	Buyers	%	80	50	90
	Tenants	%	100	80	100
	Investment return	%	10	7	8
Technological risks	Site conditions	%	20	20	30
	Designers and Constructors	%	90	80	70
	Multiple functionality	%	100	50	30
	Constructability	%	10	20	30
	Duration	%	50	55	45
	Amendments	%	80	90	100
	Facilities management	%	90	100	80
	Accessibility & Evacuation	%	100	90	80
Durability	%	70	90	80	

Note:

1. Plan A: a retail-led mixed-use inner CBD development
2. Plan B: an office-led adjacent inner CBD development
3. Plan C: an entertainment-led adjacent inner CBD development

Further assumptions are made based on the scenario of three alternative development plans for the specific site(see Table 3). In order to establish the reasonable assumptions, information from the real projects including information from other sources such as BCIS (Building Cost Information Service, UK) are also considered as the important information to found the assumptions in this study.

As mentioned above, although interdependences among 29 risk assessment criteria can be measured based on experts' knowledge, the ANP model should comprehend all specific characteristics of each alternative plan, which are given in Table 4. According to the fundamental scale of pair-wise judgments (see Table 2), all possible interdependences between each alternative plan and each risk assessment criterion, and between paired risk assessment criteria in regard to each alternative plan are valuated; Table 2 also provides the result of all these pair-wise comparisons, which used to form a two-dimensional super-matrix for further calculation. The calculation of super-matrix aims to form a synthesized super-matrix to allow for resolution of the effects of the interdependences exist between the nodes and the clusters of the ANP model (Saaty, 2005).

In order to obtain useful information for development plan selection, the calculation of super-matrix is conducted following three steps, which transform an initial super-matrix or un-weighted one based on pair-wise comparisons to a weighted super-matrix, and then to a synthesized super-matrix. Results from the synthesized super-matrix are given in Table 4 (Chen, et. al., 2008)

According to the results in Table 4, Plan A is identified as the most appropriate plan for the specific development because it has the highest synthesized priority weight among the 3 alternatives. Thus, according to the ANP calculation, it is suggested to select Plan A as the project development plan of the studied project.

**Table 4 Comparison or Alternatives development plan results**

Results	Plan alternatives		
	Plan A	Plan B	Plan C
Synthesized priority weights	0.5036	0.2960	0.2004
Ranking	1	2	3

## CONCLUSION

This paper presents an application of Analytic Network Process (ANP) for risk assessment in real estate development at feasibility study stages. An ANP model is set up based on 29 defined risks associated with real estate development and these risk assessment criteria are classified under four clusters, including environmental risks, social risks, economic risks, and Technological Risks, to ensure a comprehensive coverage of possible risks in generic sustainability-led assessment.

A case study reveals that ANP is an effective tool to support developers in decision-making based on risks assessment. The ANP model therefore can be adopted by real estate developers in the case of business needs to assess risks in a real estate development scheme. The further researches are needed for collecting more precise information from real estate developers to modify those criteria and improve the model to suit the developer requirements in order to assess the risks in real estate.

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