INNOVATION PERSISTENCE DURING ECONOMIC CRISIS BY NIGERIA'S CONSTRUCTION CONTRACTING FIRMS: AN INVESTIGATION OF THE CRITICAL SUCCESS FACTORS.

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List of abbreviations

CPI	Consumer price Index
CSF	Critical success factor
CSFs	Critical success factors
EU	European Union
FCT	Federal Capital Territory
GDP	Gross domestic product
IMF	International monetary fund
OPEC	Oil producing and exporting countries
RBV	Resource based view
R&D	Research and development
RQ	Research question
SIC	Standard Industrial Classification
UK	United Kingdom

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Above all, I am very much grateful to the Great Architect of the Universe. His all-seeing eyes were on me throughout this challenging but exciting journey.

Now, the key question is, what shall I do next?

Dedication

I dedicate this work to my late sister, Onyebuchi Mary-Ann Ugwuoke. She was a rare gem of a sister. Continue to rest in peace, Onyi.

Declaration

This thesis is submitted under the University of Salford code of practice for the conduct of postgraduate research degree programmes. Some findings of this study have been presented in peer reviewed journals and refereed conference proceedings prior to the submission of this thesis. The work presented in this thesis was carried out under the supervision of Professor Carl Abbott, of the School of the Built Environment, University of Salford.

I hereby declare that the work presented in this thesis is wholly mine and that there is no portion of the work covered in this thesis has been submitted elsewhere for the award of any academic degree or qualification.

Signed: .....

Azubuike Anthony Ugwuoke

Date: .....

Abstract

Innovation is viewed by many as a driving force for sustainable economic and social change. However, it has been established that economic crisis impacts firm level innovations. The extent of the impact on firm level innovations differs widely across countries and industries. In the case of Nigeria, it has been argued that economic crisis has a disproportionate impact on innovation in the local construction industry. Indeed, the reaction of construction contracting firms to the incessant turbulence in the economic environment has been that of collective belt-tightening and general apathy to risk-taking. This apathy to risk-taking is the reason why Nigeria's construction industry has been rated as having low disposition towards the adoption of innovative changes.

While certainly risky, there are inherent merits in persisting with firm level innovation during economic crisis. Thus, the insistence that a difficult economic environment argues for more innovation, not to pull back and that firms should redouble their innovation efforts during economic crises. Indeed, the need to innovate during economic crisis does not stem just from the quest to succeed but also to survive. However, firms must get their approach to innovations consistently right during economic crisis. Therefore, the present study focuses on identifying and exploring the critical success factors that enable firm level innovation persistence during economic crisis. In order to do this however, it is imperative to identify and evaluate the factors that hinder firm level innovations during economic crisis as well as the merits of firm level innovation persistence during economic crisis.

The study utilizes a sequential exploratory mixed method design to explore the research problems. The qualitative data for this study have been obtained through semi-structured interviews with ten (10) management level employees of five (5) selected innovation persistent construction contractors. The themes that emerged from the interviews are further tested through the survey of 83 mid-level professionals employed by 16 innovation persistent construction contractors. To enable an in-depth investigation of the research problem, the present study adopts a case study strategy.

The study finds several factors that hinder firm level innovations during economic crisis. Notable amongst these are; unstable funding regimes, increased apathy to costs by clients,

erosion of good organizational slack, rapid and incessant changes to clients' needs and requirements, dearth of creative ideas and reduced appetite for risks. Furthermore, the merits of firm level innovation persistence as established in the present study are; increased revenues and profits levels, increased market share and brand loyalty, improved clients' satisfaction and brand loyalty, improved operational and resource efficiency, a dynamic knowledge base for organizations and improved employee morale and brand loyalty. Finally, the study establishes that the leadership of the innovation process by the experienced client, the capacity to maintain strategic flexibility, the presence of an effective innovation system and a culture of market orientation are the critical success factors that enable firm level innovation persistence during economic crisis.

The present study ultimately lends weight to the argument in support of innovation persistence during economic crisis by providing practitioners and researchers with the merits of firm level innovations persistence, the factors that constrain firm level innovations as well as the critical success factors for firm level innovation persistence during economic crisis.

Chapter 1 : Introduction

1.0 Overview

This chapter introduces the thesis. It commences with a review of the research background and the research problem. The research aim, objectives, contributions and limitations are briefly highlighted. The chapter concludes with the presentation of a concise discussion on the research methodology and an illustration of the structure of the thesis.

1.1 Background and context of the study

Economic crisis has always been a key weakness and a major source of criticism for the capitalist economic system (Grewal and Tansuhaj 2001). In the case of Nigeria, the nature of its economy – mono product economy – is such that it is often at the mercy of the erraticism and vulnerability of the international crude oil market and the tide of militancy in the crude oil producing Niger Delta area of Nigeria. As a result, Nigeria is frequently in one manner of economic crisis or the other (Soludo 2009, Garuba 2006, Ihonvbere 1993). The frequent economic crises and the inherent uncertainties in Nigeria have been blamed for the lack of appetite and the inability of most firms to maintain creativity and sustain innovation momentum in the local construction industry (Ayedun and Oluwatobi 2011, Egbetokun et al. 2008, Onasanya et al. 2007).

However, Grewal and Tansuhaj (2001) argue that organizations must find ways to "cope with anomalous events that create high levels of uncertainty and are potential threats to the viability of an organization". This naturally elicits further interrogations as to what the best way is to cope with an economic crisis in relation to innovations. Carry on innovating and improving or pause and prioritize survival? There are two basic camps on the question of the significance or otherwise of carrying on with innovations during economic crisis. One spectrum of the argument contends that innovation is not actually a meaningful organizational strategy. It is according to this school of thought, "a tactic that is somewhat frivolous in good times and downright wasteful in bad times" (Advertorial age, 2008 cited in Anthony and Feinzaig, 2008). On the other hand, the pro-innovation persistence school of thought insists that a difficult economic environment argues for more innovation, not to pull back and that companies should redouble their innovation efforts in recessionary times (OECD, 2012, Antonelli et al., 2012, Martinez-Ros and Labeaga, 2009, Anthony and Feinzaig,

2008, Roper and Hewitt- Dundas, 2008). They claim that the need to innovate does not stem just from the quest to succeed but also to survive.

The present study takes the view that innovation persistence is not only critical for withstanding the "gales of creative destruction" in times of economic crises (Döner, 2017, Roberts, 2003, Danneels, 2002, Schumpeter, 1950) but also vital for long term growth beyond the downturn (OECD, 2012, Murphy et al. 2011, Damanpour, UK Trade & Investment, 2010, Roberts, 2003). This PhD research draws on Schumpeter's (1942) creative destruction theory and the work of Edgerton (2007) and argues that innovation is a fundamental core of the capitalist economic system. Therefore, innovation is viewed in the present study as a force that acts from within a capitalist economy rather than an external variable (Whyte and Sexton, 2011).

1.2 Research problem

There is an overwhelming support in the body literature regarding the importance of firm level innovation in fostering long-term growth and organizational performance (OECD, 2012, Murphy et al. 2011, Damanpour, and Wischnevsky, 2006, Fagerberg and Godinho, 2005, Castellacci, 2004, Fagerberg, 1994, Schumpeter, 1939, 1942). Indeed, firm level innovation has been acknowledged as critical for the growth and development of Nigeria's economy (Egbetokun 2016, 2015, Oluwatobi 2011).

However, following the 2008 global economic crisis, many studies have come out to demonstrate that economic crises do hamper firm level innovations. The works of Clausen et al. (2011), Archibuigi et al. (2013), Antonelli et al. (2012) and OECD (2012) are instructive in this regard. In the case of Nigeria, the uncertain economic conditions as caused by the rather frequent economic crises it experiences (Soludo 2009, Garuba 2006) have been blamed for the lack of appetite and the inability of most local firms to maintain creativity and sustain the innovation momentum (Egbetokun et al. 2016, Ayedun and Oluwatobi 2011, Obianyo 2010, Onasanya et al. 2007). Hence, the low rate of firm level innovations in Nigeria (Egbetokun 2015). In his work which tracks technical innovations in Nigeria, Egbetokun (2015) finds that the volume of firm level innovations in Nigeria is substantially lower than what obtains in all EU countries (please refer to Figure 1.1 below) and a key reason adduced for this is the uncertain economic conditions in Nigeria. Whilst, critics will argue that comparing firms in

Nigeria with those of the EU countries suggests that the peculiar challenges of the innovation process in developing economies are not adequately understood and considered. However, it is reasoned that comparing the rate of firm level innovations in Nigeria with those of developed countries is vital if the substantial gap is to be narrowed.

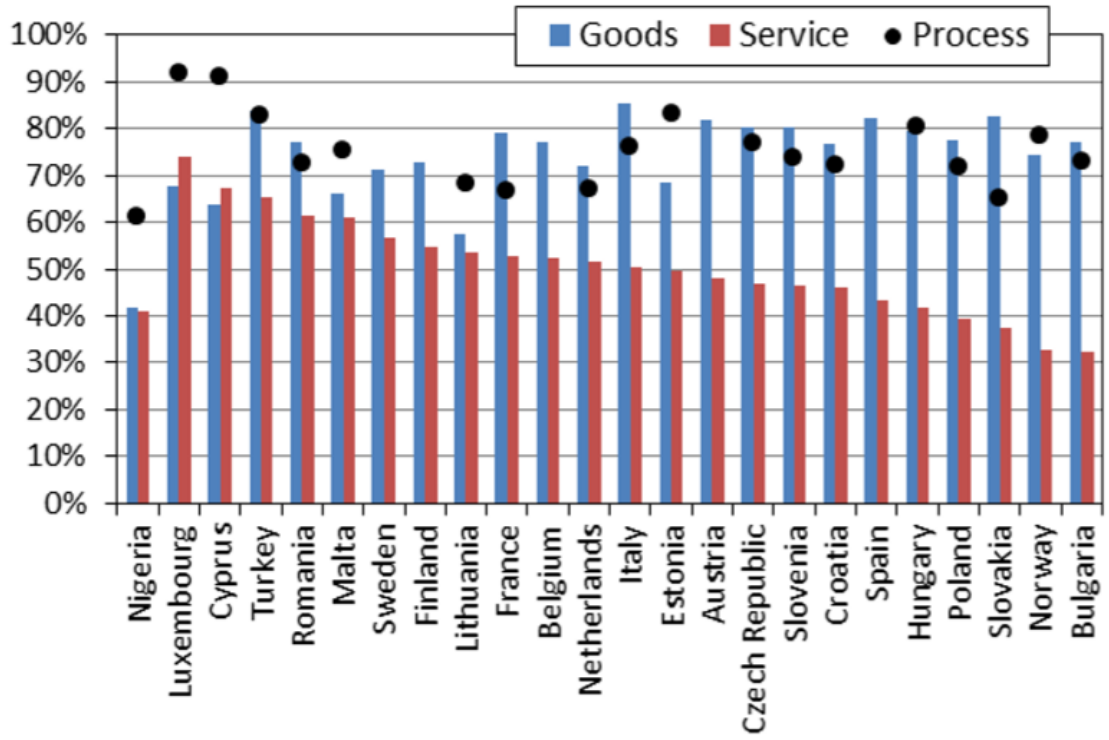


Figure 1-1: Rates of innovation by firms in Nigeria and EU countries (Adapted from Egbetokun, 2015)

This lack of innovativeness is even more apparent in the local construction industry (Ibrahim 2011, Ayedun and Oluwatobi 2011, Olatunji 2010). Osofisan (2007) criticizes Nigeria's construction industry for being one of the slowest to integrate technological advancement and the least innovative. Ibrahim (2011) finds that the general apathy to risk-taking in the Nigerian construction industry and the consequent unwillingness to innovate stem from the inherent low margin of error and the tendency to prioritize survival over growth and product/service improvements in Nigeria's uncertain economic environment. Olatunji (2010) points-out that when analysed together, the high incidence of cost and time overruns (Oyedele and Tham, 2007), project abandonment (Sonuga et al., 2002), sub-standard work output (Olatunji, 2010) and general non-performance of projects as envisaged by clients and end users (Olatunji, 2010) are indications that Nigeria's construction industry has not kept

pace with the changing requirements of clients due to lack of persistent innovation in the industry.

Most if not all major construction-based firms in Nigeria especially construction contractors have a substantial operational presence in Abuja. There are currently over 150 medium to large construction contracting firms in Abuja (NgEX, 2017). The reason is not far-fetched. Abuja is a city that is currently undergoing massive regeneration (and has been for some time). The FCT Abuja receives an annual budgetary allocation for construction projects that is often greater than most states of the federation. For instance, the Federally allocated budget for construction projects (Capital cost) in the FCT Abuja stands at about N30.4 Billion as passed in the 2017 Appropriation Act (Nigeria's Budget Office, 2017), making the FCT Abuja (by far) the city with the most Federal budgetary allocation for construction projects. There are currently a number of innovative construction projects that are either recently completed like the Abuja Train Station or currently ongoing e.g. Abuja Metro link project, The Abuja Millennium Tower, The World Trade Centre project, Abuja Centenary City project etc. in Abuja. This suggests that at the same time as there is an apparent lack of in innovativeness in Nigeria's construction industry (Ibrahim 2011, Ayedun and Oluwatobi 2011, Olatunji 2010), there are still construction-based firms in Nigeria that have continued to implement innovations even during economic crisis (Odediran et al. 2012). Thus, a basic question logically arises; why the few and not the many? Indeed, what is it about these organizations which allows the commercial innovation process to flow more successfully even during economic crisis? And more importantly, can general, transferable lessons be learned?

Whilst the general consensus amongst previous studies is that economic crisis does constrain firm level innovations, they however predominantly recommend that firms engage in more innovations not less during economic crisis (Archibuigi et al. 2013, OECD 2012, Antonelli et al. 2012, Ayedun and Oluwatobi 2011, UK Trade and Investment report 2010, Anthony and Feinzaig 2008, Egbetokun et al. 2008). Nevertheless, these studies have generally failed to adequately address the nagging question of how firm level innovations are constrained by economic crisis. More specifically, what are the factors responsible for this constraint? Likewise, the all-important questions of why firms should persist with innovations during economic crisis and more importantly, what are the basic factors that enable firm level innovations during economic crisis have also not been sufficiently dealt with. It is reasoned

that having a good understanding of the factors that constrain firm level innovations during economic crisis will provide practitioners and researchers with a useful insight into the nature of economic crisis (Anthony and Feinzaig 2008) and how this alters the dynamics especially in relation to the validity of existing organizational capabilities, market needs and clients' expectations. Furthermore, a good knowledge of how best to approach innovation during economic crisis particularly the basic factors that enable firm level innovations during economic crisis can help firms to resolve some of the factors that constrain firm level innovations during economic crisis. Thus, allowing organizations to do more with less and continue to move forward during economic crisis (Anthony and Feinzaig 2008). As Drucker (1989) puts it "the greatest danger in time of turbulence is not the turbulence - it is to act with yesterday's logic."

Hence, the need for the present study which sets-out to unravel and codify the specific factors that constrain firm level innovations during economic crisis and the merits of firm level innovation persistence, with a view to identifying how organizational capabilities may be used to effectively manage these constraints so as to facilitate persistent innovations during economic crisis. More specifically, the present study seeks to establish from the construction contractors' perspective, the key elements that are necessary for organizations to successfully persist with innovations during economic crisis in Abuja Nigeria.

1.3 Research aim

This research seeks to propose and validate a set of critical success factors that enable firm level innovation persistence during economic crisis for construction contractors based in Abuja, Nigeria.

1.4 Research objectives

The research objectives are follows:

- To examine and synthesize relevant literature in order to better understand the nature of innovations and the different schools of thought on why firms innovate.
- To explore the nature of economic crisis and the specific factors that constrain firm level innovation persistence during economic crisis.
- To determine and evaluate the key merits of firm level innovation persistence during economic crisis.

- To establish and validate the critical success factors that enable firm level innovation persistence during economic crisis for construction contractors based in Abuja, Nigeria.

1.5 Research contributions

- The present study lends weight to the argument in support of innovation persistence during economic crisis by ascertaining and evaluating the key merits of firm level innovation persistence during economic crisis in Nigeria. Thus, providing researchers with an important platform and reference document for future studies in the broader area of innovation persistence.

- It is envisaged that the factors that constrain firm level innovations during economic crisis as explored in the present study will offer a useful insight to construction practitioners in Nigeria as to the limitations of their extant innovation management approaches in times of economic crisis. Thus, nudging firms towards redesigning their approach to innovations during economic crises.

- It is similarly envisaged that the factors that constrain firm level innovations during economic crisis as explored in the present study will provide researchers with a valuable insight into the limitations of the existing innovation management submissions during economic crisis.

- The proposed set of critical success factors that enable firm level innovation persistence during economic crisis will provide construction practitioners in Nigeria with essential guidelines on how best to approach innovations during economic crisis.

- It is envisaged that the proposed set of critical success factors that enable firm level innovation persistence during economic crisis will provide researchers with a vital platform to build on towards further exploring the necessary elements required to enable firms to persist with innovations during other forms of crisis in Nigeria for example political crisis, security crisis etc.

1.6 Research limitations

The scope and boundaries of the present study are highlighted below.

- The present study confines itself to the management of innovation persistence from the construction based firm's viewpoint. As such, a creative process can only be termed an "innovation" if it culminates in an outcome that adds value to the firm (market exploitation). Hence, what could be construed as an innovation by other stakeholders or actors may in fact, not meet the criteria for innovation in the present study.

- The present study focuses on firm level innovation persistence during economic crisis. Therefore, before establishing what the critical success factors for firm level innovations during economic crisis are, the present study presupposes the presence of the basic environmental conditions necessary for innovations to thrive in organizations irrespective of the economic situations. The present study essentially builds on this.

- Nigeria is a large country with over 250 ethnic nationalities and with distinct cultural, social and religious beliefs. There are also substantial differences in laws and value systems amongst the federating states and the Federal Capital Territory, Abuja. The social, political, cultural and economic peculiarities of Abuja could limit the applicability of the research findings to other contexts.

- The five construction contracting firms studied are all fairly large sized. Therefore, the replicability of the research findings may be limited to large sized construction based firms.

1.7 Research methodology

This study adopts a pragmatic research philosophy utilizing both quantitative and qualitative research methods while adopting a case study research strategy. The research methodology is examined exhaustively in chapter 5.

1.8 Structure of thesis

The thesis adopts a "standard linear-analytic structure" (Yin, 2003). The structure of the thesis is illustrated in Figure 1.2.

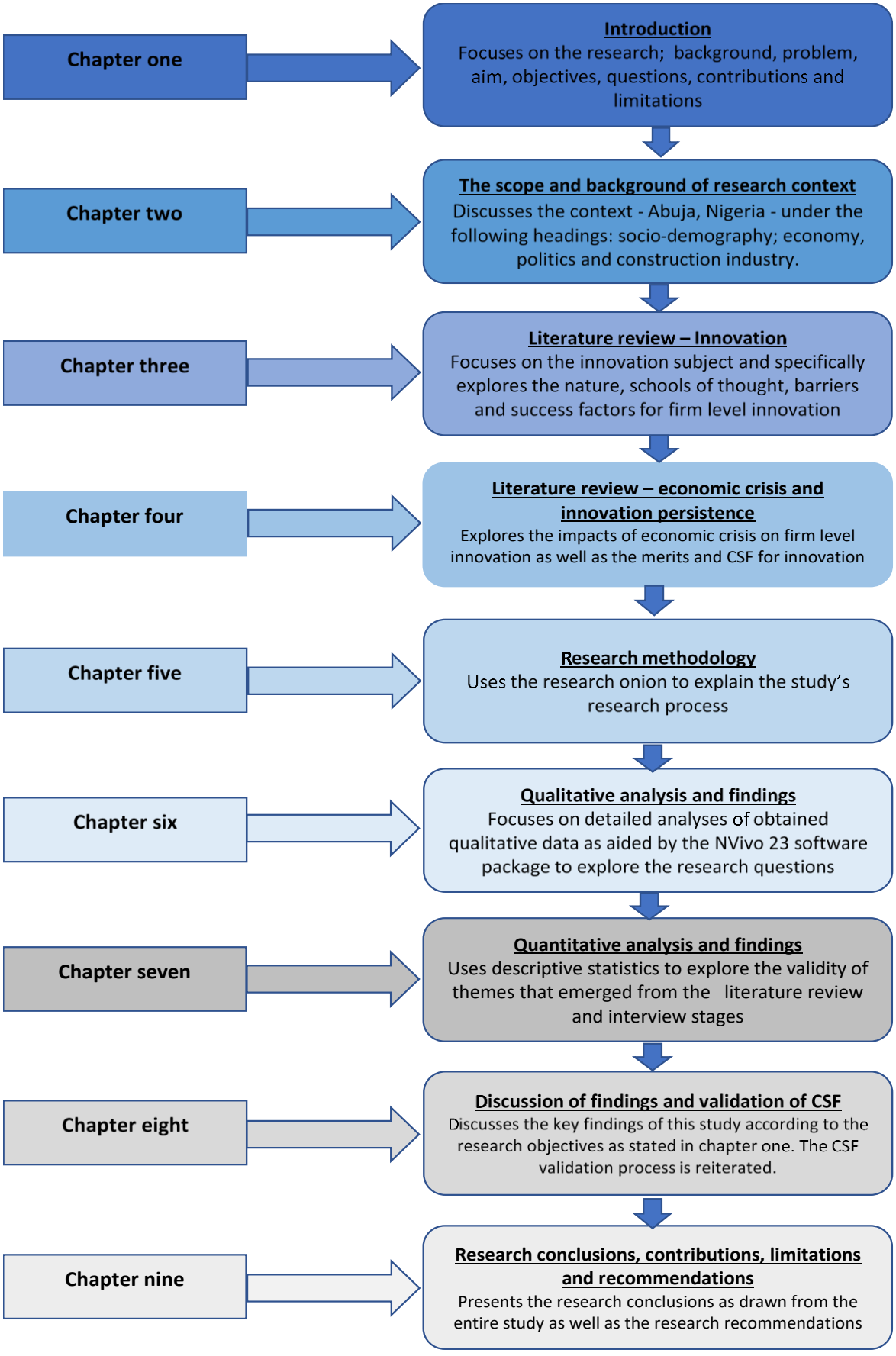


Figure 1-2: Structure of thesis

1.9 Summary – chapter 1

The chapter presented the background of the study and the research problem, highlighting the gaps and the need for the study. The research aim, research objectives, research contributions, research limitations and research methodology were presented in the chapter. In addition, the structure of the thesis was illustrated in this chapter.

The next chapter considers the study context. It specifically discusses the political, economic and socio-demographic environment of the research setting – Abuja, Nigeria.

Chapter 2 : The scope and background justifications for the empirical context.

2.0 Introduction

This chapter discusses the setting of this research under the following headings: socio-demography, economy, economic indicators and politics. It concludes with a brief discussion on the local construction industry.

2.1 The socio-demographics of Nigeria

The name Nigeria was apparently taken from the Niger River running through the country and was allegedly coined in the 19th century by British journalist, Flora Shaw. Nigeria is reported as having an estimated population of about 182 million (United Nations, 2015). This makes her the most populous country south of the Sahara with an area of 923,768 square kilometres (Akujuru, 2014). Nigeria is bordered in the north by the Republics of Niger and Chad, in the west by the Republic of Benin, in the south-east by the Republic of Cameroun and in the south by an Atlantic Oceanic coastline that measures about 800km (Akujuru, 2014). She measures about 1200km from east to west at its widest point and about 1050km from north to south (Akujuru, 2014). Nigeria is made up of six geopolitical regions, with 36 states and the Federal Capital Territory, Abuja. Table 2.1 below illustrates this classification.

Table 2-1: Classification of the 36 states and Abuja (FCT) into six geopolitical regions of Nigeria

S/N	REGIONS	STATES
1	North-Central	Abuja (FCT), Benue, Kogi, Kwara, Nasarawa, Niger, Plateau
2	North-West	Adamawa, Bauchi, Borno, Gombe, Taraba, Yobe
3	North-West	Jigawa, Kaduna, Kano, Kastina, Kebbi, Sokoto, Zamfara
4	South-East	Abia, Anambra, Ebonyi, Enugu, Imo
5	South-South	Akwa Ibom, Bayelsa, Cross-River, Delta, Edo, Rivers
6	South-West	Ekiti, Lagos, Ogun, Ondo, Osun, Oyo

Source: Compiled by Researcher (2016)

The Niger and Benue are the two major rivers and both flow through the south-east and the Niger Delta into the Gulf of Guinea. The climatic condition varies from largely equatorial in the south to arid in the north. Census figures for 1952 reveal that approximately 10.6% of the total population lived in the cities (NPC, 2017). This figure increased to about 19.1% and 36.3% in the censuses of 1963 and 1991 respectively. Isa et al. (2013) observe that "close to 50% of Nigeria's population now live in urban areas" and that this "heralds more demand for infrastructure" (Isa et al., 2013). Indeed, Nigeria is unquestionably one of the fastest urbanising countries in sub-Saharan Africa. Figures from the most recent census conducted in 2006 suggest that Nigeria's total annual population growth rate is about 3.2%, although, it is generally accepted that urban population growth rate is much more than this figure. For instance, the population of Federal Capital Territory (FCT) – Abuja is said to be growing at the rate of 9.3% (Ajanlekoko, 2001). Lagos, Anambra, Imo and Kano states are some of the densest populated states. See Figure 2.1 for a map of Nigeria highlighting the 36 states, the FCT and the population density.

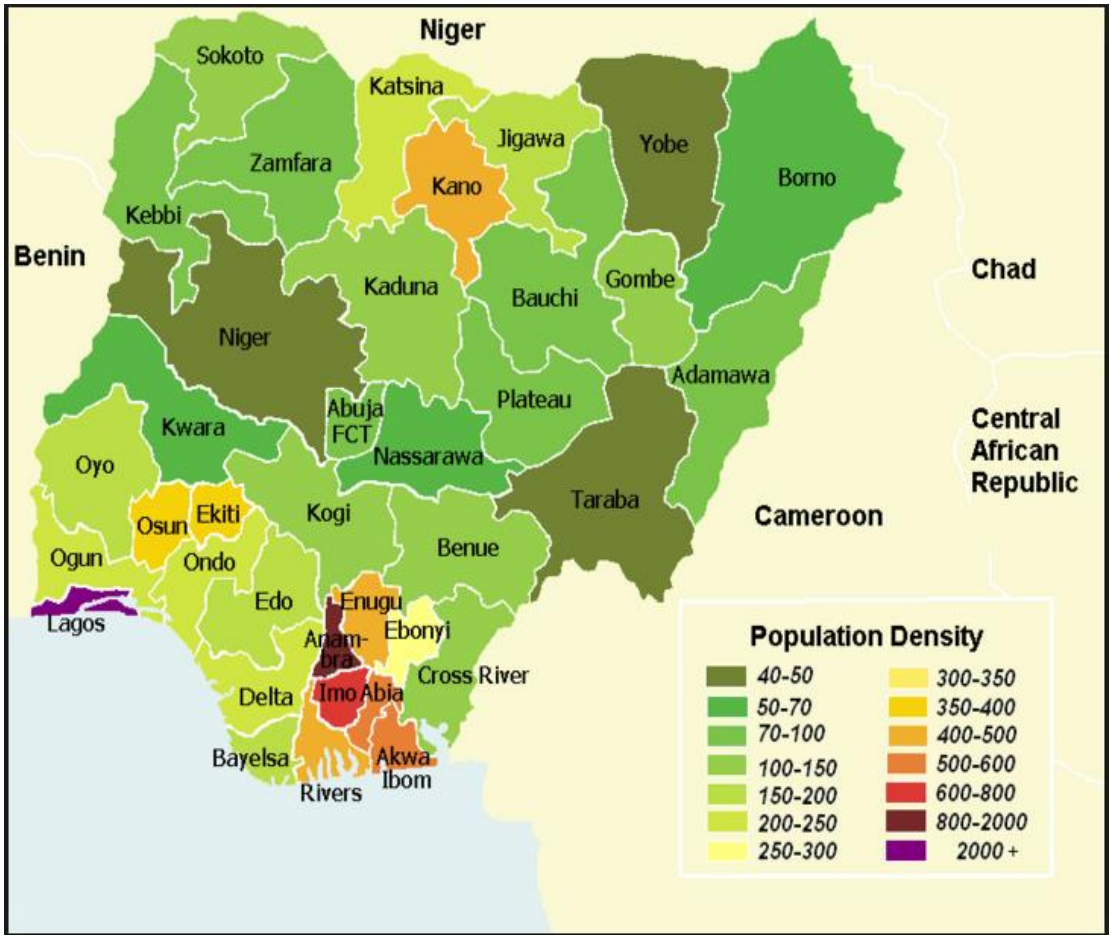


Figure 2-1: Map of Nigeria (Source: **Mapsofworld.com)**

2.2 Politics and administration

Nigeria plays a prominent role in Africa's politics and most notably, in West Africa, by promoting regional economic co-operation and integration. Nigeria's political domain has been characterized by military dictatorship with numerous coups, before the return to civilian democracy in 1999. The present democratic arrangement is made up of three arms of government; the executive; the legislative; and the judiciary with constitutionally mandated checks and balances. NDRDMP (2007) remarks that the principle of separation of power is constitutionally mandated and is replicated at federal, state and local government levels. The current democratic administration of General Mohammadu Buhari (retired) was elected to a four-year term as the President and Commander-in-Chief of the Federal Republic of Nigeria in May 2015. The focal concerns of his administration have been the fight against corruption and tackling the problem of resource inefficiency. Each of the 36 states of the federation is administered by an elected Governor. While the FCT Abuja is overseen by a federally appointed Minister. Nigeria operates a bi-cameral legislature called the National Assembly. The Senate with 109 members is the upper house while the House of Representatives with 360 members is the lower house of the legislative arm of the government. Each of the 36 states is made of three senatorial zones, hence each state produces three senators, while the FCT Abuja has one senatorial seat. On the other hand, the number of House of Representatives members produced by each state is based on the number of federal constituencies there are in each state as pre-determined by the population of the states. Hence, Lagos and Kano states produce a far greater number of representatives - 24 each. Statutory allocations of funds to these 36 states and FCT Abuja from the Federal Government are guided by constitutionally enshrined quotas, with resource derivation and population as key guiding principles.

Indeed, Nigeria has witnessed a reasonably stable political landscape since the return to democratic rule in 1999, and is increasingly becoming politically matured. With a declining political risk, long term investments in innovations is considered fairly prudent (Henisz, 2000, Alesina and Perotti, 1996). It is the view of this researcher that Nigeria's relatively stable political environment should foster innovations.

2.3 Economy

With the 2014 revaluation of the Nigeria's economy which took into consideration, the rapidly growing contributions of previously insignificant sectors such as telecommunications, banking and the film industries, Nigeria's economy became the 21st largest economy in the world in terms of nominal GDP and the 20th largest in the world in terms of Purchasing Power Parity (The Economist, 2014). With an estimated GDP size of $485 Billion (nominal; 2016) / $1.166 trillion (PPP; 2015), she is in fact, the largest economy in Africa (International Monetary Fund, 2015). Nigeria's GDP per capita however, remains at a relatively meagre $2,640 – nominal (122nd in the world)/$6,351 - PPP (124th in the world).

Nigeria's economic figures reveal "a puzzling contrast between rapid economic growth and quite minimal welfare improvements for much of the population. Annual growth rates that averaged over 7% according to official data during the last decade place Nigeria among the fastest growing economies in the world" (The world Bank, 2013). This growth has been concentrated particularly in trade and agriculture, which would ordinarily suggest substantial welfare benefits for many Nigerians. Yet, as observed by The World Bank (2013), the improvements in social welfare indicators have been much slower than would be expected in the context of this growth. Poverty reduction and job creation have not kept pace with population growth, implying social distress for an increasing number of Nigerians. Indeed, over 62.6% of Nigerians live in poverty (BBC, 2016), while unemployment rate as at September, 2017 stands at 14.20% (Trading Economist, 2017). There has been a largely recent slowdown in the pace of Nigeria's economic growth (The World Bank, 2016). Following a robust 6.2% GDP growth in 2014, growth declined to 4 percent, year-on-year, in the first quarter of 2015, falling to 2.4 percent in the second quarter and 2.8 percent in the third quarter (World Bank, 2016). Non-oil GDP growth according to World Bank (2016) "registered at 4% for the first three quarters of 2015, down from the 7.3 percent growth pace in 2014". More worryingly, as at the first quarter of 2017, Nigeria's GDP contracted by 0.52 per cent (year on year) representing the 5th consecutive quarter of contraction since Q1 2016 (National Bureau of Statistics, 2017b). Thus, Nigeria's economy has been in recession since Q2 2016. Table 2.2 below highlights Nigeria's economic indicators.

Table 2-2: Nigeria's economic indicators

INDICATORS	2011	2012	2013	2014	2015 (PROJECTED)
GDP Growth (%)	5.3	4.2	5.5	6.2	3.2
Inflation Rate (CPI Dec/Dec, %)	10.3	12.0	8.0	8.0	9.5
General Government Budget Balance (% of GDP)	-2.0	0.4	-3.1	-1.9	-3.1
Federal Government Budget Balance (% of GDP)	-2.0	-1.4	-1.4	-1.1	-1.8
Fiscal Reserves (ECA/SWF) US$ Billions	4.6	8.6	3.0	2.1	2.1
Gross Monetary Reserves ($ Billions)	32.6	46.0	43.6	34.5	30.0
Nominal Exchange Rate (N/US$)	158	157	158	168	197
Sovereign Debt (% of GDP)	12.8	13.1	12.4	12.6	13.3
Domestic Debt	1.9	1.9	1.7	1.8	1.6
External Debt	10.9	11.2	10.7	10.8	11.7
Domestic Credit to the Private Sector	22.5	21.0	20.0	23.9	25.0

- Note: General Gov. Budget balance includes Federal, State, Local, Extra-Budget Funds, Fuel Subsidy, Net Change in ECA.

Source: Compiled from World Bank (2015).

As noted above, Nigeria's economy is arguably the largest in Africa. Therefore, the present study argues that Nigeria's economy is big enough to maintain a dynamic construction industry capable of meeting the social needs of Nigeria's growing population.

2.3.1 Inflation

The rate of inflation has remained relatively high in Nigeria, although, the tight macro-economic policy introduced in 2011 has supported a gradual reduction in inflationary pressures (World Bank, 2015). Nevertheless, the inflation rate (CPI) year-on-year in August 2017, stood at 16.01% (Trading Economics, 2017). Moreover, a combination of a fast-rising inflation rate, a declining government finances and the fiscal depreciation of the naira implies that the decline in real purchasing power has been even greater (World Bank, 2015). Although, all the sectors of Nigeria's economy are affected by the steep and continuing

upsurge in the inflation rate, it is however, argued that the effects are felt more in the local construction industry (Egbetokun et al., 2008).

A key implication of the high inflation rate as discussed above for construction contractors operating in Abuja Nigeria is that their operating costs are impacted. It is often the case that resources that could have been channelled toward research and development are eaten-away by the extra resource requirement for operations as occasioned by the increased operating costs, a fallout of high inflation rate.

2.3.2 Labour/employment

The labour size for Q4 2016 according to National Bureau of Statistics (2017a) is about 81 million. The median age is 19 years and approximately 55% of the population are within the working age bracket (Isa et al., 2013), which ordinarily should portend strong potentials for continuing economic growth. The official unemployment figure stands at about 14.2% (Trading Economics, 2017). Youth unemployment has historically been worse than the average unemployment figure (Okafor, 2011). The average annual earnings according to BBC (2016) is about $1280 (£850). Besides, recently published NBS figures reveal a 45 per cent slowdown in job creation year-on-year, in the second quarter of 2015, providing further evidence of a significant economic slowdown (National Bureau of Statistics, 2017a).

The historically high unemployment rate has significant implications for the local construction contractors especially in the area of innovation implementation. For instance, whilst the high unemployment rate suggests that sourcing for human resource should be fairly easy, however, sourcing for appropriately experienced and skilled persons is often challenging. It is pertinent to mention here that innovation requires human inputs and efforts and that these humans must be knowledgeable hence suitably skilled and experienced to drive innovations (Tsai, 2001).

2.3.3 Oil and gas

Nigeria is Africa's biggest producer of oil (BBC, 2016), with a proven crude oil and gas reserves of over 37 billion barrels and over 5 billion cubic metres respectively (OPEC, 2017). She currently exports over 1.7 million barrels of crude oil per day with a present market value of over $34 billion yearly (OPEC, 2017). Although, much has been made of Nigeria's status as a

major exporter of oil and gas, however, she currently produces only about 2.7% of the world's oil supply while Saudi Arabia accounts for 12.9%, Russia for 12.7% and USA 8.6% (OPEC, 2017). To put her oil revenues into perspective; at an estimated export rate of 1.9 million barrels per day, with a projected sales price of $65 (note that this has significantly declined at the moment) per barrel in 2011, Nigeria's revenue from Oil and Gas was about $52.2 billion (2012 GDP: $451 billion). This accounts for about 11% of official GDP figures (and drops to 8% when the informal economy is included in these calculations). Therefore, while the petroleum sector is important, it remains in fact a small part of the country's overall vibrant and diversified economy. Indeed, oil and gas sales currently accounts for only about 15% of Nigeria's GDP, BBC (2016) remarks that "Nigeria is not Saudi Arabia". Implying that the Oil and Gas industry has a disproportionate effect on the economy as a whole. Petroleum exports revenue represents over 90 per cent of Nigeria's total export revenue (OPEC, 2017) and 75-80% percent of the government's budget (BBC, 2016).

It is often the case that Nigeria witnesses an upsurge in construction activities in times of oil boom and a lull in construction activities each time the revenue from oil and gas crashes. Therefore, it could be argued that there is a positive correlation between the conditions in Nigeria's oil and gas sector and activities in the local construction industry.

2.3.4 Current economic conditions

Given the high dependency of Nigeria on oil revenues, the recent sharp decline in crude oil prices has continued to cause significant difficulties in the form of external imbalance, steep falls in government revenues, rising inflation, a currency that has collapsed to record lows on the parallel market, a stock market slump, and the slowest pace of economic growth in more than a decade. Consequently, fund allocation to federal and state governments declined by 39 per cent in the first half of 2015 relative to the same period of 2014. This has caused both federal and state governments to slash capital spending, while a number of state governments have struggled just to pay salaries to civil servants and fulfil domestic debt obligations. The national currency has depreciated by 20 per cent between November 2014 and March 2015, leading to a significant import contraction that has alleviated some of the pressure on the naira (World Bank, 2016). Meanwhile, the depreciation of the naira and general fuel scarcity increased the prices of imports, and pushed the pace of year/year

inflation in Nigeria to nearly 10% in December 2015. In addition, the current government's anti-corruption campaign has had other unanticipated consequences for the economy. For instance, the government recently announced the tracing and recovery of over 2.2 trillion naira (over US$11 billion) held in thousands of bank accounts which were operated autonomously by different government ministries, departments and parastatals. This huge recovery of funds was a direct consequence of the enforcement of the Treasury Single Account system. Recovered funds were taken out of commercial banks and lodged with the Central Bank of Nigeria. This affected the liquidity position of several commercial banks leading to over 7000 jobs losses in the banking industry alone (The Daily Trust, 2016). Similarly, nearly 20,000 Nigerians suffered public sector job losses within a space of 6 months in 2016 (The Premium Times, 2016). As the effect of this liquidity mop-up trickles down to the real economy, there has been a noticeable lull in consumer confidence. Again, there has been an unexpected consequence of this anti-corruption drive on aggregate productivity in the economy. The conclusion reached by the work of Ahmad et al. (2012) lends significant support to this observation. They argue that "in an economy with a rigid bureaucracy, corruption may be beneficial in that it oils the wheels of bureaucracy". Ahmad et al.'s contention is founded on the role bribery plays as "speed money," that is, payments that speed up the bureaucratic process, or payments that are intended to "mediate" between political parties that would not reach agreement otherwise (Ahmad et al., 2012). Indeed, Nigeria faces a difficult short and medium term economic outlook (World Bank, 2015) but has the opportunity to make major progress towards more diversified development. Therefore, Nigeria must endure a major fiscal adjustment to lower oil revenues. Even if oil prices rebound, the general rapid trend toward a decline in the share of oil revenues in GDP should continue (World Bank, 2015). World Bank (2015) concludes that economic growth is expected to be relatively sluggish in the short term. Nevertheless, "higher economic growth should gradually resume as its economy adjusts to lower commodity prices" (World Bank, 2015). The weaker naira should boost domestic competitiveness, with expanded opportunities for exports and import substitution over the medium term (The Central Bank of Nigeria, 2017). As at August 2017, the negative gulf between the official exchange rate for the naira and that of the real economy, often referred to as 'parallel market rate' has significantly narrowed and the value of the naira has remained relatively stable in the 2nd and 3rd quarters of 2017

(OANDA, 2017). The parallel market value of the naira in relation to the dollar is N370/1$ as at 25th of August, 2017 compared to a value of N502/1$ less than a year ago (Aboki FX, 2017).

There is little or no doubt that the current economic conditions have continued to impact on the local construction industry. The work of Ayedun and oluwatobi (2011) blames the turbulence in the economic environment for the lack of appetite by firms in Nigeria for implementing innovations. However, the present study argues that difficult economic conditions demand for more innovations not less (Anthony and Feinzaig, 2008).

2.4 Nigeria's construction industry

A shrinking resource envelope instigated the Federal Government's introduction of substantial cuts and adjustments to the 2014 and 2015 budgets, with a particular focus on capital expenditures (World Bank, 2015). Federal revenues in 2014 were 15 percent lower than the level predicted in the approved budget, with oil revenues falling 6 percent below expectations (World Bank, 2015). This decline in revenue has continued through 2015 till date. Nigeria's capital-budget implementation rates have typically been low, in 2014 actual spending amounted to just 39 percent of budgeted spending, down from 60 percent in 2013 (World Bank, 2015). World Bank (2015) remarks that "this was not merely the result of the usual implementation bottlenecks, but a deliberate move by the Federal Government to curb debt". The approved 2015 budget is 4 percent lower, in nominal terms, than the budget ratified in 2014. Although, "resource allocations to priority social sectors such as education and health were protected in the 2015 budget - for instance, the total share of education spending was 9.3 percent, compared to 9.0 in the approved budget for 2014, while health spending accounted for 5.7 percent, up from 5.0 percent in 2014" (World Bank, 2015). In contrast, planned capital spending bore the brunt of the impact of resource decline, falling by 50 percent from its planned 2014 level (World Bank, 2015), with the execution rate for the 2015 capital budget reportedly at just 10 percent by mid-year (World Bank, 2015).

The impact of this resource shrink on Nigeria's construction industry has been particularly telling. Although, this is not surprising bearing in mind that Nigeria's government (federal and states) is by far the largest client of the local construction industry, accounting for over 60% of local construction orders (Ayangade et al., 2009). The work of Isa et al. (2013) suggests that the sluggish productivity and growth in Nigeria's construction industry should not be

attributed wholly to the shrinking oil prices. They point-out that "despite low crude oil prices in the 80s, key Middle East economies managed to maintain their infrastructural development, and by 2009, UAE's construction sector has grown very rapidly with construction accounting for 11% of its GDP" (Oluwakiyesi, 2011 cited in Isa et al., 2013). Rather, they suggest a relationship between the degree of economic diversification and the capacity for continuing infrastructural developments by key oil producing countries during low crude price regimes. Nevertheless, Isa et al. (2013) agree that the resultant construction boom in these key Middle East economies over the last decade, lend credence to the notion of a substantial correlation between strong economic growth and growth in the construction industry. The problem here is that there has always been a strong link between the international price of oil and the health of Nigeria's economy. Nigeria being a classic example of a mono product economy with Petroleum exports revenue accounting for over 90 per cent of Nigeria's total export revenue (OPEC, 2017) and 75-80% percent of the government's budget (BBC, 2016). Historically, Nigeria's construction industry contribution to the economy has ranged between 3 and 6% of the GDP, although, this had collapsed to about 1% over the last decades (Isa et al., 2013). However, sectoral growths returned during the first half of this decade with its contribution responsible for about 3% of the GDP in 2012 (NBS, 2017). Isa et al. (2013) attribute this growth "to an improved budgetary implementation and private sector participation" and not a real upswing in sectoral productivity. Recent sectoral analysis showed that construction output in real terms declined to ₦579.30 billion ($2.9 billion) or 0.11% in Q3 2015 compared with ₦579.91 billion ($2.9 billion) in Q3 2014, representing a mere 3.22 percent share of total real GDP (NBS, 2015). Table 2.3 below presents a comparative analysis of real GDP growth by sectors (emphasis on construction sector).

Table 2-3: Real GDP growth by Sector (%)

SECTORS	2011	2012	2013	2014	Q1 2015	Q2 2015	Q3 2015
Total GDP	5.3	4.2	5.5	6.2	4.0	2.4	2.8
Agriculture	2.9	6.7	2.9	4.3	4.7	3.5	3.5
Industry	8.0	2.2	1.8	7.0	-2.1	-3.3	-0.1
Oil and Gas	2.3	-4.9	-13.1	-1.3	-8.1	-6.8	1.0
Solid Minerals	14.5	19.7	16.5	14.9	11.3	7.1	7.0
Manufacturing	17.8	13.5	21.8	14.7	-0.7	-3.8	-1.8
Construction	15.7	9.4	14.2	13.0	11.2	6.4	0.0
Services	5.1	4.1	8.5	6.7	6.7	4.6	4.0
Information & Communication	2.2	3.1	8.2	7.0	9.5	6.3	5.8
Finance & Insurance	-26.9	21.1	8.6	8.1	9.0	6.4	6.6
Reals Estate	0.4	5.7	12.0	5.1	3.1	3.0	2.0
Accommodation & Food Services	9.2	15.9	73.9	18.3	26.7	-9.0	-5.4
Arts, Entertainment & Recreation	148.3	27.4	25.5	31.2	25.6	6.3	6.4
Trade (Wholesale & retail)	7.2	2.2	6.6	5.9	6.5	5.1	1.0
Non-Oil GDP	5.9	5.8	8.3	7.3	5.6	3.5	3.0

Source: World Bank (2015)

World Bank Report (1984 cited in Isa et al., 2013) concludes that in developing countries, construction typically accounts for between 3 and 8% of the gross domestic product (GDP). Isa et al. (2013) observe however, that there are considerable variations, in some low-income countries (e.g. Nepal and Uganda). In general, construction activities tend to increase with an upsurge in a country's resource base and level off only after a high degree of economic

development has been achieved (Isa et al., 2013). Table 2.4 below shows the sector shares (emphasis on construction sector) in Nigerian gross national product.

Table 2-4: Sector shares in Nigerian gross national product (% of GDP)

SECTORS	2011	2012	2013	2014	Q1 2015	Q2 2015
Agriculture	22.3	22.1	21.0	20.2	17.8	17.9
Industry	27.8	26.8	25.4	24.2	21.1	21.2
Oil and Gas	17.5	15.8	12.9	10.8	6.6	7.6
Solid Minerals	0.1	0.1	0.1	0.1	0.1	0.1
Manufacturing	7.2	7.8	9.0	9.8	10.2	9.3
Construction	3.0	3.1	3.3	3.6	4.2	4.2
Services	49.9	51.1	53.7	55.6	61.1	60.9
Information & Communication	10.1	10.1	10.4	10.8	11.9	13.9
Finance & Insurance	2.4	2.8	3.0	3.1	4.0	3.7
Reals Estate	7.3	7.7	8.3	8.4	7.8	8.7
Accommodation & Food Services	0.4	0.5	0.8	0.9	1.3	0.7
Arts, Entertainment & Recreation	01	02	02	02	03	0.2
Trade (Wholesale & retail)	16.4	16.5	17.1	17.6	20.1	18.9
Other services	13.2	13.3	13.8	14.5	15.8	14.8
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: World Bank (2015)

Scholars have identified some of the major constraints faced by firms operating in Nigeria's construction industry (Egbetokun et al., 2008). Egbetokun et al. (2008b) enumerate these as follows; infrastructural inadequacies leading to high production costs, high interest rates, unpredictable government policies, non–implementation of existing policies, lack of effective regulatory agencies, dumping of cheap products, unfair tariff regime and Low patronage.

2.5 The Federal Capital Territory, Abuja

Abuja was selected as the empirical context for the present study mainly because most construction contractors in Nigeria have an operational presence in Abuja. Secondly, there are disproportionately more construction projects being implemented in Abuja than in any or part of Nigeria.

The city of Abuja was chosen in 1976 as Nigeria's new capital because of its central location, easy accessibility, salubrious climate, low population density, and the availability of land for future expansion. It was the first planned city to be built in Nigeria. Abuja lies at 1,180 feet (360 m) above sea level and has a cooler climate and less humidity than is found in Lagos (Nigeria's former capital). The FCT Abuja is located in the North Central Geo-Political region of Nigeria. It occupies a land area of 7,753.9 Square Kilometres and shares boundaries with Kaduna, Kogi, Nasarawa and Niger states (NPC, 2013). The 2006 census has the population of the metropolitan city (built-up urban area) of Abuja as about 1.6 Million, making it one of the ten most populous cities in Nigeria, while the population of the entire FCT Territory stands at about 2.9 Million (Worlds Capital Cities, 2017). According to the *United Nations*, Abuja grew at the annual rate of 139.7% between 2000 and 2010, making it the fastest growing city in the world (Boumphrey, 2010). The city's population has continued to grow at the rate of 9.3% (Ajanlekoko, 2001). The FCT Abuja receives an annual budgetary allocation for construction projects that is often greater than most states of the federation. For instance, the Federally allocated budget for construction projects (Capital cost) in the FCT Abuja stands at about N30.4 Billion as passed in the 2017 Appropriation Act (Budget Office of The Federation, 2017), making the FCT Abuja (by far) the state with the most Federal budgetary allocation for construction projects. Figure 2.2 below is a map of FCT Abuja.

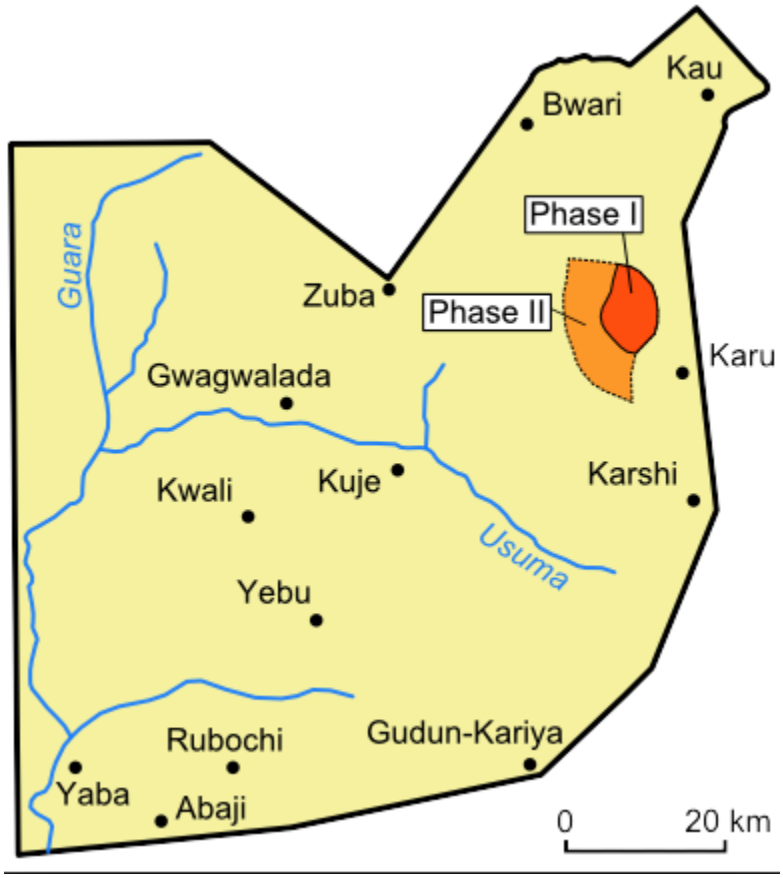


Figure 2-2: Map of Abuja (Source: **Mapsofworld.com)**

At the expiration of its Master Plan period (1980-2000), which coincided with the commencement of the new millennium perceived as quintessentially urban, the Capital City is progressively catching on to its role as the nation's hub (Ikoku, 2004). Ikoku (2004) adds that Abuja is becoming more and more familiar with its role as the modern administrative city of national and continental significance it was envisaged to be.

Prior to the economic crisis, Abuja was witnessing a massive construction expansion and regenerations, with an annual budgetary allocation for construction projects that is often greater than those of most states of the federation. Whilst there is currently a lull in construction activities within Abuja unlike most cities in Nigeria continues to witness reasonably large construction activities. The reason is simple. Abuja is the seat of government and while Lagos is still considered the 'heart of the country', Abuja is increasingly being seen as 'the face of the country'.

2.5.1 Politics and administration – FCT Abuja

The city of Abuja is currently administered by Mohammed Bello, a federally appointed minister of the Federal Capital Territory. There are six local government areas in FCT Abuja, namely; Abaji, Abuja Municipal, Bwari, Gwagwalada, Kuje and Kwali. Each of these local government areas is administered by a democratically elected Chairman.

2.5.2 Economy – FCT Abuja

Abuja is a thriving commercial city consistently ranked as the top city among 36 cities in Nigeria in the ease of doing business in Nigeria index (The world Bank, 2017). The city of Abuja ranks as the 20th costliest city in the world to reside according to Mercer (2017).

2.5.3 Local construction industry – FCT Abuja

Abuja is a city that is currently undergoing massive regeneration (and has been for some time). The FCT Abuja receives an annual budgetary allocation for construction projects that is often greater than most states of the federation. For instance, the Federally allocated budget for construction projects (Capital cost) in the FCT Abuja stands at about N30.4 Billion as passed in the 2017 Appropriation Act (Nigeria's Budget Office, 2017), making the FCT Abuja (by far) the state with the most Federal budgetary allocation for construction projects. Thus, there are a number of innovative construction projects that are either recently completed (like the Abuja Train Station) or currently ongoing (Abuja Metro link project, The Abuja Millennium Tower, The World Trade Centre project, Abuja Centenary City project etc.) in Abuja. Most of these key projects were undertook or are being undertaken by large expatriate construction contracting firms. However, Abuja has the unwanted tag of being one of the most difficult cities in Nigeria to secure construction permits. In fact, The World Bank (2017) ranks Abuja as the 35th out of 37 states in Nigeria in terms dealing with construction permits.

Most if not all major construction contracting firms have a substantial presence in Abuja. The reason is not far-fetched. Abuja is the seat of political power in Nigeria. All federal construction contracts are approved and funded from Abuja. It is worth noting that the Nigerian government is by far the largest client of the local construction industry, accounting for over 60% of the total value of local construction orders (Ayangade et al., 2009). Another reason is that although the FCT Abuja is geographically smaller than all 36 federating states in Nigeria, it receives disproportionately far more federal approvals and allocations for

construction projects than each of all other 36 federating states. The reason being simply that Abuja is the Federal Capital Territory of Nigeria with all the three arms of the government (executive, legislature and judiciary) domiciled there. There are currently over 150 medium to large construction contracting firms in Abuja (NgEX, 2017).

2.6 Summary – chapter 2

This chapter presented an overview of the research setting – Abuja Nigeria, encompassing its socio-cultural, legal, economic, political and construction industry characteristics and supporting the reasons for the study focus on firm level innovation persistence during economic crisis by construction contractors in Abuja, Nigeria. Regarding the socio-demographics of Nigeria, it was noted that Nigeria has the largest population in Africa, with a lot of potentials for construction projects like residential houses, social facilities etc. On the economic front, it was established that Nigeria is the largest economy in Africa, and the 21st in the world with an economy large enough to sustain continuous construction expansions and renewals. It was however determined that Nigeria as at the time of empirical data collection was in an economic crisis, with the effects of this felt all through the local construction industry. Furthermore, it was ascertained that prior to the economic crisis, Abuja was witnessing a massive construction expansion and regenerations, with an annual budgetary allocation for construction projects that is often greater than those of most states of the federation. As at the time of empirical data collection, there was a lull in construction activities within Abuja but this is expected to pick up as the economy begins to grow again. It was further noted that about 80% of the capital expenditure figure for the federally allocated budget of the FCT Abuja for 2016, was for the completion of abandoned projects. Lastly, it was established that most construction contractors in Nigeria are headquartered in Abuja, Nigeria and that about 60% of construction orders in Abuja are public sector related.

The next chapter examines literature on innovation in general and innovation in construction contracting firms.

Chapter 3 : Literature review - Innovation

3.0 Introduction

This chapter critiques recent and related studies on the innovation theme of this study. It explores the theories required for understanding the multiple dimensions of this complex phenomenon – innovation. Given that this PhD research is primarily concerned with innovation in construction contracting firms, it explores literature focusing on firm level innovation. It specifically explores the nature, key sources and the schools of thought on firm level innovation are explored. It is the view of this study that the discussions herein would provide reviewers with the needed criteria and theoretical lenses with which to evaluate the outcomes of this research.

3.1 Nature of innovations

The overwhelming importance of innovation to wider economic and social order has continually provoked the interest of scholars from a broad range of academic endeavours and this is reflected in the multiple, albeit, largely harmonious interpretation of the innovation phenomenon by several studies. Innovation is a "concept central to economic growth and can be a source of sustained competitive advantage to firms" (Schumpeter, 1934 cited in Damanpour, and Wischnevsky, 2006). Innovation is viewed by many as a driving force in long-wave technical, economic and social change (Schumpeter, 1946). The work of Murphy et al. (2011) stresses the importance of product innovations for economic growth. He contends that product innovation has fundamental implications for appreciating the nature of capitalism as well as the nature of competitive forces. Utterback (1974) affirms this by observing that product innovations are not just about increased productivity but are creative reactions to competitive and technological challenges. A widely-adopted definition of innovation is offered by OECD (2005). It submits that:

> *"An innovation is the implantation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations"* (pg. 46).

OECD's definition emphasizes two fundamental factors. Firstly, that innovation is the implementation of something (a key distinction between innovation and invention). Secondly, that what is being implemented is new in its current form. The wide range of innovation definitions submitted since the 1930s have all proposed the concept of something

"new", the implementation of which brings irreversible transformations to its environment (Murphy et al. 2011, Johannessen et al. 2001).

Slappendel (1996) concludes that "not all ideas, practices or objects are recognized as innovations and it is widely accepted that newness or novelty is a key distinguishing feature". Most of the widely-adopted characterizations of innovation focus on novelty and newness. For instance, Nohria and Gulati (1996) conceptualize innovation as "any policy, structure, method or process, or any product or market opportunity that the manager of an innovating unit perceives to be **new**". Damanpour (1991) argues that innovation "is the adoption of an internally generated or purchased device, system, policy, program, process, product, or service that is **new** to the adopting organization". Similarly, Zaltman et al. (1973) conclude that innovation represents "any idea, practice, or material artefact perceived to be **new** by the relevant unit of adoption". European Commission's (1995) definition of innovation lends additional credence to the "novelty" pre-condition. They submit that innovation is "the successful production, assimilation and exploitation of **novelty** in the economic and social spheres". Rogers (1995) adds that, "newness" in an innovation can be expressed not only in terms of new knowledge, but also in terms of first persuasion, or a decision to adopt. Indeed, most of the definitions submitted since the 1930s have all proposed the concept of something "new", the implementation of which brings irreversible transformations to it (Murphy et al., 2011, Slappendel, 1996). Johannessen et al. (2001) argue that, although, "newness" is a sub-theme in most definitions, there are however, questions regarding the nature of newness; "what is new, how new and new to whom"? They further observe that "several of the definitions suggest a sub-theme of successful adoption, for example, but are vague in terms of what is adopted and what constitutes a success" (Johannessen et al. 2001). Slappendel (1996) points out that identifying what is new is essential for distinguishing innovation from mere change. Furthermore, Johannessen et al. (2001) point out that most of the available characterizations of innovation fail to address the issue of "how new'', that is, the degree or extent of newness that qualifies as an innovation. Likewise, the issue of "new to whom" according to Johannessen et al. (2001) has not been properly addressed in the body literature. Nevertheless, a critical review of relevant literature reveals that the question of "how new" is closely related to the issue of "new to whom". To this end, Johannessen et al. (2001) advise that, "in order to operationalize the distinction between incremental and radical innovations,

we must also determine the relevant unit of analysis". The unit of analysis in this case is obviously the innovation itself.

Thus, it is the view of this study that the notion of "first use" as advanced in Rothwell's (1976) definition of innovation as, "the first use of an idea by a new unit of adoption" and further highlighted in a handful of organizational innovation scholarship (Slaughter, 2000, Harkola and Greve, 1995, Laborde and Sanvido, 1994), essentially addresses the question of "what is new" as raised by Johannessen et al. (2001). However, this criterion of "first use" appears "insubstantial without further qualifications" (Murphy et al., 2011). In fact, Murphy et al., (2011) underscore this point by remarking that "continuous first use within an industry would invariably render the innovation (if it could still be termed so) defunct" (pg. 418). Nevertheless, there has to be consideration for quite a few other factors when determining "what is new". **Context** is an important factor here, in the sense that an idea already adopted in an organization or a country for instance could be considered a new idea when adopted for the first time in another organization or country. Likewise, an innovative process or model adopted in the manufacturing industry for instance could be considered an innovation if it is adopted and operationalised in the construction industry. Again, the **derivable benefit** for which a creative idea was developed and adopted could be altered to offer other initially unanticipated benefits. Instances abound where products and processes were developed for a particular use and then were found to offer other unexpected benefits, hence, were adopted by other actors in order to exploit these unanticipated benefits.

Furthermore, the definition of innovation as submitted in Slaughter (1998) not only highlights the close link between innovation and change but also largely resolves the nagging question of "how new". She sees innovation as "the actual use of a **non-trivial** change and improvement in a process, product, or system that is novel to the institution developing the change". This study contends that for a novel idea to adequately resolve the question of "how new", the change in the features of the "material artefact" has to be "nontrivial". Likewise, the use of "unit of adoption" as reflected in a number of scholarly definitions of innovation (Egbu, 2001, Rothwell, 1976) largely resolves the question of "new to whom" as raised by Johannassen et al. (2001). The point here is that for the change in the features of the "material artefact" to meet the criteria for innovation, it has to be new to the "unit of adoption". Slappendel (1996) advances an interesting dimension to this debate on "newness". She

argues that "it is the perception of newness that counts, rather than whether the idea or object is new to the world or some other environment". This logic of "perception of newness" underpins Zaltman et al.'s (1973) view of innovation. They submit that innovation is "any idea, practice, or material artefact perceived to be new by the relevant unit of adoption". Slappendel (1996) adds that "the perception of newness also serves (along with specifying "what is new") to differentiate innovation from change".

On the questions of "what is adopted" and "what constitutes a success" as raised by Slappendel (1996); it is the view of this study that the recurring theme of "successful adoption" of an idea helps to underscore the inherent difficulties and complexities in bringing a creative idea to full fruition. This sub-theme more or less, is a hint to the fact that most creative ideas end up just as mere "ideas". The questions of "what is adopted" and "what constitutes a success" are therefore, inextricably linked. Egbu's (2001b) submission that innovation is the "successful exploitation of an idea, where the idea is new to the unit of adoption", essentially resolves both questions. The point here is that what could only be adopted are "material artefacts" that have been assessed and adjudged to add value to the unit of adoption. This value added is therefore, what constitutes a success. Indeed, there is a mainly recent recognition by scholars that for a creative idea to metamorphose into an "innovation", market success has to be achieved. Thus, researchers in this spectrum of the innovation argument have attempted to infuse a commercial attainment requirement for innovations (Egbu, 2001a, b; Johannessen et al., 2001; Damanpour, 1992). Here, Egbu (2001b) provides us with a seminal characterization of the innovation phenomenon. His definition of innovation emphasizes that the outcome of a creative process can only be termed an innovation if it is successfully exploited in the marketplace. This suggests that if an idea is not successfully exploited by way of accruable commercial benefits (taking a classic Schumpeterian perspective), then that creative idea would have fallen short of achieving the criterion for "innovation". A number of authors echo this view (Thornberry, 2001, Pinchot, 1985), thus, confirming that without the presence of some form of entrepreneurial activity to exploit opportunities as they arise within organisations, innovation remains little more than an aspirational destination, rather than a tangible one. Similarly, Teece (1998) and Sullivan (1998) conclude that innovation can only be said to have been achieved if the new knowledge has been implemented or commercialised in some way. Closely linked with this criterion is a

yardstick that assures that every innovation must be assessed by stakeholders as value adding. The point here is that the business can only retrieve value from innovation efforts if the "innovative" product/process is seen to be value adding by the end user. This is the striking contrast between innovation and invention. Invention is only concerned with the creation of something new (Freeman, 1982) and need not fulfil any useful customer's requirement and so need not involve the exploitation of the concept in the marketplace (O'Sullivan and Dooley, 2009). Thus, it is argued that the invention of new knowledge is insufficient without market exploitation (Tidd, 2001). The work of O'Sullivan and Dooley (2009) lends support to this argument. They submit that innovation is more than the creation of something novel; innovation they argue, also includes the exploitation for benefit by adding value to customers. Naidoo's (2010) definition of innovation appears instructive; he contends that "Innovation, at an aggregate level, represents the successful exploitation of ideas that are new to an adopting organization, into profitable products, processes and/or services".

A more recent development in the innovation subject is the idea of "open innovation". The open innovation concept somewhat erodes the validity of the "first use" concept of innovation. This paradigmatic shift assures that firms can use external and internal ideas and external and internal paths to the market as they attempt to advance their products/processes. Chesbrough (2006) defines this concept as the "use of purposive inflows and outflows of knowledge to accelerate internal innovation and expand the market for external use of innovation, respectively". It is worth noting that the achievement of "an innovation relies largely on the creation of technological or social capability through problem-solving or learning activities principally within (and between) large firms" (Cantwell, 2001). Thus, innovation depends upon the generation of feasible new capabilities, the operation of which adds new value to the existing circular stream of income, and thereby creates new profits and higher income (Cantwell, 2001). This basically denotes that the development of new products and processes is the outcome of a path dependent building upon established capabilities and achievements, by the critical revision of emergent new products or methods and the search for relevant novelty.

Finally, a key feature of every innovation is the measure of risk associated with their implementation. In construction, this risk is exacerbated by the inherent complexity and interdependent systems of the constructed product (Winch, 1998). Slaughter (2000) adds that "firms considering the initial use of an innovation need a systematic approach to identify the activities that can reduce avoidable uncertainty and risk".

3.1.1 Interplay between creativity, invention and innovation

Martins and Terblanche (2003) observe that "today's post-industrial organizations are knowledge based - their survival and success depending largely on creativity, innovation, discovery and inventiveness". A distinction is typically made between invention – an idea made manifest and innovation – idea applied successfully and which adds value to the organization (McKeown, 2008). Whilst the terms; "creativity" and "innovation" were used interchangeably in the past, they are indeed remarkably different. Creativity refers to the generation of novel ideas while innovation denotes making money with them (Henry and Walker, 1991). Gurteen (1998) remarks that creativity is the generation of ideas while innovation is all about putting these into action by sifting, refining and implementing. Henry and Walker (1991) argue that creativity is the starting point for any innovation; in many cases a solitary process, "conjuring up the image of an eccentric scientist buried under mounds of papers, or of an artist surrounded by half-finished canvases and multi-coloured palettes". Heap (1989) argues that creativity is the synthesis of new ideas and concepts by the radical restructuring and re-association of existing ones whereas innovation is the implementation of the results of creativity. Amabile (1983) adds that creativity is a context specific and subjective judgement of the novelty and value of an outcome of an individual's or collective's behaviour. Kuratko and Welsch (1994) submit that everyone is creative to an extent and that some individuals, however, appear to have a greater aptitude for creativity than others. It has been argued severally that creativity is "necessarily a wild, uncontrolled, undisciplined generation of new ideas that are of limited (or no) practicality" (Domb, 2000). However, even if creativity is chaotic as suggested by Domb (2000), it can be managed and it can be focused as acknowledged by Domb (2000).

In an essentially managerial context, any shift towards innovative activity requires first, learning how to implement the creative process (de Sousa et al., 2012). Innovation is the real work that succeeds idea conceptions and typically involves the coming together of multiple

people with different, yet complementary skills. It is a social process because it must involve more than one person. The challenge here is to successfully manage this social process (bearing in mind that all social processes are complex) so as to transform creative ideas into tangible products/services or organizational processes that will improve customer value, cut costs and/or generate new earnings for an organization (Levitt, 1963). Simply put, Innovation = conception +invention+ exploitation (Henry and Walker, 1991). Schumpeter (1942) contends that an innovation does not necessarily have to emerge from an invention but can be a recombination of old ideas. West (2002) observes that three themes dominate scholarly writings investigating creativity and innovation among work team. The first is the value of the team task and the demands and opportunities it generates for creativity and innovation. The second is the premise of diversity in knowledge and skills among team members, which researchers suggest is related to both team creativity and innovation. And the third is the theme of team integration - when team members work in cohesive ways to capitalise on their diverse knowledge and skills, researchers believe that both creativity and innovation result". A fourth theme which identifies the consequent effect of external demands, threat or uncertainties upon creativity and innovation implementation in teams was subsequently proposed by West (2002). The key is to turn ideas into useful knowledge and the useful knowledge into added value. In practice, this means bringing together creative minded individuals so that they can discuss and elaborate on their ideas. It also means finding the resources necessary, when resources are limited (as always), and trying to manage what is often an uncertain and unpredictable process.

3.1.2 Summary – nature of innovations

In appraising the above characterizations of innovation, there are key fundamentals that would assist in the identification of construction innovation. These key elements could also provide us with a standard for determining if a process/product change meets the requirements to be termed as "innovation". These key essentials are; (i) newness in its present form - although, this may include the recombination of existing ideas (ii) first use within the industry – there is however, the contention that geography is a significant factor in determining the "first use" concept. Again, it could be argued that the "open innovation" prescriptions erode to a degree, the significance of the "first use" concept (iii) capacity to effect change in standard practice – non-triviality (iv) derivable benefits for all stakeholders

and this often encompasses successful market exploitation. Kimberly (1981) refers to this as "generation of value"; and (v) the associated risks of innovating.

3.2 Innovations in construction contracting firm

To adequately examine innovations in construction contracting firms, it appears imperative to firstly explain what a "firm" means and what construction contracting firms entail. This, it is believed, will assist our understanding of innovations in construction contracting firms.

3.2.1 Definition of a firm

The use of the word "firm" as a generic term for describing a business unit or enterprise is commonplace. From a neo-classical economic viewpoint, a "firm" is seen as an abstract "primitive device for turning inputs into outputs" (Crew, 1975). Crew's definition emphasizes time, process and outcome. Barlow (2012) adds that the activities that go on within a firm are subject to limitations of the organization's capabilities, and driven by its goals which often include shareholders' value maximization, risk management and long-run growth. Whilst an economic definition of a "firm" is necessary considering the nature and focus of this research, this study will however, prefer a definition that will encompass the many non-profit entities who are often stakeholders in a typical construction industry. Thus, Black et al. (2009) definition of a "firm" as "the basic unit of organization for productive activities" is relevant. Although, their definition lacks fleshy characterization, it fits somewhat with the present study's viewpoint of what a "firm" entails. This work however, argues that a "firm" is a social unit of people structured and managed to achieve common goals. It is noted that relationships between the different activities and the members within an organization is determined by the management structure of the organization.

The neo-classical view of a firm's interaction with another is such that is defined by competition in a complex mixed economy characterized by even denser patterns of interaction by other productive agents (Barlow, 2012). However, this does not fit in with the realities of today. It has been established that it is cooperation rather than competition that is appropriate for advancing not organizational goals but also those of the industry and wider society (Black et al. (2009). Chiesa and Toletti (2004) agree that competition can have negative consequences, whereas cooperation is a competent social behaviour that entails many positive consequences.

At firm level, successful innovation depends essentially, on a firm's willingness to commit the necessary time, resources, and leadership to research and development. In the simplest terms, the difference between high- and low-innovation organizations is that the latter are willing to follow up and follow through on new ideas.

It is to be noted that the words “firm” and “organization” as used interchangeably in the course of the present study bear the same meaning for this research.

3.2.2 Construction contracting firms

Often referred to as construction contractors, construction contracting firms in broad terms are “organizations appointed by clients to carry out construction works” (Designing Building Wiki, 2017). However, this apparent simple relationship is complicated by the fact that contractors tend not to have all the trades required to construct a building in their direct employment. This means that a contractor is likely to appoint a range of sub-contractors to build the works for which they have been contracted. Thus, Institution of Civil Engineers (2017) views a general contractor as an organization that “undertakes the whole of construction of a project but typically in turn sub-letting parts of its work to specialists or trade contractors and others as sub-contractors”. In a design and build contract, the construction contractor is responsible for the completion of the design as well as construction (Design Building Wiki, 2017).

As explored above, the definition of the term “firm” from an economic viewpoint mostly include entrepreneurial concerns whose goals are to maximize profit and to remain in business as espoused by the classical theory of the firm. It is important to note that the five construction based firms that provided the boundaries within which the case was studied were all entrepreneurial concerns whose central goals are to maximize profit and to remain in business. Thus, creative ideas are assessed by the value they add to the innovating unit, by way of market exploitation.

3.2.3 Innovation in construction contractors

Despite being a dominant component of the global economy, the construction industry has continuously been criticized for lagging behind other industries in terms of its innovativeness (Reichstein et al. 2005, Asad et al. 2005, Newton 1999, Nam and Tatum 1997). Reichstein et al. (2005) reveal that the number of firms engaged in product and/or process innovation in

construction is considerably fewer in comparison to other sectors. They argue that "construction based firms are less open to the external environment and tend to have poorly developed research and development (R&D) units, with low capacity to absorb ideas from their external environment" (Reichstein et al., 2005). In contrast, there is also literature that touts the inherent innovativeness of the construction industry (Pries and Janszen, 1995, Tatum, 1986, Tatum, 1984). These conflicting assessments of construction innovativeness naturally elicit reactions from construction industry practitioners. There has been the question of "whose view matters"? (Egbu, 2004), implying that it is meeting the clients' increasingly complex requirements that matters rather than striving to impress critics. There is also the contention that the traditional nature of the construction industry impinges critics' perception of the industry and the activities that go on therein (Egbu, 2004). Another problem is that of developing an appropriate measurement tool for gauging innovations in the industry. Winch (2003) challenges the appropriateness of using the automobile industry as a role model or comparing the construction industry's performance data with that of the manufacturing industry. Sundbo and Gallouj (2015) point-out that the service enhanced industry (e.g. construction industry) have frequently been adjudged, often in comparison with manufacturing, as lagging behind in terms of low productivity, low capital intensity, weak qualification levels and as not innovative. They argue that "this is not true". They further contend that "service firms do innovate, but the innovations often take other forms than in manufacturing and they may be organised differently". The construction industry is a sector within which traditional measures do not reflect the true extent of the innovative activities that occur therein (Barrett et al. 2007, Ozorhon et al. 2010). Winch (2003) further contends that the deficiency of Standard Industrial Classification (SIC) means that the data from which most researchers build their statistics regarding construction and other sectors are often skewed. For instance, construction sector in SIC leaves-out Architectural and Engineering Consultancy firms where copious amounts of innovative designs are churned-out. Furthermore, huge proportion of value added in the construction industry are repairs and maintenance works where scope for innovation is limited and where the nature of the activities therein means that productivity is low. This is however, not the case with most of the other industries or at least not as significant. Consequently, it is argued that the construction industry under SIC is not analogous to other industries (Winch, 2003). Similarly, R&D expenditures, number of R&D personnel, number of patents, number of publications

and their citations, etc. which are often considered as indicators of measures of R&D performance, and thus metrics for assessing innovation (Seaden and Manseau, 2001) are in reality not adequate for gauging the construction industry's innovativeness. "Is R&D a sufficient gauge for innovation?" asks Kulatunga et al. (2006). Kline (1985 cited in Seaden and Manseau, 2001), Slaughter (1991), and OECD (1996, 1997) conclude that innovation can emanate from a variety of sources and not exclusively from R&D. Nevertheless, the level of R&D activity has been shown to positively correlate with the relative innovativeness of various industrial sectors, particularly high-tech manufacturing sectors, and therefore may be considered a valid indicator of innovation (Seaden and Manseau, 2001). This conflicting assessment of the construction industry's innovativeness is further exacerbated not only by the complexity of the construction industry but also by the diversity of this sector meaning that there is 'not one single way in which innovations occur in construction' (Ozorhon et al., 2010). Blayse and Manley (2004) remark that "building and construction is increasingly conceived as partly manufacturing - materials, components, equipment - and partly service industry - engineering, design, surveying, consulting and management".

Innovations in construction can generally be detected at three distinct levels; these are sector level, business level and project level (Ozorhon et al., 2010). Barrett et al. (2007) contend that because construction is a "project-based and fragmented industry and has much of its innovation co-developed at the project level, they mostly remain hidden". The project nature of the construction industry renders every project unique on its own (Veshoskey, 1998) hence there is considerable prospect and propensity for novel approaches (Kulatunga et al., 2006). Seaden and Manseau (2001) argue that it is in fact these new approaches that are often interpreted by proponents of construction innovativeness as innovative behaviour. Then again, it is still this uniqueness of the nature (one-off project nature) of the construction industry that critics readily point to as a hindrance for optimal diffusion of innovation in construction. The point here is that contractors gain little or nothing from being innovative, other than the optimization of their own processes. Further to this, Whyte (2003) findings indicate that the effect of this uniqueness of the project nature of the construction industry (as highlighted above) on innovation depends to a large extent on the size of the construction project suggesting that when the project is small and work is cyclical, it is possible to achieve higher return with relatively lesser investment on innovation (thus, innovativeness is

discouraged). In contrast, large complex projects offer scope for innovation to overcome the associated practical problems.

From the above, it is in fact apparent that there is not enough conclusive evidence from body literature to adequately form an opinion about the innovativeness or otherwise of the construction industry in comparison with other industries (Winch, 2003, Kulatunga et al. 2006). Nonetheless, the unique conditions as orchestrated by the project-based nature of the construction industry provide the potential to be innovative, although, this can also be a hindrance for construction innovation" (Pries and Janszen, 1995 cited in Kulatunga et al., 2011). Furthermore, Pries and Janszen (1995) remark that "owing to the unique conditions imposed by the temporary site-based operations such; topography, other members of the temporary project team and one-off clients, the contractor has little to gain from being innovative, other than the optimization of their own processes" (cited in Kulatunga et al. 2011).

3.2.4 Summary – innovation in construction contractors

In service industries (construction is one these industries - see Issa et al. 2002), product is not always perfectly "formatted" and codified, precisely determined a priori (Sundbo and Gallouj 2015). Each service transaction may be deemed unique as far as it is produced on demand (custom-made) in interaction with the client or as a response to a specific, not standardisable problem, and in different environments. Client participation (in various forms) in the production of the service may be the most basic characteristic of service activities, particularly knowledge-intensive ones. Several theoretical models have been advanced in order to account for this client involvement. Some of these concepts for instance are; co-production (Bettencourt et al., 2000, Hertof, 2000), service relationship (Lemon et al. 2002; Coulter, 2000; Bitner, 1995), the moment of truth (Bitner et al, 1994; Gronroos, 1990) etc. Sundbo and Gallouj (2015) remark that 'at the interface between the service provider and its client different types of interaction are occurring: Different types of elements are being exchanged; information and knowledge, emotions, verbal and gesture signals of civility'. The nature of this interaction means that it could also express power struggle and other forms of influences. Indeed, the innovation process in construction is to a large extent an interaction process, both within and outside the firm's boundaries. Externally, this interaction involves actors and agents domiciled outside the firm's domain, for instance, research centres, regulatory bodies

and the client. The interaction with the client in the service-enhanced firm is a key divergence from manufacturing production system. Furthermore, the client's perception, which is often influenced by the quality of this interaction, is the most important determinant or indicator of the value of an innovation outcome. Thus, it is noted that the client's satisfaction with the total encounter (not only the core service delivered, but also the circumstances of the delivery) is crucial in service production (Sundbo and Gallouj, 2015).

3.3 Different schools of thought on why firms innovate

The innovation phenomenon has been researched from diverse scholarly background often resulting in not only varying but also sometimes conflicting outcomes. For instance, innovation management scholars - greatly influenced by their background - have continued to offer different reasons as to why organizations choose to innovate. Therefore, there are multiple schools of thought on why organizations innovate. These schools of thought are discussed below.

3.3.1 Schumpeterian school of thought

Essentially, the Schumpeterian school of thought takes a more classical view that the reason organizations innovate is to maximize profit and remain in business. The "pull" theory as espoused by Gilad and Levine (1986) which argues that organizations are attracted to innovation by wealth, and other desirable outcomes confers validity to this school of thought. This spectrum of the innovation argument recognises that the compensation for "exceptional hazards" taken on by the innovating organization in the form of risks associated with uncertainties is a source of "new profit". It is indeed this quest for compensation that drives innovation. Marceau (1995) contends that innovation in economic terms (involving exceptional profits) typically ascends the interaction of paradigmatic discontinuities in technology, from technical systems of 'complexes' and from cumulative learning processes.

3.3.1.1 Theoretical underpinning

Two theories underpin this school of thought. First, is the classical theory of the firm which argues that organizations are in existence for two main reasons; to survive and remain in business and to maximize profit. The second underpin, is the Schumpeterian theory of economic innovation and business cycle which contends that the economy creatively destroys

old ideas by mutation that "incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating new one" (Schumpeter 1942).

One of the fundamental highlights of entrepreneurship is that it causes innovation (Schumpeter, 1936). Intuitively, we all know that entrepreneurship has played an important role in the development of the innovation subject throughout its history. Schumpeter (1928) contend that entrepreneurs, who could be independent inventors or R&D engineers in large corporations, create the opportunity for new profits with their innovations. In turn, groups of imitators attracted by super-profits would start a wave of investment that would gradually erode the profit margin for the innovation. However, before the economy could equilibrate a new innovation or set of innovations, conceptualized by Schumpeter (1928) as "Kondratiev cycles", would emerge to begin the business cycle over again. It is indeed instructive to refer to the remarks of Hubert H. Humphrey the 38 Vice-President of the United States as quoted by Cohen and Graham (2001) that "much of our American progress has been the product of the individual who had an idea; pursued it; fashioned it; tenaciously clung to it against all odds; and then produced it, sold it, and profited from it". Even the most ardent critics of the Schumpeterian school of thought would agree with these sentiments, expressed so compellingly by an entrepreneur turned politician. Indeed, there is a general consensus that the emergence of new ideas and more importantly how they can lead to commercializable opportunities are central to the field of innovation (Baron, 2006, Shane and Venkataraman, 2000).

3.3.1.2 Criticism of the Schumpeterian school of thought

Two major constraints of the Schumpeterian perspective are; (i) that it has a relatively narrow view of why organizations innovate and, (ii) that it lacks consideration for the social innovator who takes into account a "positive return to the society" (Thompson, 2002) and whose central motivation is to proffer solutions to social problems by creating and sustaining social values, and consequently, furthering broad social, environmental and cultural goals.

3.3.2 Resource based view

The resource-based view of organizational innovation assumes basically that innovation is one of the resources an organization can draw upon to carry-out its businesses and that people are at the heart of this resource. It argues that, organizations with valuable,

uncommon, and inimitable resources have the prospect of achieving competitive advantage (Barney, 1991). Hence an organisation's devotion to innovation depends to a large extent upon the knowledge, keenness and expertise possessed by its work force (Egbu, 2004).

3.3.2.1 Theoretical underpinning

According to Barney (1991), the resource-based view (RBV) anchors on two fundamental assumptions. First, organizations are assumed as bundles of productive resources and that different firms possess different bundles of these resources (Penrose, 1959). This is the supposition of firms' resource heterogeneity (Ferreira et al., 2011). Second, drawing on Selznick (1957) and Ricardo (1966) , this perspective assumes that some of these resources are either very costly to copy or inelastic in supply. This is the assumption of resource immobility (Ferreira et al. 2011). Building on the work of Alvarez and Busenitz (2001), Simpeh (2011) concludes that "access to resources by founders is an important predictor of opportunity based entrepreneurship and new venture growth". This theory highlights the importance of financial, social and human resources (Simpeh, 2011, Aldrich, 1999, Kumar, 2007). Thus, access to resources enhances the organization's capability to perceive and act upon identified opportunities (Davidsson and Honig, 2003). If an organization is to achieve competitive advantage in the market, this "capability" must be distinctive (Afuah, 2003). To this school of thought, innovation (like other business functions) is a stable management process that requires specific tools, rules, discipline and accrues from possessing distinctive resources. Financial capital (funding and funding regimes), social capital and human capital are important sub-themes in this school of thought. Going by the above analysis, it does appear plausible to argue that the central proposition of the resource-based view is that for a firm to successfully exploit an idea and subsequently achieve a state of sustainable competitive advantage, it must acquire and control valuable, rare, inimitable, and non-substitutable resources and capabilities, in addition to having the organization (or system) in place that can absorb and apply them (Kraaijenbrink et al., 2009, Barney, 2002, Alvarez and Barney, 2002). This contention has been offered by several related evaluations; core competences (Hamel and Prahalad, 1994), dynamic capabilities (Helfat and Peteraf, 2003, Teece et al., 1997, Leonard-Barton, 1995, Leonard-Barton, 1992) and the knowledge-based view (Grant, 1996).

3.3.2.2 Criticisms of the resource-based view

Whilst researchers have addressed much of the criticisms of the RBV by advancing and strengthening the content and context of this theory, quite a few of these criticisms remain unanswered and are still generally considered "as flies in the ointment". For instance, the pillar that holds-up the RBV is that sustainable competitive advantage can be achieved by applying resources and capabilities when these are valuable, rare, inimitable, and non-substitutable in an appropriate environment (Barney, 1994). This postulation has largely been treated sceptically by management researchers. The contention herein is that the valuable, rare, inimitable and non-substitutable criteria are neither adequate nor necessary to explain the complex innovation phenomenon. One version of this sufficiency criticism concerns the lack of empirical support for the RBV. As pointed-out by Armstrong and Shimizu (2007) and Newbert (2007), empirical investigations have produced only modest support, suggesting that other factors should be considered if we are to adequately explain and further add to the robustness of this spectrum of the innovation argument. This sufficiency criticism is not restricted to methodological issues (Kraaijenbrink et al. 2009). Also, it has persistently been contended that being in possession of resources is not even remotely sufficient and it is only by being able to deploy these resources appropriately that innovations can be achieved (Makadok, 2001, Peteraf and Barney, 2003). The point here is that for a firm to "successfully exploit ideas", there has to be a bundle of resources as well as the managerial capabilities to recognize and exploit the productive and market opportunities inherent in these ideas. The critical question here is whether such knowledge (managerial alertness to opportunities implicit in some ideas) can be justifiably or conveniently treated as a resource of the same sort as those in the bundle. This opens up another source of criticism for the RBV. Again, it has been debated that the value of a resource as espoused in the RBV is too indeterminate to provide for a useful theory (Kraaijenbrink et al. 2009). Lockett et al. (2009) observe that the "RBV does not contain the conceptual generalization that we have come to expect from theorems". Rather, it stands on analytic declarations that are redundant, true by definition that cannot be tested.

3.3.3 The psychological view

This school of thought assures that any organization can innovate and that they do not have to be a profit-oriented business to innovate. A charity organization for instance can also innovate. Here, the motivation for innovating is the intrinsic satisfaction that typically comes with the development of a new idea, product or process (McClelland, 1961).

3.3.3.1 Theoretical underpinning

McClelland's (1961) achievement motivation needs theory readily comes to mind. Individuals/organizations with a strong achievement and growth orientation enjoy challenging tasks and constantly set new goals. This sets in motion the creation of new ideas triggering a circle of creative destruction (McClelland, 1987).

3.3.3.2 Criticism of the psychological view

Although, there has been an extensive validation of this school of thought, there is still no standard for independently and robustly verifying or evaluating the basic underpin (the desire to achieve intrinsic satisfaction by innovating) of this school of thought.

3.3.4 Social-construct view

Organizations continue to develop new ways of relating, interacting and impacting on the community/society they operate in. Austin et al. (2006) remark that every new idea developed is typically embedded with a social purpose. Similarly, Santos (2012) notes that social innovations involve the deployment of new business models that address basic human needs. The underlying belief here is that the basic motivation for every innovation is to meet a specific societal need. This spectrum of the innovation argument is also consistent with the push theory of motivation (Maehr and Meyer, 1997).

3.3.4.1 Criticism of the social-construct view

The underlying reason behind this viewpoint is at best too simplistic and generally ignores cultural and environmental factors that shape human behaviour and drive. Furthermore, Woolgar and Pawluch (1985) observe that social-constructionists tend to "ontologically gerrymander" social conditions in and out of their analysis. Following this point, Thibodeaux (2014) cautions that social-constructionism can "both isolate and combine a subject and their

effective environment". To resolve this, he suggests that "objective conditions should be used when analysing how perspectives are motivated".

3.3.5 Summary - schools of thought

This section explored the broad spectrum of arguments regarding why firms innovate. Whilst the contentions of the different schools of thought are quite appreciated, the fundamental tenet that underpins this PhD research draws mainly on the views of the Schumpeterian school of thought. It does also draw partly on some fundamentals inherent in the resource based view. As such, this study submits in line with Gilad and Levine's (1986) pull factor theory that firms innovate to reap accruable profits as a compensation for the exceptional hazards taken. Nevertheless, this study adds that organizational innovations are essentially possible only when organizations possess a bundle of valuable, uncommon and inimitable resources (resource based view) (Barney, 1991). Thus, this study holds a somewhat mixed view of why organizations innovate: Yes, principally to make profits but achievable only in the event of an organization possessing the "capacity" to perceive and act upon identified opportunities. This it is argued, is significantly dependent on the quality of knowledge repository available to the organization (Davidsson and Honig, 2003) and the existence of a conducive environment for the optimal exploitation of the "unique" knowledge held (appropriate funding regime, appropriate organizational culture and structure - vertical and horizontal).

3.4 Key sources of innovations for construction contractors

Firms obtain ideas for innovations from a broad variety of sources (Cohen and Levinthal, 1990, von Hippel, 2002) and their "innovative performance depends on how successful they are at appropriating knowledge from these sources"(Laursen and Salter, 2004). Investigating the source of innovation according to Zahra and Covin (1994) is important because doing so will help to uncover the capabilities and skills a firm must possess to adopt innovations deemed necessary to achieve success in the marketplace. Explanations for how new ideas emerge include prior experiences (Tripsas, 2008, Gaglio and Katz, 2001, Shane, 2000); personal disposition (Tripsas, 2008; Gaglio and Katz, 2001); changes in the broader external environment e.g. changes in regulatory requirement etc. (Gaglio and Katz, 2001); gaining specific information (Shepherd and DeTienne, 2005, Gaglio and Katz, 2001); being a frustrated user (Tripsas, 2008; Shane, 2000) and serendipity (Meyer, 2007, Barney, 1986). As discussed in Section 3.13, this study largely adopts Drucker's (1985) argument regarding how

innovations emerge in organizations – a purposeful and organised search for changes. Yet, the present study does not attempt to discount the significance of "happy accidents" in the innovation discourse. Rather, it is argued that serendipity can only be seized upon by an adequately prepared organization relying upon intuition, imagination, and creativity of its unique human resource. Meyer (2004) views this "unique" human resource as that unbounded by traditional theories, willing to suspend the usual set of beliefs, unconstrained by the requirement to obtain approval or funding for his or her pursuits, and possesses an outsider's perseverance that leads the way to a dazzling breakthrough.

Amara et al. (2005) identify four categories of innovation sources. These are; (a) internal sources (R&D, marketing, management and production staff) (b) market sources (related firms in a corporate group, suppliers, clients, competitors and consultancy firms), (c) research sources (universities, government and provincial agencies, and research laboratories) (d) generally available sources (trade fairs and exhibitions, internet or computer based networks, professional conferences, meetings and publications). McAdam and McClelland (2002) advance a broader categorization. They attempt to distinguish between internal and external sources of innovation. They conclude that the "customer" (client) is the most profitable external source of ideas, and that the "Marketing/Sales" and "R&D" departments are the most profitable internal sources of innovations (innovative ideas). Davila et al. (2012) advise that firms should rely more on internal capabilities of the organizations rather than external support. On the other hand, Moore (2006) argues that external sources of innovation can be indispensable and should be considered as important as the internal sources of innovation. For instance, the criticality of the client (an external source) to the development and retention of a dynamic organizational knowledge base is established (Gibbert et al., 2002, Tiwana and Ramesh, 2001). The notion that firms can improve their innovativeness by tapping users and clients for knowledge has become prominent in innovation studies. In fact, the customer is now viewed as a strategic asset and only sustainable source of competitive advantage in a knowledge economy (Drucker, 1993).

Construction contractors are in the business of project implementation. This offers what this study considers an invaluable opportunity for the generation of creative ideas. As Slaughter (1998) notes, problems solved on projects by researcher-practitioners could be continually codified as an effective internal source of creative ideas. This source of creative idea is

typically less costly and has faster turnaround time in relation to formal R&D and could become even more priceless during periods of economic crisis. Winch (1998) concludes that construction projects involve considerable problem-solving as the available collection of technologies and techniques is adapted and applied to meet a client's specific needs in interaction with the constraints of the site. However, for problem-solving to provide an effective source of creative ideas, "solutions reached for the particular problem faced on the project must be learned, codified and applied to future projects" (Winch, 1998). Winch (1998) concludes that management model appropriate for managing this process should take cognisance of the bottom-up flow of ideas through problem solving/learning. A key assumption here being the sufficiency of a firm's absorptive capacity (see section 3.13). It is also worth noting that the source of a creative idea does hold implications for how they should be managed. An externally sourced creative idea does follow a top-down flow of adoption/implementation, while an internally generated creative idea follows a bottom-up flow of problem solving/learning. These two processes that characterise the trajectories of the flow of ideas are distinct, thus, should be managed in different ways (Winch, 1998).

Four key sources of innovations for construction based firms are identified from literature. These are (i) the construction clients (ii) the employees and; (iii) firms in the supply chain (iv) universities/ polytechnics/independent research centres.

3.4.1 The construction client, a critical source of creative ideas

The criticality of the client to the development and retention of a dynamic organizational knowledge base is established (Gibbert et al., 2002). The notion that firms can improve their innovativeness by tapping users and clients for knowledge has become prominent in innovation management studies. In fact, the client is now viewed as a strategic asset and the main sustainable source of competitive advantage in a knowledge economy (Drucker, 1993). The current policy in the UK's construction industry identifies the experienced client as the "main institutional leader in stimulating construction innovation" (Winch, 1998). Kulatunga et al. (2011) argue that clients' demand for innovation has become one of the key drivers of innovation. Von Hippel (2005) remarks that the clients' demand for innovative ideas to cater for their changing requirements often compel designers to think "out of the box" to design innovative solutions. Similarly, McAdam and McClelland (2002) observe that clients are the most profitable external source of ideas. Unarguably, there have been significant

technological and environmental changes from the time when Henry Ford remarked that "if I had asked people what they wanted, they would have said faster horses", suggesting that customers/clients lack knowledge and do not know exactly what they want. Nevertheless, there is still a contrary view on the usefulness of the client as a source of innovation. This school of thought views clients/customers as a hindrance to innovation. They argue that customers cannot necessarily understand where a market or technology is heading, and they are perhaps unfit to be a source of innovations. Tveito (2015) concludes that if a firm is "too focused on fulfilling and responding to customers' immediate needs, they will avoid investing in what will become the disruptive and radical innovations driving the field forward". By eliminating ideas that do not instantaneously meet their clients' needs and requirements, some argue that these firms will fail over time as they cannot foresee or adapt to where the market is going (Clayton, 1997, Tveito, 2015). Steve Jobs, Co-founder of Apple Inc. claimed that Apple could not have designed their innovative and ground breaking products using focus groups, or customer knowledge, because "a lot of times, people don't know what they want until you show it to them" (Sager 1998) . Thus, the need for a thorough and in-depth study of the phenomenon especially as regards how it plays-out in the construction industry so as to build a robust evidence base for policymaking and to support managerial decision-making. Nevertheless, the most important factor here is that the firm possesses the appropriate absorptive capacity (see section 3.12.2) to not only identify external knowledge but also to "translate external knowledge inflows into tangible benefits, as well as a means to achieve superior innovation and financial results over time" (Kostopoulos et al., 2011).

Because fulfilling the needs and requirements of clients in the new product development process have often proved difficult and time-consuming (Tidd et al., 2001), thus, management researchers have not only prescribed closer client/user involvement during the development process, as a means of increasing the prospect of new product success (von Hippel, 2001) but also increasingly recommend the recognition of the experienced and knowledgeable client as a key source of creative ideas (Kulatunga et al. 2011, Winch, 1998). This it has been argued will engender a greater feeling of ownership of the innovation project by the client (Tidd et al. 2001). To this end, Tidd et al. (2001) find that clients with close interactions and information regarding a corporate enterprise are considered to be capable of coming up with ideas for future products that are perceived as being unique and of value.

3.4.1.1 Construction client – definition

A client literarily implies an individual or organization which freely decides to purchase or obtain a service or product, or both. Construction clients therefore, are individuals or organizations initiating the construction process through developing contract agreements with other parties to supply construction products with the acquisition of the final products at the end of any contractual commitment between them and the supplying parties (Chinyio, 1999). Green and Simister (1999) observe that construction clients can be any of the construction owner's representatives, acting on their behalf or the end user.

Most construction clients are individuals or groups often viewed as units of stakeholders, who might have different ideas, views, understanding and needs, sometimes in conflict with other stakeholders (Briscoe et al., 2004). Satisfying a client's requirements and needs is often a challenging task for even the smartest of organizations. Take for instance, a single construction client can hold a multiple and contradicting perspective of a building project.

3.4.1.2 Classification of construction clients

Attempts have been made to better understand the nature and behaviour of construction clients by classifying them according to their different attributes and the contributions they make to project outcomes. Clients' classification can also be based on their type of business and whether their primary source of business is constructing buildings, selling, leasing etc. or whether construction is a secondary source of their business requiring construction products to perform their main task (de Blois et al., 2011). There is also classification based on clients' levels of experience usually in the line of sophisticated client, partially experienced client, or inexperienced client.

3.4.1.3 Public and private clients

The striking difference between public and private clients is that for public clients, the motivation for projects is the satisfaction of a particular societal need. For the private client, the motivation is satisfying business needs, which in turn, is compelled by the pursuit of profit maximization for shareholders. Wong et al. (2000) submit that public clients are exposed to public scrutiny and deals with the lengthy procedure for public procurements. Thus, the public client tends to create rules aimed at eliminating issues that may increase public scrutiny and pressure. It is the view of this research that this makes public clients risk averse. Decisions by

public clients are often influenced by clients' experiences, legislations, statutory requirements and procedures, finances etc. It is notable that public clients account for over 95% of construction orders for the construction firms being case-studied. The actions of private clients on the other hand are impelled by their internal structure and business strategy (Boyd and Chinyio, 2008). Decisions by private clients are often influenced by their technical experience and civil specifications.

3.4.1.4 Experienced, partially experienced and non-experienced clients

Categorizing clients based on their level of experience provides a better understanding of their behaviour and decisions. Thus, uniformed clients who procure construction projects either sporadically or as a one-off are classed as "non-experienced clients"; those who procure small number of projects often after long intervals are classed as "partially experienced"; those who procure construction projects frequently are categorized as "experienced clients". The experienced client tends to be aware of the impact their built environment element will have on the wider environmental, economic, or social systems. They are more demanding and seek greater assurance or evidence about a range of issues, from sourcing of materials, to long-term performance of the built element (Chan et al., 2004). The more sophisticated clients adopting systems approach to whole-life management and value-based relationships (Chan et al., 2004). The sophisticated clients have come to be better informed in almost all areas of constructions and have higher expectations in terms of both the service and product delivered. Chinyio et al. (1998) find that experienced clients' – private or public – projects performance are more effective. This study finds preliminarily, that an overwhelming proportion of clients of construction contractors in Nigeria are in the category of "experienced clients". Whether the knowledge and experience they should bring to the table is adequately exploited by construction firms is right within the focus of this inquiry.

3.4.1.5 Primary and secondary construction clients

Primary clients are organizations which have construction as their main business activity and revenue earner. These can be Property Developers and Housing Associations. Secondary clients have construction as a minor part of their business scope. For instance, manufacturers, city councils etc. Primary clients tend to be repeat clients and are usually experienced. Thus, they can competently choose their procurement strategy and knows how

to deal with complexities inherent in a typical construction environment and the inherent uncertainty of the economic environment.

3.4.2 The employee as a key source of creative ideas

In today's dynamic global economy, creativity and innovation are indispensable requirements for organizational success. Unfortunately, creativity is often viewed as not important in the design and structure of organizations (Mumford and Simonton, 1997). Egan (2005) points out that "the presence and performance of creative people is essential to every organization whether in the public or private sector". The ability to dream, invent, solve problems, craft, and correspond in fresh, new ways is critical to organizational success (Egan, 2005). Mumford and Simonton (1997) add that "creativity and innovation are key requirements for the growth and adaptation of organizations". Consequently, innovative organizations not only seek creative thinkers but also ensure they are provided with an environment that nurtures their creativity. While it is historically established that organizations seek creative employees, recent research findings however, indicate that creativity can actually be imparted in the workplace (Bass, 1990). Simply put, employees can be groomed to be creative. Indeed, transformational leaders "inspire and excite their employees with the idea that they may be able to accomplish great things with extra effort" (Bass, 1990). Employees are intellectually stimulated by being shown new ways of looking at old problems by essentially seeing old problems as challenges to be solved and to emphasize rational solutions.

The problem however, is that the traditional, top-down, and hierarchical span of authority in the workplace continue to restrict employee creativity and ability to develop "out-of-the-box" solutions to old problems. McManus et al. (2007) argue that even in a less pressured environment, employees are unwilling to offer novel creative ideas because their ideas are often disregarded, devalued, taken by management with no recognition to the originator, or used to increase baseline work expectations for the hourly work force. So, the organization continues to deal with problems in its usual "in the box" solutions (Drucker, 2002). The work of McManus et al. (2007) offers us a simple framework on how to "break-out-of-the-box". The key according to McManus et al. (2007) "is in selecting the right people; providing them with "out-of-the-box" training; and placing them into an organization which utilizes transparent, trusting procedures that take advantage of the multiple talents and viewpoints which exist in that organization". In their study of 191 R&D employees in large chemical

company, Tierney et al. (1999) find that a positive correlation exists between creative output and (i) Employee Intrinsic Motivation (ii) an innovative cognitive style of supervisors and employees; (iii) supervisor's support for employee creativity (for less creative individuals).

Parvin and Kabir (2011) argue that in order to gain competitive advantage and adapt to the constantly changing environment, it is important for firms to achieve optimum efficiency by increasing employee satisfaction in the organisation. It is noted that employees who are satisfied with their job security, perform better than those who are not satisfied with their job security (Rosenblatt and Ruvio, 1996, Rosow and Zager, 1985). Similarly, individuals satisfied with their job security are often more committed to their organizations (Iverson, 1996, Rosenblatt and Ruvio, 1996). Furthermore, the erosion in the value of the naira and the steep rise in inflation rate imply a drop in employees' real wages. Parvin and Kabir (2011) find a positive correlation between employees' remuneration and job satisfaction. Tan and Waheed (2011) conclude that there is a relation between salary and job satisfaction. They add that "employees tend to be highly satisfied with their salary and job when they receive a desired raise". However, layoffs and lower wages could "increase individuals' willingness to take on greater risks and increase the availability of qualified labour during downturns" (Koellinger 2008 cited in OECD, 2012). Previous management research findings have often assured that creative potential of an organization's employees can only be released if these individuals are motivated by the knowledge that their ideas will be processed and that their organization's environment is receptive (Amabile, 1997). McAdam and McClelland (2002) add that the managers should provide systems to evaluate and then progress ideas generated. Kaplan (1960) finds that "managers of creative organisations often follow a participative management style, are receptive to new ideas, and allow their employees considerable autonomy". McAdam and McClelland (2002) view this as the whole organisation having "tolerance of the oddball". Nevertheless, as the effect of the economic crisis bites more intensively, managers will find that it will become more difficult to maintain an adequate level of funding that should ensure relative freedom for experimentations required to enable the flow of creative ideas in the organization. Finding ways to circumvent this difficulty could be a huge leap towards the ability to continuously implement innovations during economic crisis.

3.4.3 Firms in the project coalition, a key source of creative ideas

Innovation often occurs within a complex system of interactions between research, the knowledge base, invention, design, production, distribution and marketing, and existing or potential markets (Bakhshi and McVittie, 2009). It is noted that a broad range of dynamics does often influence the propensity for an individual firm to innovate. This includes access to new ideas from sources such as from other firms (Bakhshi and McVittie, 2009, Roy et al., 2004). To a large degree, this type of knowledge is tacit is nature, although measures such as patent citations provide a partial record of technical and scientific innovations by one firm building on knowledge generated by others (Bakhshi and McVittie, 2009). The work of Roy et al. (2004) finds that the greater the extent of buyer-seller interaction, the greater the generation of innovations in supply chain relationships. They add that the "greater the tacitness of technology associated with an innovation, the greater the impact of interaction on the generation of innovations in supply chain relationships". This is particularly relevant for firms operating in the construction industry where a substantial degree of knowledge resident is tacit in nature. It is also noted that the greater the IT adoption and integration between firms, the greater the impact of interaction on the generation of innovations in supply chain relationships (Roy et al., 2004).

Previous studies conclude that B2B relationships are important for the creative industries (Freeman, 2007, Andari et al., 2007). This finding is also implicit in Chesbrough's (2006; 2004; 2003) open innovation theory. Indeed, "almost 60 percent of overall demand for creative products within the UK comes from purchases by businesses" (Bakhshi and McVittie, 2009). Firms "obtain information from other businesses simply by observing, copying or adapting others' innovations" (Bakhshi and McVittie, 2009). Because knowledge that flows between businesses are often tacit and difficult to manage, Roy et al. (2004) advise greater integration of processes between firms in the supply chain. This integration according to Roy et al. (2004) should be moderated by IT.

3.4.4 Research centres/tertiary institutions, a key source of creative ideas

Research in Nigeria's institutions of higher learning comprising the universities, polytechnics and research centres has yet to make a real impact on the technological advancement of the country and the socio-economic well-being of its citizenry. Constraints hindering the research activeness of tertiary institutions in Nigeria include inadequate and irregular funding, poor

motivation, poor or obsolete research infrastructure, brain drain and rising workload resulting from deteriorating staff/student ratio (Yusuf, 2012). There is also the problem of establishing effective linkages between universities/research centres and industries. These constraints have also generally led to low research productivity (Yusuf 2012). However, tertiary institutions in Nigeria have been under increasing pressure to translate the results of their work into privately appropriable knowledge. Recent changes in government policies have incentivised tertiary institutions in Nigeria to increase their research activeness. It is now significantly easier for universities to retain the property rights to inventions deriving from federally funded research. At the same time, there is a rising level of competition for research grants. This has compelled many universities and research centres to turn to alternative sources of funding. Several universities, polytechnics and research centres have established technology licensing offices and are actively pursuing industrial support. A handful of smart research savvy firms are already exploiting the inherent benefits of the increased research activities in Nigeria's tertiary education system. Yet, establishing effective and reliable linkages between Research centres/Universities and industries have continued to prove difficult.

Indeed, the work of Henderson et al. (1998) conclude that since universities and research centres are in principle dedicated to the extensive dissemination of the results of their research, their spill overs are likely to be disproportionately large and may therefore be disproportionately important. Indeed, the role of higher education research in national economic development cannot be over-emphasised (SABETI et al., 2014). Therefore, establishing effective linkages with universities and research centres has been found to be a critical step towards ensuring a seamless flow of creative ideas even during economic crisis.

3.4.5 Summary – key sources of innovation

This section investigated the key sources of innovation for construction based firms. Contrary to the historical assumption that innovations typically emerge from within the organization, it has been established that sources of creative ideas external to the organization are as important (if not more) than the internal sources of creative ideas. It is argued that innovative organizations will often have to design an innovation strategy aimed at optimally and simultaneously exploiting the internal and external sources of creative ideas.

3.5 Innovation typologies

There have been suggestions that treating innovation as a generic heading for research is unhelpful and that the adoption of categories or typologies is more useful based on the characteristics or attributes of innovation being studied. Indeed, the taxonomy of technological change and market innovation remains a challenge in innovation studies (Van Dijk et al., 2014). Due to the copious number of dynamics involved in the origins, causes and implications of innovation, a plethora of typologies have been proposed, such as radical versus incremental innovation and the product-process distinction (Garcia and Calantone, 2002, Van Dijk et al., 2014). However, there are "two distinct yet balanced ways of referring to innovation in terms of a position on complementary axes or dimensions" Tidd et al. 2005 cited in Barlow, 2012). This research will refer to these "two distinct yet balanced ways" as (i) innovation typologies, and (ii) innovation forms. The innovation typologies focus on the categories of innovation for instance, "a new, changed or improved entity usually an artefact, a process, a system, or a business model" (Barlow 2012), while the innovation forms centre on the expression of the "scale or extent of change to and impact on the status quo" (Barlow, 2012). Barlow (2012) argues that literature "establishes a consistent and coherent framework" for adopting innovation typology as a "prelude to" innovation form which expresses the scale and degree of change.

3.5.1 Product innovation

Product innovations are usually associated with a search for technological competitiveness, based on high productivity rooted in quality advantages in niche markets for small firms, and in the control of new and dynamic markets for larger firms.

Product innovations, either incremental or radical ones, developed through internal (and external) innovative activities, increase the quality and variety of goods and may open up opportunities for firms' growth in output through larger quantities and/or prices. Conversely, process innovations lead to improvements in the efficiency of production of particular goods, lowering their prices, and are associated with investment embodying new technology.

3.5.2 Process innovation

Process innovations on the other hand, mainly emerge from a strategy of active price competitiveness dominated by a search for efficiency, where productivity growth is rooted in the increase of the capital intensity of production processes, thanks to the acquisition of new machinery in small firms, or to cost-cutting restructuring in large firms (Pianta, 2001). Such a distinction provides a new perspective for the analysis of firm size and innovation.

3.5.3 Distinction between product and process innovations

Although much of the available literature in this area generally focuses on highlighting the distinctiveness of product and process innovations, there is however, a notion that the interaction and relationship between the two is not fully understood (Abernathy and Utterback, 1978). This perspective stresses that product innovations often lead to process innovations, while process innovations are commonly needed in order to achieve a product innovation (Abernathy and Utterback, 1978). Nevertheless, a conceptual distinction can be made between product and process innovations (Antonucci and Pianta, 2002, Edquist et al., 2001). Indeed, whilst these two types of innovation are closely intertwined, and in many innovative firms they are often present together, they are however, the results of distinct innovative processes, pursuing different objectives with different means.

3.5.4 Position innovation

As highlighted by Schumpeter (1934), the exploitation of new markets typically involves the re-positioning of an existing firm, brand or product. Barlow (2012) contends that this process of positioning "reflects the elements of innovation". She adds that this level of innovation relies to a large extent on the expertise and skills of marketing and advertising. Francis and Bessant (2005) offer instances of position innovation as the emergence of "New Labour" in the 1990s, the rebranding of Daily Mail as a "Women friendly" newspaper, Lucozade as a drink for health rather than convalescence.

3.5.5 Paradigm innovation

This denotes a new way that disrupts and replaces an older, more traditional but less value-adding way, often essentially aimed at generating and sustaining increased value (Tidd et al., 2001). Paradigm innovations according to Barlow (2012) are often internally directed by shifts in values and power structures or externally directed, by reconfiguration of business models following for instance, mergers, alliances or acquisitions. A classic example of paradigm

innovation according to Barlow (2012) is offered by Henry Ford's change of the auto industry from a low volume production industry into a cheap, mass producing industry with its consequent infrastructural disruptions (eg. Fuel and roads).

3.5.6 Summary – innovation typologies

Both of these innovation typologies are inextricably linked and cannot be adequately explored in isolation. Besides, it is often the resulting process innovation that sustains the initial product innovation. For the purposes of the present study, a keen attention is paid to how investment in process technology relates to product innovation. Some advocates of investment in process innovation have seen it as an alternative to product innovation, especially if it permits existing products to be made at lower cost (this could be doubly important during economic crisis). The reverse is also possible: if products can be given a new lease of life through modifications made at low cost, this may be preferred to investment in sophisticated and costly equipment. It is commonly noted that process innovations are predominantly beneficial or appropriate for small firms, since by this means they can share in advanced technology developed by larger firms. The implementation of a proven process technology may also have the advantages of low risk and short-term payback. The drawback of relying on investments in process innovation, however, is that competitors can easily follow suit, eliminating the initial advantage achieved from the investment. While new products tend to put a firm ahead of its competitors, investments in available process technology merely transports a firm up to standard. From the viewpoint of regional development, nevertheless, it is important that the process technology used by local industry should be up to an adequate standard, since otherwise the region will cease to be competitive with other regions where investment in up-to-date technology is higher.

3.6 Innovation forms

This refers to the extent of novelty of innovation (whether product, process, practice or paradigm) compared to the status quo (Henderson and Clark, 1990) and degree to which the innovation impacts associated components and systems. Four of the widely-accepted classifications are those of (i) Abernathy and Clark (1985) (ii) Henderson and Clark (1990) (iii) Tushman et al. (1997) (iv) Chandy and Tellis (1998).

Abernathy and Clark's model (1985) views innovations according to their impact on the market knowledge and technological capabilities of the firm. A firm's technological capabilities could become obsolete while its market capabilities remain intact (Popadiuk and Choo, 2006). Abernathy and Clark's (1985) categorization is founded on the impact of an innovation on the technological and production capabilities of an organization – for instance, supplier relations, technical knowledge, skills and the market (Van Dijk et al., 2014). Henderson and Clark's (1990) model argues that new product development requires two types of knowledge; knowledge of a product's make-ups and knowledge of the linkages between components (Popadiuka and Choo, 2006). The former is often referred to as modular knowledge while the latter is described as architectural knowledge. A successful product development requires both types of knowledge which produces four kinds of innovation as seen in Figure 3.1 below. Tushman et al.'s (1997) model highlights technology cycles and innovations streams. In addition, it gives consideration to types of innovation according to impact on market knowledge and technology. Market knowledge is considered as ''new'' or ''existing''. Technological changes are either classified as ''incremental'' or ''radical''. Using these dimensions, four kinds of innovation are identified as shown in Figure 3.1 below. Similarly, Chandy and Tellis' (1998) model suggests that two common dimensions underlie most definitions of innovations: technology and markets. The first dimension determines the extent to which the technology involved in a product is new or different from previous technologies. The second dimension determines the extent to which the new product fulfils key customer needs better than existing ones. Combining these two dimensions leads to four types of product innovations, as shown in Figure 3.1 below.

(1) ABERNATHY and CLARK MODEL (1985)

Market knowledge	Technical capabilities	
	Preserved	***Destroyed***
Preserved	Regular innovation	Revolutionary Innovation
Destroyed	Niche innovation	Architectural Innovation

(2) HENDERSON and CLARK MODEL (1990)

Component knowledge	Architectural knowledge	
	Enhanced	***Destroyed***
Enhanced	Incremental innovation	Architectural innovation
Destroyed	Modular innovation	Radical innovation

(3) TUSHMAN et Al. MODEL (1997)

Market	Technology – (R & D)	
	Incremental	***Radical***
New	Architectural innovation	Major product, service innovation
Existing	Incremental product, service, process	Major process innovation

(4) CHANDY and TELLIS MODEL (1998)

Newness of technology	Customer need fulfillment per dollar	
	Low	***High***
Low	Incremental innovation	Market breakthrough
High	Technological breakthrough	Radical innovation

Figure 3-1: Four models of innovation forms and typologies. Source: Popadiuk and Choo (2006)

3.6.1 "Steady state" innovation

Often, an innovation emerges with limited and incremental impact on relationships with other products, processes or systems (Slaughter, 1998). Building on the work of Bessant et al. (2005), Barlow (2012) argues this flow of incremental change in an established framework of "dynamic stability" can be expressed as "doing what we do, but better". This "dogged pursuit of improvement" (Abernathy and Clark, 1985) is easy and cheap to manage simply because the associated risk factors are smaller and less uncertain of (Bessant et al., 2005). Consequently, innovation management prescriptions are often effective under these conditions of (relative) stability in terms of products and markets but have been found as less effective when elements of discontinuity come into the equation (Phillips et al., 2006). It has been argued that the "steady state of innovation offers substantial room for experimentation and exploration but within a particular space (Francis and Bessant, 2005).

3.6.1.1 Incremental innovation

Incremental innovation refers to minor improvements to an already existing artefact. Henderson and Clark (1990) conclude that incremental innovation optimises "the potential of the established design". Similarly, Daft (2007) submits that incremental innovation concerns system tweaks to improve or extend technological or organizational processes. Bessant et al. (2005) find that whilst minor and commonplace, the aggregate benefit of incremental

innovation to an organization can be substantial. Barlow (2012) remarks that "incremental innovation occurs through established management structures and normal business processes, and maintains the equilibrium or status quo", affecting just the innovating aspect of the organization (Daft 2007) and strengthening overall organizational capabilities (Henderson and Clark 1990).

3.6.1.1 Modular innovation

The work of Henderson and Clark (1990) extends the scale of incremental and radical innovation, availing us a better understanding of the innovation phenomenon. This highlights the relationship between innovation in the units of a product or service and the impacts of such innovation in the product or service architecture. This is depicted in Henderson and Clark (1990) model as seen in Figure 3.1 above. Barlow (2012) notes that a modular innovation "describes a significant change in a discrete component that has minimal or no effect on related products and processes and thus is self-contained".

3.6.2 Innovation "beyond the steady state"

Bessant et al. (2005) submit that the environment within which organisations operate is most times (relatively) stable. However, occasionally something happens which disrupts this stability and thus, changes the rules of the game. These are often rare events but have the potential to redefine "the space and boundary conditions" – not only opening-up new opportunities but also challenge existing players to reconfigure what they are doing in the context of the new conditions (Bessant et al., 2005). This is a central argument in Schumpeter's "creative destruction" theory. Economic crisis is an example of these rare but significant events. Innovations which emerge from these disruptive effects are referred to as innovations "beyond the steady state" and will be discussed below in four strands – disruptive innovation, discontinuous innovation, architectural innovation and radical innovation. Table 3.1 below highlights the four strands of innovation "beyond the steady state" and their literature support.

Table 3-1: Innovation "beyond the steady state"

TERM	SUMMARY	KEY LITERATURE SUPPORT
Disruptive	Evolving market demand disrupts the market	Christensen (1997)
Discontinuous	External triggers requiring divergent approaches to the management of organizational innovation.	Abernathy and Clark (1985)
Architectural	Organizational culture and behaviour is altered. Failure to adequately manage change could impact organizational outcomes.	Henderson and Clark (1990)
Radical	Impacts the "innovating entity" as well as sectors and other organization in the innovation coalition	Ettlie, Bridges and O'Keefe (1984)

3.6.2.1 Disruptive innovation

The emergence of new market with the corresponding expression of a range of new or different demands and expectations has been acknowledged as a trigger for innovation (Christenson, 1997). Thus, firms should react to these emerging and changing demands by changing what they offer in order to meet these new requirements. In addition, firms are encouraged to find a balance between managing steady state innovation and responding to market disruption (Tidd et al., 2005).

With relevance to this research, OECD (2005) points-out that economic crisis often alters the demand pattern, with clients' needs and requirements frequently changing during economic turbulence. Hence, radical innovations are required if the needs of these "significantly altered markets" are to be met. The work of Anthony and Feinzaig (2008) validates this stance. They conclude that previous economic crises have not hindered disruptive innovations.

3.6.2.2 Discontinuous innovation

Discontinuous innovation refers to radically new products that involve dramatic leaps in terms of customer familiarity and use (Veryzer, 1998a). Schumpeter's theory of "creative destruction" is implicit here with firms developing products or processes as instigated by changes in technologies or knowledge, with these technologies and knowledges becoming new industry standards (Barlow, 2012). The market therefore, changes "from within", driven in a dynamic "demand –pull" pattern (Clark and Juma, 1988 cited in Barlow, 2012). An

appreciation of the peculiar challenge in managing discontinuous innovation and the key success factors according to Veryzer (1998) is key to the development of radically new products/services.

3.6.2.3 Architectural innovation

Slaughter (1998) characterizes an architectural innovation as any alteration in a component that involves major transformations to related components and systems, extending to other organizations involved in the process. This recognizes that innovation "does not occur in a solipsistic organizational vacuum" according to Barlow (2012), and provides a conceptual setting for the research which focuses on construction contractor firms who often work together with other organizations on construction projects.

3.6.2.4 Radical innovation

Radical innovations require a fundamental shift in perspective and is characterized by Schumpeter's idea of "Creative destruction" (Barlow, 2012). At a firm's level, radical innovation disrupts the status-quo and transform's organizational capabilities. The work of Ettlie, Bridges and O'Keefe (1984) finds that radical innovation impacts the "innovating entity" as well as sectors and other organization in the innovation coalition

3.6.3 Summary – innovation forms

This section investigated the various forms innovations take. The concise notes as contained in Table 3.1 provide a helpful and rational explanation of the features of and responses to the four expressions of innovation "beyond the steady state". It has been argued that this form of innovation is best suited for periods of economic crises (Anthony and Feinzaig, 2008) bearing in mind that market needs and requirements are often substantially altered during economic crisis. It is noted that this could require changes to the organizations' internal architecture and more importantly, may re-define organizations interactions within project coalitions. On the other hand, the steady state innovations are often focused on improving an existing product's development efficiency, productivity and competitive differentiation.

3.7 The innovations process

In some of the broadest conceptualizations, the innovation process has been portrayed to encompass stages of design and development, adoption, implementation, and diffusion. Although, narrower conceptualizations are commonly encountered in the innovation literature (Slappendel, 1996). Examples of this (narrower conception) argues (Slappendel, 1996), are the models of product innovation process which focus on the initial phase of design and development and the diffusion models which are concerned with the later stages of the innovation process. Besides, studies of innovation typically centre on different levels of analysis. Indeed, various approaches have been adopted to the modelling of innovation processes (Adams et al., 2006). For instance, McAloone et al. (2004) conceptualize the innovation process "as a circular process, similar to a learning process". They argue that the input is commonly, some kind of stimuli and the output, a product concept. McAloone et al. (2004) framed understanding of the innovation process is illustrated in 3.3 below:

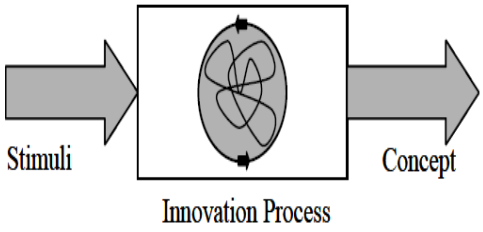


Figure 3-2: Innovation process as a circular process. Source: Adapted from McAloone et al. (2004)

Other conceptualizations are; as a succession of events (Zaltman et al., 1973), as a series of transactions (Nelson and Winter, 1982), as a social interaction (Voss et al., 1999) and as a process of communication (Phaal et al., 2000). Furthermore, the innovation process discourse is somewhat characterised by an increasingly important contention concerning the extent to which events and activities within the process occur. Zaltman et al. (1973) contend that the innovation process consists of linear, sequential, identifiable and discrete stages. In contrast, Fitzgerald and van Eijnatten (2002) maintain that the innovation process is chaotic. They suggest that "nothing ever happens quite the same twice, and yet everything happens in an orderly enough way to preclude complete and utter mess" (Fitzgerald and van Eijnatten,

2002). Similarly, (King, 1992) argues that the innovation process is inherently disorganized and complex, inferring that it cannot be replicated and managed.

Similarly, there are divergent submissions by researchers as to what is the best model for controlling the quality and speed of the various successive elements of the innovation process. Cooper (1990) provides us with a seminal work on this. His stage-gate process model attempts to divide the innovation process into phases or gates. Other methodologies as advanced for innovation project management control include Phased Development (Balla et al., 2001), Product and Cycle-time Excellence and Total Design (Jenkins et al., 1997). Adams et al. (2006) observe that these methodologies "have in common the separation of the product development process into structured and discrete stages, with each having milestones in the form of quality control checkpoints at which stop/go decisions are made with regard to the progress of the project". The trajectory of the innovation process isn't as well-defined. The reason for this mostly stems from the peculiarity of the constructed product. Winch (1998) describes the constructed product as "complex product systems" (pg. 270).

3.7.1 Management of the innovation process

Available literature are in harmony that "the organizational processes followed by the firm in order to integrate strategic learning across functional and divisional boundaries" are key strategic problems deserving of managers' attention (Gann and Salter, 2000, Tidd et al., 1997). The perceived organizational climate for innovation in terms of resource supply and support for innovation can significantly motivate team members and consequently influence their innovation efforts. Indeed, previous scholarships have shown that it is not the absence of ideas that deters innovation in construction, but rather the decision to use them or the environment that influences them (Nam and Tatum, 1992b). Reviewed literature approaches the question of the right "organizational culture and structure" appropriate for innovation in a variety of ways. Some management scholars conceive innovation as an outcome and consequently, attempts to determine the contextual, structural and process conditions under which organizations would innovate (Damanpour and Gopalakrishnan, 1998, Kimberly and Evanisko, 1981). While others view innovation as a process and attempt to understand how this process emerges, develops and becomes embedded in organizational routine (Schroeder

et al., 1989, Dean, 1987). Nevertheless, reviewed innovation management literature largely agrees that "having a supportive organizational context within which creative ideas can emerge and effectively deployed" (Tidd et al., 1997) is critical to innovation management. Furthermore, reviewed literatures are in harmony that the recipe for attaining the right culture and structure for innovation includes work "organization arrangements, training and development, reward and recognition systems and communication arrangements" (Tidd et al., 1997). The requirement in a nutshell, is to create the right conditions within which a learning organization can begin to function, with shared problem identification and solution coupled with the ability to capture and accumulate learning. However, given the large number of actors involved in any given project, with each individual firm controlling only one element of the overall process, effective communication is impaired giving rise to incongruent and discordant effort (Barlow, 2000). Besides, the often rigid and hierarchical structure of project-based organizations dampens innovation in construction. This traditional approach to managing projects has long elicited criticisms from researchers and managers alike (Winch, 2000, Koskela and Vrijhoef, 2001). Winch (2000) reveals that the allocation of hierarchical roles bears important implications for innovation. He explains that the "construction process is generally managed by dividing work into discrete packages, which are often procured sequentially and then completed by specialists". This often results in project workflow interruptions. The only practicable approach to manage the risks caused by such interruptions according to Blayse and Manley (2004) "is to institute cascading legal contracts that pass risk down the supply chain (for example, from contractor to subcontractor)". This generates more preference for tried and tested approaches and significantly limits organizations' ability and willingness to innovate (Blayse and Manley, 2004).

3.8 Barriers to innovation in construction based firms

Hadjimanolis (1999) remarks that one of the several approaches to innovation inquiry is a focus on the main barriers, i.e. obstacles to innovation usually as perceived by the top managers of the firms. The idea behind the barriers approach is that once inhibitors of innovation are identified, their effects are understood and action is taken to eliminate them, then the natural flow of innovation will be re-established (Hadjimanolis, 1999). Innovation, however, requires motivation, extraordinary effort and risk acceptance to proceed (Tidd et al., 1997).

Following a review of literature on innovation and innovation persistence with particular focus on the construction industry, a number of barriers to innovation in organizations have been identified. For the benefit of the current study, these are barriers to the flow of the innovation process in construction industries across the world. These barriers have been extensively investigated by previous studies and are therefore empirically established. Some of these barriers are:

3.8.1 Nature of construction and the constructed product

The one-off nature of construction projects and its damaging implication for innovation has often been viewed by critics as the reason why construction innovation lags behind other industries say for instance, manufacturing (Blayse and Manley, 2004, Gann and Salter, 2000). They argue that tacit knowledge is often lost in between projects. Dubois and Gadde (2002) conclude that one of the challenges of construction's one-off nature is "discontinuities in knowledge development and in transfer of knowledge within and between organizations, and restraints on the developments of an organization memory". Similarly, the one-off and bespoke nature of most construction projects inhibits the extent to which a given innovation will be applicable to other situations, reducing the benefits of innovation and thus incentive to innovate (Blayse and Manley, 2004). There is also the tendency to develop different solutions to identical client requirements, meaning that organizational learning is hampered (Barlow, 2000). Besides, Miozzo and Dewick (2004) observe that the nature of the constructed product itself impairs innovation. The point here is that the constructed products are typically required to be long-lasting. This is ill-suited to creating conditions required for innovation. Blayse and Manley (2004) submit that this has two negative consequences for innovation. The first according to Blayse and Manley (2004) "is that it creates a preference for tried and tested way of doing things". The other is that the durability (and longevity) of buildings and infrastructure places pressure on suppliers to retain stocks of spares far into the future, reducing the incentive for manufacturers to change product ranges (Blayse and Manley, 2004). Another salient consequence of the constructed product longevity is that being required to stock up spares (inventories), the firm's resources are tied down, its structural flexibility is eroded hence ability to quickly react to any change in the external environment or customer requirement is compromised.

3.8.2 Structure of production in construction

There is also a bi-dimensional perspective on how organizations structures influence innovation. Structural variables explored in previous innovation studies are categorized under two constructs – organizational complexity and bureaucratic control. Organizational complexity construct typically focuses on the influence of specialization, functional differentiation and professionalism on organizational innovation (Damanpour, 1996). Damanpour (1991) discusses control bureaucracy which encompasses formalization, centralization and vertical differentiation negatively impact organizational innovation.

Furthermore, there is a general acceptance by scholars that construction innovation involves an extensive range of participants within a "product system" (Blayse and Manley, 2004, Marceau et al., 1999). This diverse range of participants as reflected in 3.3 below reinforces the importance of putting in place, an active network between them (Gann and Salter, 1998).

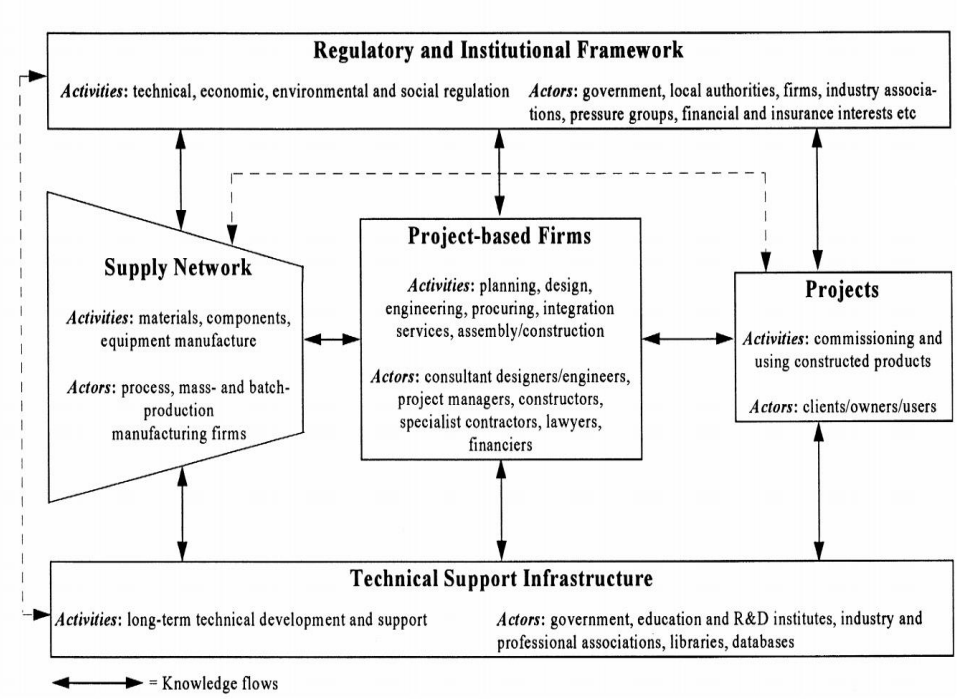


Figure 3-3: Participants in construction product system (Source: Gann and Salter, 1998)

When considered as a "product system", it becomes apparent that construction is "partly manufacturing – supplies and materials, components, equipment and partly services – engineering, design, surveying, consulting, even hire and lease and management" (Blayse and Manley, 2004). This highlights the challenge of coordinating and at the same time controlling

a large number of variables that characterize different products and services and their transformation into finished products (like road, airport, office block or 'hospital). A consequence of this is that innovation in construction could emerge from any of the participants (Blayse and Manley, 2004). However, given the large number of actors involved in any given project, with each individual firm controlling only one element of the overall process, effective communication is impaired giving rise to incongruent and discordant effort (Barlow, 2000). Besides, the often rigid and hierarchical structure of project-based organizations dampens innovation in construction. The traditional approach to managing projects has long elicited criticisms from researchers and managers alike (Koskela and Vrijhoef, 2001, Winch, 2000). Winch (2000) reveals that the allocation of hierarchical roles bears important implications for innovation. He explains that the "construction process is generally managed by dividing work into discrete packages, which are often procured sequentially and then completed by specialists". This often results in project workflow interruptions. The only practicable approach to manage the risks caused by such interruptions according to Blayse and Manley (2004) "is to institute cascading legal contracts that pass risk down the supply chain (for example, from contractor to subcontractor)". This generates more preference for tried and tested approaches and significantly limits organizations' ability and willingness to innovate (Blayse and Manley, 2004).

3.8.3 Contract procurement system

The presence of a finely-integrated project team is a critical feature of every innovative procurement system (Walker et al., 2003). This according to Blayse and Manley (2004) often involves "partnerships alongside fixed cost contracts to improve communication, learning, and innovation outcomes in projects". Scholars have long criticised the traditional lump-sum, fixed –price contract system. At the heart of this criticism is the realization that this type of project procurement is mostly conservative, and fundamentally detrimental to innovation (Walker and Hampson, 2003). This and other traditional contract procurement systems tend to "discourage construction firms from risking the adoption of non-conventional processes and products by emphasizing speed and urgency or by encouraging competition on the basis of price alone" (Kumaraswamy and Dulaimi, 2001). Construction firms react to this by establishing rigid roles and responsibilities, or by encouraging "adversarial self-protective behaviours" (Blayse and Manley, 2004). Other procurement systems available to construction

clients apart from the traditional lump-sum, fixed price contracts highlighted above are; guaranteed maximum price, design-build, full-cost reimbursable, BOOT (build, own, operate and transfer) etc. Blayse and Manley (2004) add that "for more complex projects, a design-build, construction management, project management, or BOOT style arrangement can have good innovation outcomes". These project contracting methods according to Kumaraswamy and Dulaimi (2001) integrate design and construction functions, bringing about an improved design constructability and economy, through innovation. Communication, learning, and innovation are also improved across the supply chain through management by a single entity. In addition, incentives for innovation are enhanced as there is better opportunity for capturing benefits (Walker et al., 2003; Kumaraswamy and Dulaimi, 2001). The procurement of built assets within the public sector in Nigeria follows the traditional contracting approach. Aje et al. (2016) argue that "the traditional contracting approach is axiomatically characterized by the dichotomy between design and construction". The Architect makes a design brief for the client, which is then handed over to the Quantity Surveyor to prepare the preliminary estimates (Aje et al. 2016). These documents are sent to the Due Process Office for benchmarking and used for the preparation of tender documents. The open tendering system is commonly adopted whereby adverts are placed in newspapers and interested contractors may then indicate interest. Contractors are often chosen based on the lowest bidder and rarely on technical expertise or innovativeness. Aje et al. (2016) point out that the drawbacks of the traditional contract procurement approach mostly adopted in Nigeria are; unrealistic construction periods, contractors bidding at unreasonably low prices just to make sure they get the job, incomplete documentation and lack of project and site analysis prior to preparation of documents due to the unreasonable time limit given to consultants to prepare contract documents. It is noted that these problems as enumerated by Aje et al. (2016) have in turn caused delay in project execution, delay in project completion, high levels of variation, additional works to project thereby increasing the contract sum, project abandonment etc. and ultimately impact innovation.

3.8.4 Inadequate organizational resources

Supposing that the presence of external conditions favourable for innovation is a given, continuous innovation may not be achieved unless organizations put in place the right attitudes and processes conducive for innovation (Blayse and Manley, 2004). This work will

follow Blayse and Manley (2004) to categorize these attributes as “organizational resources”. These resources comprise the following; the existence (or otherwise) of the right culture for innovation within the organization, the capacity to successfully exploit the open innovation concept (adopt innovations developed elsewhere), the presence (or otherwise) of key individuals whom scholars often refer to as “innovation champions”, the presence or not of an appropriate funding regime, knowledge codification and retention capabilities, and a subsisting innovation strategy finely tuned-in with the organization’s internal and external environments (Blayse and manley, 2004). It is worth mentioning that it is indeed this factor that gets mostly impinged during economic turbulence.

3.8.5 Industry regulators

In order to ensure that standards and clients’ changing requirements are consistently met, regulatory bodies (often statutory) exercise significant influence in determining the direction of technological change (Gann and Salter, 2000). Whilst there is little or no doubt that a well-regimented construction industry would ensure standardization of product/service quality, however, creative ideas generally do not emerge from rigid and well-ordered situations; hence some scholars have viewed this “interference” as an impediment to construction innovation (Blayse and Manley, 2004; Dubois and Gadde, 2002; Veshosky, 1998; Pries and Janszen, 1995). The argument tendered by opponents of ‘over-regulation’ is underpinned by the tendency for regulatory requirements to be prescriptive, severely limiting the available means to achieve an end.

3.8.6 Lack of project collaboration

Maintaining and expanding the breadth of effective collaboration within project coalitions has been a key problem affecting construction based firms (Shelbourn et al., 2007, Phelps and Reddy, 2009) and this inhibits innovations (Faems et al., 2005). Straus (2002) sees collaboration as problem solving and consensus building. Achieving an effective collaborative functioning is often demanding, largely because individual organizations, units and professionals have diverse aims, culture, and mandates (Corwin et al., 2012). This challenge is further intensified in complex projects which are commonly characterized by multiple interconnected parts. Overcoming these differences to forge productive collaboration is a key challenge to the implementation of innovative ideas. Ansell and Gash (2012) advise that sufficient time, trust and interdependence are the core components of successful collaboration.

3.8.7 Lack of knowledge

A study conducted by Veshosky (1998) finds that a lack of information is a key barrier for innovation. Construction is an industry bedevilled by an incessant loss of knowledge often due to the tacit nature of knowledge in the industry (Egbu, 2004, Scarborough et al., 1999, Nonaka and Takeuchi, 1995). A thorough review of literature focusing on knowledge management in construction highlights an overwhelming emphasis on information technology (IT) (Egbu et al., 2001, Scarborough et al., 1999) as a panacea to the loss of knowledge in the construction industry. In the case of Nigeria, Radwan and Pellegrini (2010) suggest a closer link between "academic science and industrial technology".

3.8.8 Innovation barriers specific to Nigeria's construction industry

Barriers to firm level innovations peculiar to Nigeria's construction industry as identified from literature are presented in Table 3.3 below.

Table 3-2: Innovation Barriers Peculiar to Nigeria's Construction Industry

S/N	INNOVATION BARRIERS PECULIAR TO NIGERIA	LITERATURE SUPPORT
1	Waste in construction processes	Gidado (2004)
2	High cost of construction materials	Erguden (2001)
3	Lack of primary infrastructure	Akeju (2007)
4	Corruption	Adeleye et. Al. (2009); Egbetokun et al. (2008)
5	Unpredictable government polices	Egbetokun et al. (2008)
6	Inefficient supply chain	Oladapo, (2011)
7	Weak customer demands	Egbetokun et al. (2008)
8	Lack of skilled personnel	Egbetokun et al. (2008)
9	Legal restrictions	Egbetokun et al. (2008)
10	Uncertain domestic economic conditions	Egbetokun et al. (2008)
11	Lack of information on technology	Egbetokun et al. (2008)
12	Lack of financing and high interest rate	Egbetokun et al. (2008)
13	Unfair tariff regime	Egbetokun et al. (2008)
14	Long approval process within firm	Egbetokun et al. (2008)

These innovation barriers according to (Hadjimanolis, 1999) “may act on one or more points of the innovation process”. However, there is need to identify their specific point of impact in the innovation process and to measure their effects or consequences (Hadjimanolis, 1999). For instance, if the innovation process is imagined as a simple linear sequence of stages from the adoption of innovation through implementation (Godin, 2006), the effect of a barrier is possibly greater in one stage of the process than during another stage (Hadjimanolis, 1999). Furthermore, it has to be noted that some of the innovation barriers identified may in fact even act as innovation stimulants in some cases rather than inhibitors (Anthony and Feinzaig, 2008). Some of the identified barriers to innovations are endogenous to the organisation (Piatier, 1984). It is argued that the organisation can in most cases, eliminate or lessen the effects of these inhibiting factors resident within the organisation. On the other hand, organizational units cannot in most cases control their external environment. It is the view of the current research that the only option left for organisational units is to attempt to understand the dynamics of their often-turbulent external environment with a view to finding effective management mechanisms with which they can make most of their external environment.

3.8.9 Summary – barriers to firm-level innovations

This section identified barriers to firm level innovations in the construction industry. These identified barriers were broadly categorised into two. These are; generic barriers that are applicable to most construction industry across the world and barriers specific to Nigeria’s construction industry. This work identified the nature of the constructed product, structure of production in construction, contract procurement system, inadequate organizational resources, overbearing industry regulations, lack of collaboration and lack of knowledge as the key generic barriers that often cut across construction industries globally. As regards specific barriers to firm level innovations in Nigeria, this work found corruption, lack of equitable financial arrangements and uncertainty of payment, high cost of innovating, uncertain domestic economic conditions (e.g. economic recession, inflation etc.), lack of financing, legal restrictions, lack of information on technology, weak customer demands, lack of skilled personnel and long approval process within firm as the key factors in this regard.

3.9 Conditions necessary for innovations to thrive in organizations

Most modern construction firms understand the importance of continuous improvement in the value they offer and how they offer it. However, quite a number of these firms do not understand that breeding and nurturing innovation requires specific environment (Maxamadumarovich et al., 2012). Hence, they lack the basic knowledge of how to put in place the right conditions for innovation to flourish. This conducive environment within which innovation thrives has often been referred to as "the innovation ecosystem" (Jackson, 2011, Rohrbeck et al., 2009, Adner, 2006). Maxamadumarovich et al. (2012) submit that the innovation ecosystem entails a complex range of economic, legal and societal inputs that lets innovation to flourish. Similarly, Jackson (2011) argues that an innovation ecosystem models the economic dynamics of the complex relationships that are formed between actors or entities whose functional goal is to enable technology development and innovation. She adds that the actors in this "complex relationship" would include "the material resources (funds, equipment, facilities, etc.) and the human capital (students, faculty, staff, industry researchers, industry representatives, etc.) that make up the institutional entities participating in the ecosystem (e.g. the universities, colleges of engineering, business schools, business firms, venture capitalists (VC), industry university research institutes, federal or industrial supported Centres of Excellence, and state and/or local economic development and business assistance organizations, funding agencies, policy makers, etc.)". Fagerberg and Srholec (2008) find that in a national context, antitrust and competition regulation, education, finance, intellectual property, international trade, labour and taxes policies of the government may be either supportive or discouraging factors for innovations. The work of Terziovski and Power (2007) categorizes four fundamentals in the national context critical for countries wishing to 'catch up', namely; (a) the development of an effective innovation system, (b) the quality of governance (c) the character of the political system and (d) the degree of country's openness. In a firm level, Morris (2011) considers the integration of innovation methodology, innovation culture and leadership aspects of practice in the company as the most critical factors in enabling innovations to occur in permanent manner. The key drivers of innovative organizations have been submitted as; committed leaders (Martins and Terblanche, 2003), a highly developed innovation strategy (Hansen et al., 2009), "top-down" and "bottom-up" communication processes supported "first-to-market" philosophy of new products (Blayse and Manley, 2004). In addition, NPD strategy (Goffin and

Mitchell, 2005), e-Commerce (Amit and Zott, 2000) and Sustainable development orientation (Klewitz and Hansen, 2014) are seen as both effective enablers and drivers of organization level innovation. The critical success factors for firm level innovations as identified from literature are presented in Table 3.3 below.

Table 3-3: Conditions necessary for innovations to thrive in organization

S/N	KEY SUCCESS FACTORS	LITERATURE SUPPORT
1	Presence of innovation champion	Klerkx and Aarts (2013), Howell and Sheab (2001)
2	Committed leadership	Martins and Terblanche (2003), Nam and Tatum (1997)
3	Appropriate organization culture	Jiménez-Jiménez and Sanz-Valle (2011), Jaskyte and Dressler (2005)
4	Flat organizational structure	Townsend et al. (1998), Dalton et al. (1980)
5	Adequate resources	Huang et al. (2001), Kimberley and Evanisko (1998)
6	A learning organization	Kontoghiorghes et al. (2005), Hurley and Hult (1998)
7	Motivated staff	Hooley et al. (2005), Vossen (1998)
8	Well-trained staff	Macdonald et al. (2007), Romijn and Albaladejo (2002)

Other innovation influences

There are other factors that may not be construed as squarely within the domains of 'critical success factors' for innovation but are important considerations when attempting to predict a firm's capacity and potential to innovate. Government support, firm size, firm age, patenting and clustering are some of these factors. These are briefly discussed below.

3.9.1 Government support

Government backing in the form of favourable policies, and fiscal incentives are known to stimulate innovations. The work of Guellec and Van Pottelsberghe de la Potterie (1997) finds that "both fiscal incentives and direct subsidies stimulate private R&D investments, at least in the short run". This is even more critical for firms in developing countries in Nigeria whose

operations are often bedevilled by inadequate infrastructures and administrative bottlenecks.

3.9.2 Firm Size

Firm size has been identified by several studies as an indicator of a firm's likelihood to be innovativeness or otherwise (Roger, 2008; Vaona and Pianta 2008). The central idea of these studies is that larger firms are often more innovative than small firms (Roger 2008, Vaona and Pianta 2008). Their argument is founded on the premise that large firms have stronger cash flows to fund innovation and that larger firms may have higher assets to use as collateral for loans (Roger 2008, Vaona and Pianta 2008). Nonetheless, a handful of studies have argued to the contrary. For instance, the work of De Jong and Marsili (2006) finds that small firms can perform better in terms of innovations than large firms.

3.9.3 Firm Age

Research findings indicate a positive correlation between a firm's age and level of experience and this has been identified as an important factor when predicting the innovativeness or otherwise of an organization (Balasubramanian and Lee, 2008, Sørensen and Stuart, 2000). The work of Sorensen and Stuart (2000) explores the relationship between firm age and innovation. They provide "evidence that older firms generate more innovations (patenting rates)". They add that "this gain in competence to produce innovations comes at a price; namely, divergence between organizational competence and environmental demands". Also, there is a growing research interest on the link between firm type (typically, incumbent versus entrant) and the nature of an innovation (e.g., incremental versus radical). This spectrum of the innovation research reasons that established firms may or may not be better at innovating than new entrants and that it all depends on the nature of the innovation process. They argue that established firms may be at an advantage in implementing incremental innovations but might be worse-off if the new product compels a substantial departure from their core capabilities (Balasubramanian and Lee, 2008). For instance, Henderson and Clark (1990) find that architectural innovations tend to destroy the existing knowledge embedded in the structure and systems of established firms. Thus, in this type of innovation, incumbents may actually prove less innovative than entrants (Balasubramanian and Lee, 2008).

3.9.4 Patenting

Patenting is considered a possible safeguard against perceived barriers to the innovation process - internal barriers, risk and cost-related barriers and external barriers to innovation (Peeters and de la Potterie, 2006). Therefore, it can be viewed as a critical success factor for enabling innovations. Findings from previous research report a positive correlation between patenting and innovation (Jaffe and Lerner, 2011, Trajtenberg, 1990). Although, Boldrin and Levine (2008) argue that "patent protection is detrimental to product market competition and thereby to innovation". This argument against patenting is wholly founded on the negative impact it has on the breadth of Knowledge.

3.9.5 Clustering

This factor falls within the domains of Chesbrough's (2006, 2003) open innovation theory. Chesbrough recommends that organizations should not only look inwards for creative idea generation but also pay close attention to the potentials of external linkages in the generation of creative ideas. In reality, firms using internal and external resources more intensively have higher levels of innovation output (Oerlemans et al., 2001). The importance of including inter-organisational linkages in the analysis of innovation is underlined by this result.

3.9.6 Summary – Conditions necessary for firm level innovations

The present study finds that paradoxes characterize the identified critical success factors for innovation implementation. For instance, organizational slack e.g. inventories or unutilized funds (March 1981) is commonly viewed as a positive factor but could also be seen as an inhibitor against resource flexibility and nimbleness and by extension against the strategic flexibility conducive for innovations (March 1981). Likewise, a flat and flexible organizational structure often prescribed by management scholars (Blayse and Manley 2004) as the ideal structure for an organization to speedily and successfully exploit ideas could only in reality be important at the earlier stages of an innovation process (if we go by the linear process model). In fact, bureaucratic and rigid organizational structure are often required at the product/service validation and launching stages of the innovation process in order to ensure that product/service standards are not comprised and do consistently meet regulators' and customers' requirements.

Nonetheless, this work attempts to extend the critical success factors for firm level innovations to include the essential factors required for persisting with innovation during economic crisis. This is specifically dealt with in section 4.8.

3.10 Innovation management models currently available and their level of efficacy during economic crisis.

Attention focuses primarily on how innovation in organizations can be carried out most successfully. The convergence of experience around successful innovation management routines has given rise to a 'good practice' model which embeds some key guidelines or design principles for effective innovation management (Shavinina, 2003, Dodgson, 2000). It is unsurprising that most innovation management studies take a normative posture focusing on how to innovate successfully (Ortt and van der Duin, 2008). Their adoption still requires extensive configurations to suit specific circumstances but the emergent model provides a starting point for such organisational development. In particular, it can be utilised as a "structured framework against which organisations can begin a process of audit and consequent organisational development activity" (Chiesa et al., 1996).

Given that innovation management has changed considerably over the last five decades, it appears that every timeframe has its own conceptualisation of what are best practices in this regard. Consequently, it is reasonable to conclude that the innovation generations description by Rothwell (1994) are largely what constitute the dominant models of best practices at every stage of the innovation management historical trajectory. In reality, innovative organizations do not follow the best practices as prescribed by the dominant models of their time rather they manage their innovation process based on their specific context (Ortt and Van der Duin, 2008). Ortt and Van der Duid (2008) argue that the "idea of a single set of dominant best practices of innovation management within a specific historical period no longer holds instead modern organizations adopt a more context-based approach". Most organizations manage their innovation processes in an informal way contrary to what is assumed in the concept of innovation generations (Ortt and Van der Duid, 2008). Indeed, many organizations continue to apply intuitive and informal techniques to innovate (Hanna et al., 1995, Griffin, 1997) and quite a few of these organizations have been very successful (Griffin 1997). There is also the suggestion that organizations could adopt broadly disparate approaches to innovation, and yet arrive at similar innovation outcomes (Brown and

Eisenhardt, 1997). Moreover, different approaches to innovation may be adopted within a single organization (Van Den Elst et al., 2006, Ortt and van der Duin, 2008). The point here is that different conditions demand different kinds of processes or even approaches. Thus, Ortt and Van der Duid, (2008) dismiss the idea of innovation management generations as almost obsolete. Indeed, the suggestion of a mainstream approach to innovation management is simply not consistent with realities on ground. Tornatzky and Fleischer (1990) conclude that innovation cannot be understood without careful attention to the personal, organizational, technological, and environmental contexts within which it takes place. Wolfe (1994) accepts that there can be no convergence among innovation management scholars. His suggests that: (a) there can be no one theory of innovation, as the more we learn, the more we realize that 'the whole' remains beyond our grasp; (b) numerous adequate, limited, theories of innovation exist, but each applies under different conditions. Consequently, Wolfe (1994) recommends that "researchers' efforts should be directed at determining the contingencies that govern various innovation theories". He argues that given the complex, context-sensitive, nature of innovation, it is incumbent upon the innovation management scholar to minimize ambiguity in all aspects of his/her research. To accomplish this, Wolfe, (1994) suggests that researchers must clearly address:

(i) Which of various streams of innovation research is relevant to a research question;

(ii) The stage(s) of the innovation process upon which a study focuses;
(iii) The types of organizations included in a study;

(iv) How a study's outcome variable (e.g. adoption, innovation, implementation) is conceptualised; and

(v) The attributes of the innovation(s) being investigated.

The present study accepts that these issues are fundamental to the development of a cumulative information base and to establishing the contingencies which differentiate the applicability of different innovation theories (Wolfe 1994).

3.10.1 Currently available innovation management models

Tidd et al. (1997) report that "successful innovation management is strategy-based, depends on effective internal and external linkages, requires enabling mechanisms for making change

happen and only happens within a supportive organizational context". Most studies on the innovation management theme take a somewhat similarly path, commonly prescribing the recipes for ensuring that creativity and inventiveness are nurtured and sustained with most focusing on the right leadership and environment (Von Stamm, 2008, Tidd, 2006, Bessant et al., 2005). Chiesa et al. (1996) focus on process and performance. They attempt to link "core processes" with a set of "enabling processes" (i.e. the deployment of resources and the effective use of appropriate systems and tools governed by top management leadership and direction). While this could be useful in managing innovations in complex systems industries like construction (Winch, 1998), it appears a little too intricate for smaller and simpler systems. Again, it fails to deal with peculiarities inherent in every organization and their implications for the approach adopted. Likewise, Verhaeghe and Kfir (2002) focus on the "examination of the processes that support and enable both 'hard' and 'soft' (e.g. a research or consultancy project) innovation". They unequivocally bind their model with concepts of inputs and commercialized outputs. The changes the work of Verhaeghe and kfir (2002) brings to the innovation management discourse appear insubstantial. Nonetheless, it extends the theoretical applicability of the innovation management model to service contexts. On the other hand, Cormican and O'Sullivan (2004) view innovation management as an incessant and cross-functional process that includes and integrates an increasing number of divergent competencies within the organization. They argue that "the effective management of the process requires successful adoption and adaption of a socio-technical systems approach to all aspects of the organization, critically including people and process as well as technology-related issues". However, Cormican and O'Sullivan's work mostly concerns product innovation and could be found deficient when applied to a service context. Having noted that innovation takes place in an organization's internal and external environments; it is Ortt and Van der Duid's (2008) contention that strategy and organizational structure are important aspects of an organizational internal environment and that they have an impact on innovation management practices. Thus, the contingency approach (Ortt and Van der Duid, 2008) in the management of innovation assures that the effectiveness of an organizational strategy and structure (internal environment) depends largely on how it aligns with market and the broad societal environment. Ortt and van der Duid's (2008) "bespoke" innovation management prescription does offer a promising and refreshing alternative to the sort of one-size-fits-all approaches to innovation management that has long been bandied by management experts.

In fact, it could be the way forward during resource turbulence. Still, it appears too narrow and advances an overly simplistic view of organizational realities. Besides, its applicability to complex environments like construction remains untested as the two case studies that yielded Ortt and Van der Duid's (2008) findings were in manufacturing firms which share very little similarities with the complex construction environment.

Building on the work of Cooper and Kleinschmidt (1995), Ernst (2002) advances what he refers to as "five techno-centric factors for new product performance". These are; NPD process, NPD strategy, organization, culture and management commitment. Adam et al. (2006) argue that Ernst's model "overlooks innovation in non-technical contexts and other important factors such as the role of knowledge". In their review of strategy implementation for innovation management, Goffin and Mitchell (2005) advance what they describe as "innovation pentathlon framework". This framework advances five elements of the innovation management discourse, namely; (i) creating an innovation strategy, (ii) generating ideas - involves managing creativity and knowledge (iii) prioritizing and selecting from these ideas (iv) implementing the ideas selected and (v) involving people from across the business. Goffin and Mitchell's (2005) framework is diagrammatically reflected in the Figure 3.4 below.

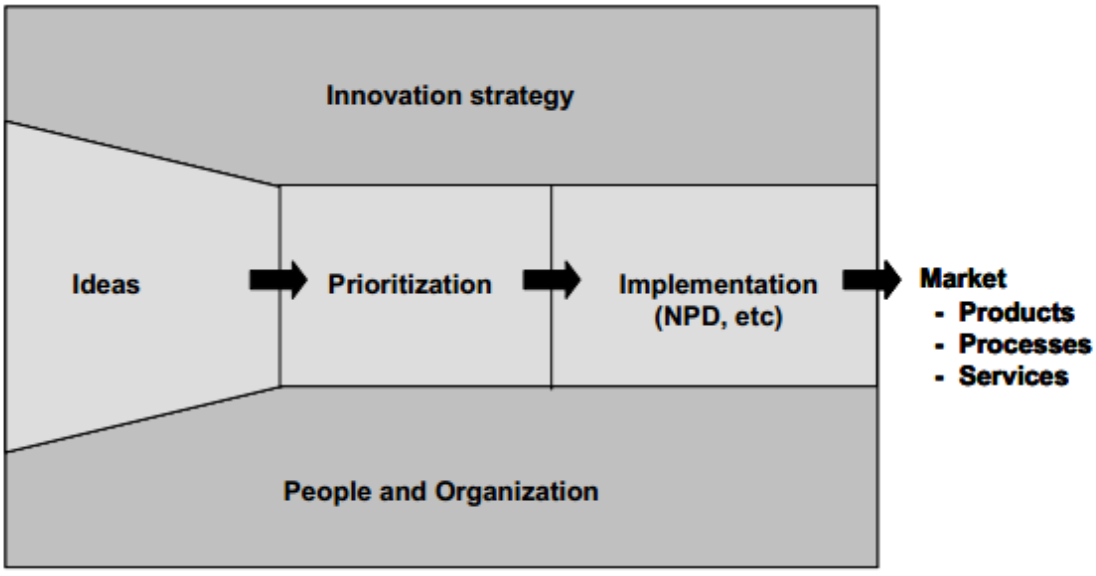


Figure 3-4 The innovation pentathlon framework expressed diagrammatically
(Adapted from Goffin and Mitchell, 2005)

Although, the work of Goffin and Mitchell (2005) may appear exhaustive having dealt with the key elements of innovation management in their pentathlon framework, it however, largely imagines that creative ideas could only be generated and progressed within the boundaries of the firm. They essentially focused on the internal generation and development of creative ideas. This clearly does not sit well with Chesbrough's (2006; 2004) open innovation prescriptions which assures "that firms can and should use the external as well as the internal ideas and the internal and external paths to the market as they look to advance their technology". The reality today is that for firms to be competitive, they must have to exploit external sources of creative ideas for instance by collaborating with other firms, tertiary institutions, research centres and by appropriately exploiting their clients' knowledge and experience. Oke (2007) takes a parallel view to that of Goffin and Mitchell (2005) suggesting five management practices that are in his views pivotal to innovation management. These practices are (i) innovation strategy (ii) human resource management (iii) creativity and ideas management (iv) selection and portfolio management (v) implementation. Von Stamm (2008) suggests that "creating an innovative organization is much more about changing or re-framing the employees' minds than it is about changing the company's processes or vision statement". He further highlights six key areas in organizations that must be aligned with the innovation ambition. These areas according to Von Stamm (2008) are strategy and vision, leadership, culture, physical work environment, and linkages with external constituencies (customers, suppliers and regulators). Von Stamm's framework is diagrammatically represented in Figure 3.5 below.

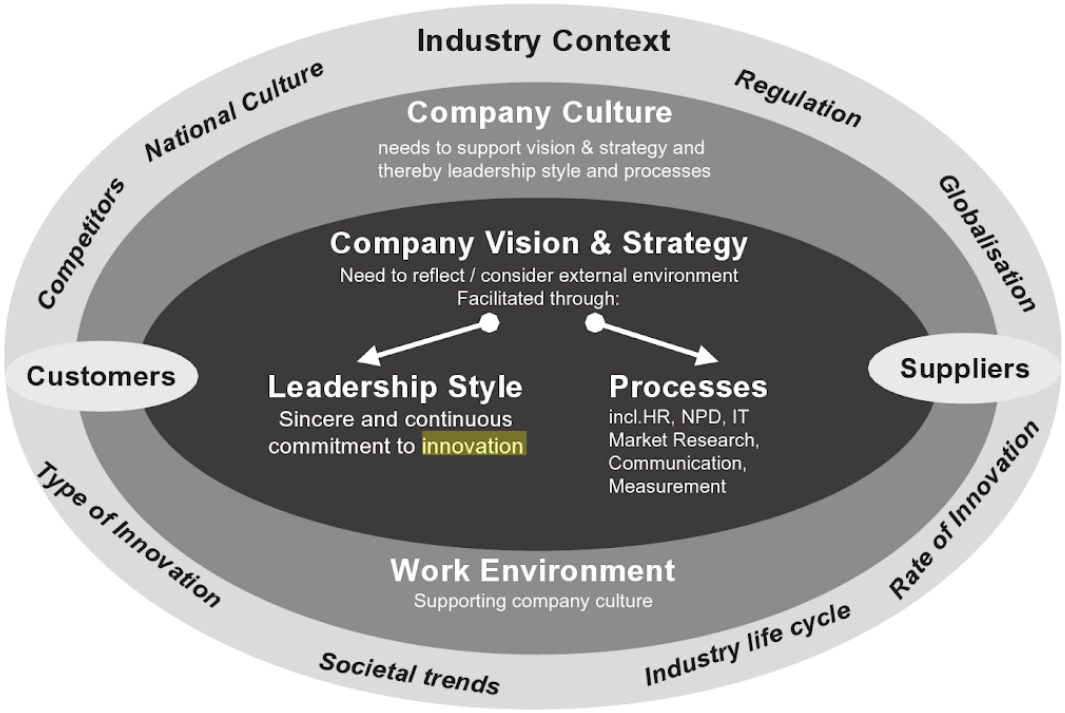


Figure 3-5: The BVS innovation framework (adapted from Von Stamm (2008)

Von Stamm's work provokes questions as to the applicability or otherwise of his recommendations to a typical construction environment where innovations are generally implemented on a project and often require collaboration with other actors in the project. Nevertheless, his work recognises the essentiality of external sources of innovation as championed by Chesbrough (2006; 2004) and deals extensively with the strategies and approaches conducive for managing innovations. In their paper, which advances a top management model for managing innovation streams, Smith and Tushman (2005) centre on the paradoxes and contradictions inherent in the innovation management process. They contend that managing strategic contradictions should be at the centre of organizational analysis if businesses are to successfully innovate. Their argument is founded on the conclusions reached in the works of Barnard (1968) and Thompson (1967) cautioning managers on the need to take seriously, the contradictions and paradoxes inherent in the innovation process. Although, other innovation management scholars have identified the roles of organizational structures, cultures, and routines in managing these contradictions (Flynn and Chatman 2001 cited in Smith and Tushman, 2005), it is Smith and Tushaman's

contention, however, that "balancing contradictions in decision making (rooted in paradoxical cognition by senior teams) allows teams to effectively embrace, rather than avoid contradictions associated with continuous and exploration and exploitation". Whilst Smith and Tushman's focus is on strategic contradictions between exploration and exploitation for top management teams, they concede that "organizations face contradictions at multiple levels of analysis". For instance, the works of Lorsch and Tierney (2002) and Sundaramurthy and Lewis (2003) emphasize the problem of "managing contradictory requirements of multiple corporate stakeholders". The contradictions in balancing financial and social goals have also been underscored (Margolis and Walsh, 2003, Sánchez, 2003). Similarly, paradoxes between efficiency and effectiveness in the product development process were highlighted by a number of previous studies (Repenning, 2002, Adler et al., 1999, Tyre and Von Hippel, 1997). Smith and Tushman (2005) submit that understanding how to effectively manage these contradictions could provide the needed answers to a range of organizational challenges including the innovation challenge. Smith and Tushman's (2005) model for managing strategic contradictions is Illustrated in Figure 3.6 below.

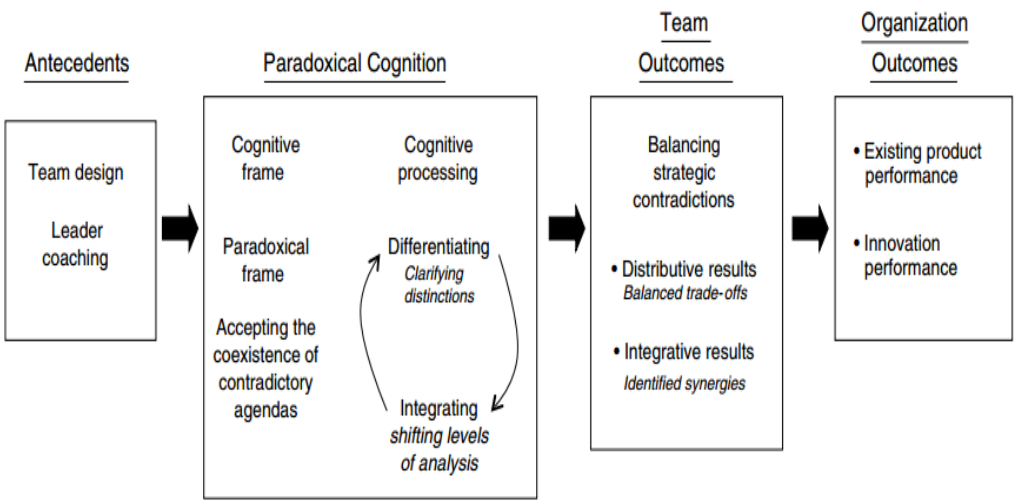


Figure 3-6: A Model of Managing Strategic Contradiction: Antecedents, Paradoxical Cognition, and Outcomes (Adapted from Smith and Tushman, 2005).

Smith and Tushman's work concentrates on top management level practices, thus, failing to provide us with a complete formula for managing a creative process that often springs from the floor of the workplace and rarely sprouts from top management decisions. Even so, it

contributes vastly to an area of management literature (strategic contradictions) that is mostly scant, providing what could be regarded as explanations to the problem of 'unintended consequence' of actions in the change (and innovation) process. And more crucially, highlighting areas that could be sources of conflicts in innovation management. Bassett-Jones (2005) takes a slightly similar position to that of Smith and Tushman (2005). His conceptual and discursive thesis focuses on diversity as an established source of creativity and innovation (West and Anderson, 1996, Hamel and Prahalad, 1994) and at the same time a cause of misunderstanding, suspicion and conflict in the workplace (Yakura, 1996). He offers recommendations on how management can best approach this paradoxical situation. He concludes that the "combustible cocktail of creative tension that is inherent in diverse organizational contexts must be contained within a multi-layered vessel". The outer layer according to Bamburger and Meshoulam (2000 cited in Bassett-jones, 2005) "must be composed of carefully crafted HRM sub-systems that are both vertically integrated with the business objectives and horizontally integrated with one another". He adds that the inner layer "consists of effective leadership, which can only be provided by suitably trained managers". Finally, he advises that managers "need to understand the challenges of diversity management, and to have the emotional intelligence and commitment necessary to build a personal relationship with each individual, or group/team member" (Bassett-jones, 2005). Bassett-jones' work appears insubstantial in addressing the complex problem of managing innovation as it only deals with a microcosm of the innovation management problem – strategic contradictions. Nonetheless, it deals extensively with a problem that commonly impacts the generation of creative ideas – the motivated human resource. Chesbrough (2004) approaches the problem of innovation management slightly more radically, he argues that "since industrial innovation is becoming more open, with external sources of knowledge becoming more prominent and external channels to market offering greater promise, there is need for businesses to change the way they manage innovations". Chesbrough (2004) further suggests that "new metrics for managing innovation may help a firm to focus more upon external sources of innovation to enhance its business model and enable the firm to salvage value from "false negatives" that otherwise would be lost". Chesbrough's argument is predicated on the realization that the historically "closed approach to innovation is no longer sustainable". In its place, a paradigm of open innovation is emerging. This new paradigm (open innovation) "assures that firms can and should use the external as well as the

internal ideas and the internal and external paths to the market as they look to advance their technology". In addition, the open innovation concept assures that "internal ideas can also be taken to the market through external channels, outside a firm's current businesses, to generate additional value" (Chesbrough, 2004). It has to be noted that whilst admitting external sources of innovation into a firm's innovation process increases the possible sources of innovation, it however, adds a layer of complexity to what is at best, a complex social process – the innovation process. Chesbrough's submission identifies the following capabilities as essential to managing innovation; (i) the capability to manage technical and market uncertainty (ii) the capability to manage false negatives (false negatives according to Chesbrough (2004) are projects that seem unpromising inside a company due to the lack of fit with the company's business mode). Chesbrough (2006) further concludes that while the contours of a new model remain obscure, it is clear that achieving sufficient understanding, will require a more externally-focused perspective, involving the actions of multiple actors in a far more distributed innovation environment. Thus, open innovation requires maintaining a strong internal competency to understand, qualify, and integrate the externally sourced solutions. Chesbrough's open innovation model is depicted in Figure 3.7 below:

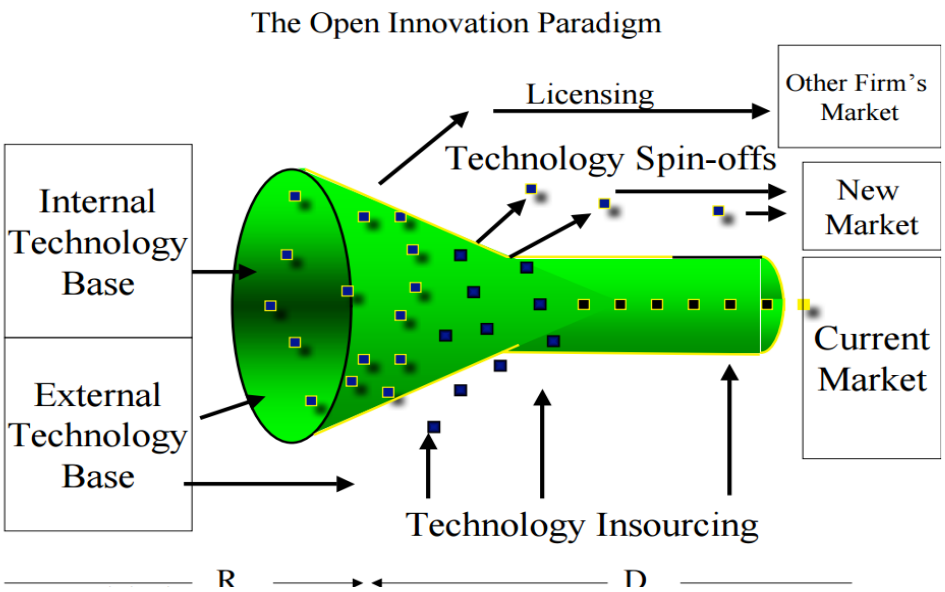


Figure 3-7: The open innovation paradigm (Adapted from Chesbrough, 2004)

Although, Chesbrough's open innovation concept represents an important development in the innovation management trajectory, particularly as regards its theoretical support for firms

to increasingly explore growing external sources of innovation, it fails, however, to deeply explore what might be the critical success factors for the 'internal technology base'. It basically assumes that creating the right internal environment for innovation by firms is a given hence did not suggest how this could be attained. Likewise, it fails to suggest how to deal with fluctuations in the external environment and more importantly how to deal with unintended consequences arising from conflicts between the internal and external technology bases.

3.10.1.1 Models appropriate for construction innovation

Although, there are process improvements which can pass as "innovations" within construction firms, however, unlike many other industries, innovations in construction are typically, not implemented within the firm itself, but on the projects upon which the firm is engaged; adoption decisions by firms have to be implemented on projects (Winch, 1998). Construction projects tend to generate novel and complex problems that often require innovative solutions (Nam and Tatum, 1992a). Although, many theoretical models of innovation exist, the objective here is to provide a set of models that responds to the nature of the construction industry and the specific activities of construction companies. At the construction project level, the innovation process typically involves interaction between the user (innovator) and one or more suppliers (producers). This interface involves transaction costs but these costs reduce dramatically with time and a longer-term productive relationship may produce further innovations, as the Japanese productive model has indicated (Marceau, 1995). Construction projects according to (Winch, 1998) are "commonly collaborative engagements with other firms within the project coalition, and so almost all innovations in construction have to be negotiated with one or more actors within the project coalition". An individual firm's ability to do this will be strongly influenced by its role within the industry as illustrated in Figure 3.8 (illustration of Winch's model). Whilst the Schumpeterian model of innovation (which assumes that all industries follow a product development pattern) is generally reflected in contemporary thinking on construction innovation, recent scholarships, however, have been able to propose models appropriate for construction. For instance, Gann et al. (1992) and Gann (1997) suggest a supply chain model for the construction industry reflecting the actor-system networks as applicable. Similarly, Winch (1998) proposes a model

which recognises the complexity of the construction environment. Figure 3.8 (see below) depicts the activities of the different actors in the system as the inventions deriving from research and development (R&D) programmes are diffused and implemented on specific projects.

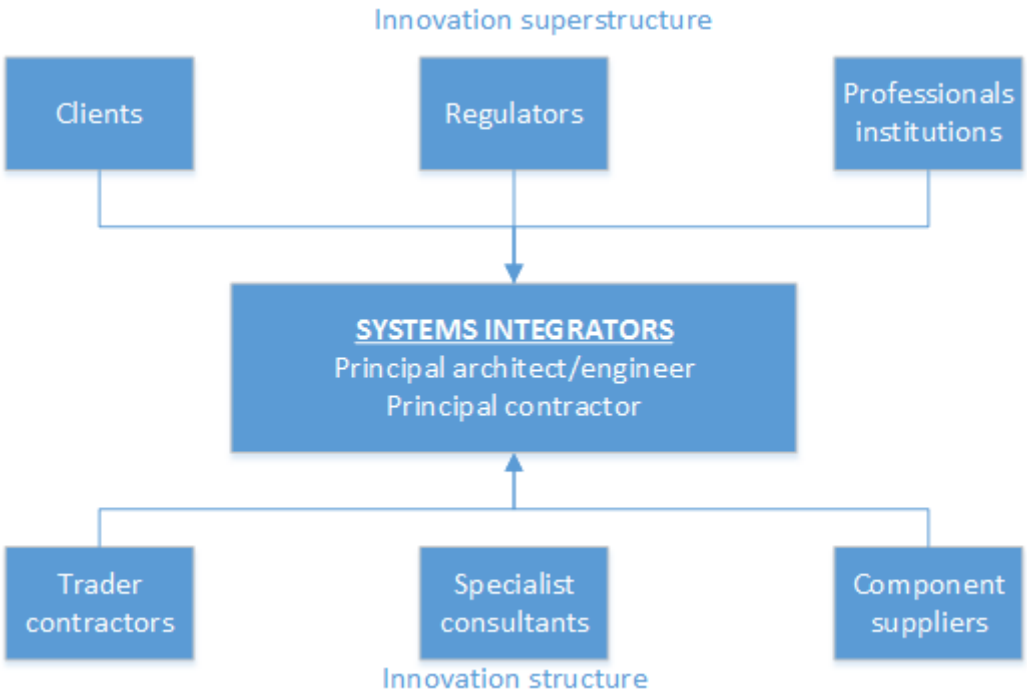


Figure 3-8: Construction as a complex systems industry (Source: adapted from Winch, 1998)

The need to co-ordinate innovation in complex systems industries such as construction requires a complex institutional superstructure (Winch, 1998). New technology proposals are guided through professional bodies. Acceptance test guides are established by regulators who then specify approval requirements and validate tests during and after the development of a system. After contracting, trust and reciprocity are necessary between buyers and sellers (Winch, 1998). Drawing on the work of Van de Ven (1986), Winch (1998) identifies four central problems that should be the focus of managers if their organizations are to be consistently innovative: (i) the management of attention (ii) managing ideas into good currency (iii) management of part-whole relationship and (iv) Strategic problem of institutional leadership and the innovation context. Winch (1998) argues that "new ideas can either be adopted by firms and implemented on projects, or result from problem-solving on projects and then learned by firms". Both according to Winch (1998) are, as important as each other in the construction innovation process. For problem-solving to become innovation, the answers

reached for the particular problem encountered on the project must be learned, codified, and applied to future projects. Knowledge that remains tacit is difficult to manage into good currency (Winch, 1998). Thus, the model of construction innovation proposed by Winch (1998) has "two distinctive moments - a top-down moment of adoption/implementation, and a bottom-up moment of problem solving/learning which, a contingency approach would suggest, need to be managed in different ways". Winch's model of managing construction innovation is depicted in Figure 3.9 below.

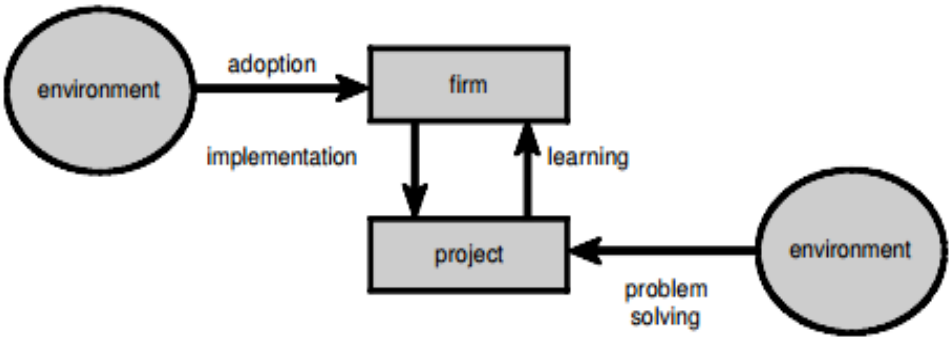


Figure 3-9: Construction innovation process model (Adapted from Winch, 1998)

The validity of Winch's model significantly rests on one important argument, that constructed products are complex product systems, and by extension, that the construction industry is a complex systems industry. While Winch (1998) touches on most of the conditions required for construction innovation, he fails, however, to exhaustively explore the dynamics that characterize these factors and how they relate and/or influence each other. The paradoxes that characterize these factors and the entire innovation process as highlighted by Smith and Tushman (2005) were largely ignored by Winch (1998). More importantly, since Winch (1998) focuses on the trajectories of innovations with all things being equal (stable economic environment for instance) he fails to investigate how these factors/dynamics would be impacted by an unstable economic situation. Thus, there could be limitations to the applicability of his prescriptions during an unstable economic period.

Similar to the work of Winch (1998), Park et al. (2004) emphasize "the role of participants at the project level and address the dynamics of construction innovation". Their model "incorporates the influence of several individual and situational factors and highlights two

critical elements that drive construction innovations" (Park et al., 2004). Firstly, normative pressure generated by project managers through their championing behaviour, and secondly, instrumental motivation of team members enabled by a supportive organizational climate (Park et al., 2004). The dynamic innovation model as reflected in Figure 3.10 below comprises of soft and hard variables integral for managing construction innovation.

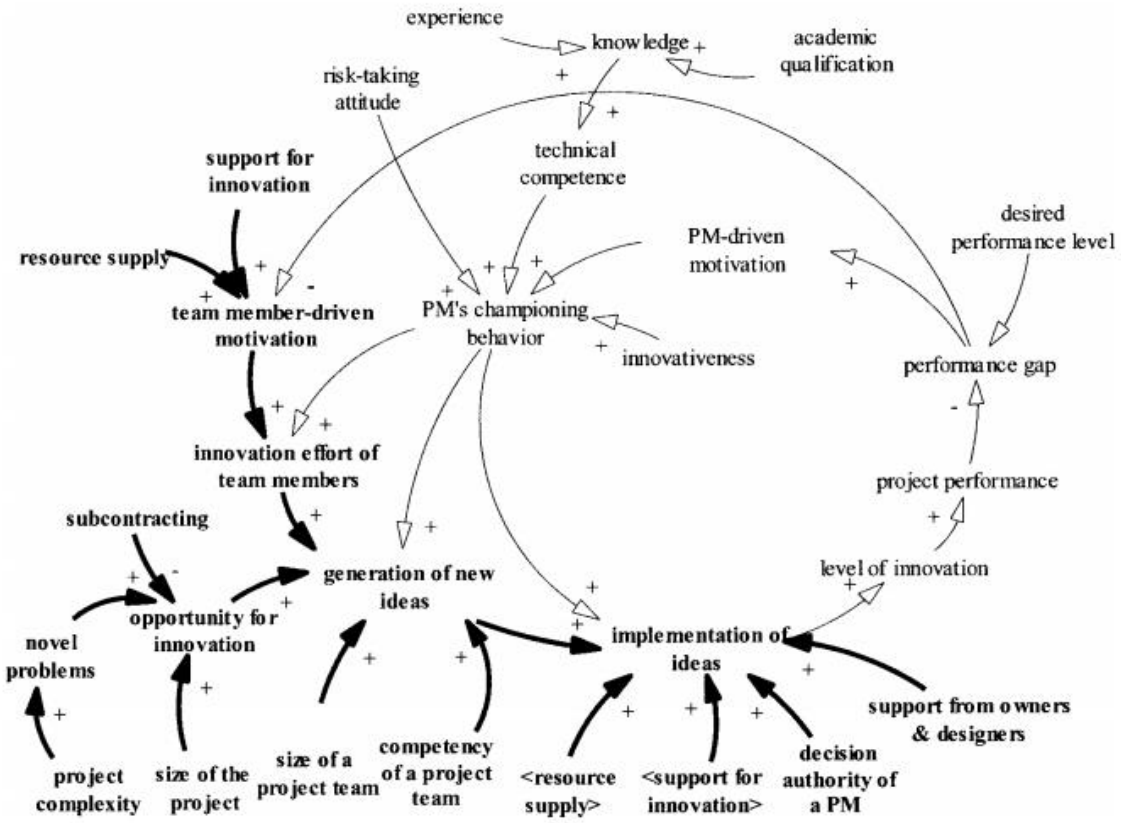


Figure 3-10: Dynamic innovation model (Adapted from Park et al., 2004)

An obvious weakness of Park et al.'s (2004) model is that it more or less ignores external sources of creative ideas like the client. Again, in its analysis of situational factors, it limits itself to 'resource supply' leaving other situational factors like shifts in demand, changes in market composition, changes in policy directions etc. largely unattended to. The reality is that construction firms must have to manage innovation in multi-technology environments, responding to changes in software, engineering, information and materials technologies, rising costs, and dealing with an increasingly complex economic, social and political environment (Gann and Salter, 2000). Gann and Salter (2000) observe that project-based firms rely upon combining technical expertise from other organisations in order to deliver

their own technical capabilities, typically in one-off processes. They argue "that these project-based firms are only able to effectively harness and reproduce their technological capabilities by integrating project and business processes within the firm". They conclude that relationship between business and project processes is vital for the understanding of project-based firms and how they sustain competitive advantage over time as they operate in multi-actor environments and based on one-off projects. Thus, the need for an improved theoretical understanding and new management approach that connects project and business processes. Furthermore, Gann and Salter (2000) explore a number of problems concerning knowledge management and learning. They advise that project-based learning and firm level business process requirements need to be harmonised to enable the integration and management of knowledge across project groups and business units. Gann and Salter (2000) further suggest that modern forms of apprenticeship, peer group and team-based learning offer vital structures for overcoming discontinuities associated with the one-off project-based method of production by enhancing the understanding of knowledge flows in client and supplier relationships. In addition, these IT systems can also enhance the speed and concurrence of decision-making, the ability to make information readily available when and where it is required; and increasing the transparency of decision-making processes, including access to other people's decisions (Gann and Salter, 2000). The flow of the innovation process and management as espoused by Gann and Salter (2000) is reflected in Figure 3.11 below.

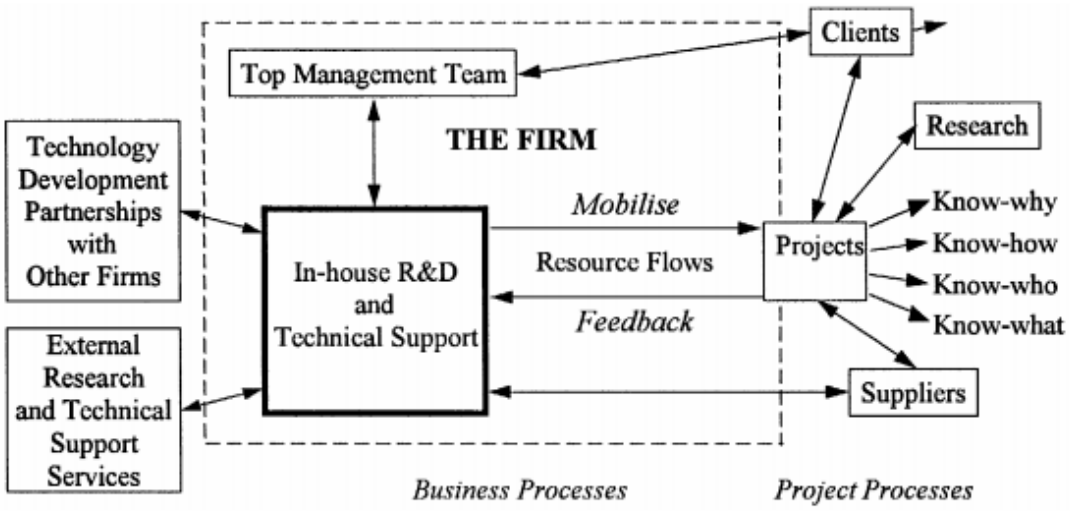


Figure 3-11: The project-based firm and technical resource flow
(Adapted from Gann and Salter, 2000).

The work of Gann and Salter (2000) goes a long way in addressing the unique and complex challenges of a multi-actor system necessary for achieving construction innovation. It pays, however, almost no attention to 'soft' factors which stimulate organization knowledge e.g. organization culture, structure etc. Besides, whilst their work highlighted extensively on the need to integrate business processes and project processes, it however, failed to equip us with the requisite knowledge of how this can be effectively accomplished.

Whilst no two organizations are going to be the same, there is a convergence in the conclusions of most studies in the reviewed literature as to what are the best approaches to innovations management. Researchers have attempted to identify the central activities of the innovation management process (Wolfe 1994), some of which are presented as linear models (Daft 1978 cited in Adams et al., 2006), and others that are dynamic and recursive characterized by feedback and feed-forward loops (e.g. Schroeder et al. 1989 cited in Adams et al., 2006). Though useful, these models are constrained from a measurement standpoint (Adams et al., 2006). Indeed, there are many competing models with unanimity only evident at intellectual levels (Adams et al., 2006). Also, because these models have mostly been generated in the context of technology, their generalizability is constrained (Adams et al., 2006). Furthermore, given that models focus mainly on activities, they "fail to take account of the organizational pervasiveness of innovation and its socio-technical connectedness with all aspects of the organization, or the levels of integration envisaged in Rothwell's (1992) fifth-generation process model" (Adams et al., 2006). Adams et al. (2006) further observe that the range and sequence of activities in the innovation process may differ across organizations and projects; their successful management is affected by several factors. Cebon et al. (1999) refer to the aggregate of these factors as the "capacity to make change". Nonetheless, Neely and Hii (1998) conclude that literature generally is somewhat silent on this "capacity to make change". Nonetheless, a generalised innovation management model specific for firm level innovations affords us a useful basis for managers to monitor and evaluate their innovation processes, identify limitations and prescribe remedies (Cebon et al., 1999).

3.10.2 Efficacy of reviewed innovation management models during economic crisis.

The present study focuses primarily on what the right management approach for enabling innovation persistence. Thus, the review of theoretical submissions by management scholars regarding what the best approach is to enable the initiation and implementation of innovations. Whilst the different management approaches as reviewed in section 3.10.1, can be effective in some cases during periods of economic stability and growth, they are however certainly inadequate for periods of significant market and wider environmental turbulence as often witnessed during economic crisis. The reason is not far-fetched. Most of the innovation management models as explored in section 3.10.1 are more concerned with the right internal mechanisms needed for innovations to flourish in firms. In most of these reviewed models, little or no attention were accorded to the fact that rarely does an innovation process starts and ends within a single organisation (Winch, 1998). Thus, the need to accord equal attention to the external mechanisms required for a collaborative management of the innovation process. Although, the works of Chesbrough (2006; 2004) as reviewed in section 3.10.1 dealt extensively with the external mechanisms and linkages required for enabling firm level innovations, they fail to recognise that a firm's external environment and linkages are not always stable and certain. This deficiency also characterises the work of Winch (1998) which like Chesbrough (2006; 2004) recognises the external mechanisms for bringing innovations to fruition, but fails to make adequate provision for uncertain environmental situations.

Managing innovations during economic crisis entails recognising that external linkages and mechanisms are often as important (if not more important) as firms' internal structures and processes. More importantly, it does also require innovation management actors to be more thoughtful (Feinzaig and Anthony, 2008) as increased investment risks, heightened uncertainties and emerged constraints redefine the operating environment. Therefore, in designing a management approach for continuous innovations during economic crisis, managers must recognise the inherent pitfalls of implementing innovations during economic crisis and proactively seek to overcome the challenges that emerge during economic crisis.

3.11 Summary – chapter 3

This chapter explored the nature of innovations by interrogating previous studies of the innovation phenomenon. The key defining characterizations of innovations were established. These key characterizations were identified as (i) newness in its present form (ii) first use within the industry (iii) capacity to effect change in standard practice – non-triviality (iv) derivable benefits for all stakeholders; and (v) the associated risks of innovating. Likewise, the different schools of thought on innovation were identified as (i) the Schumpeterian school of thought (ii) the resource-based view (iii) the psychological view; and (v) the social-construct view. The key sources of innovation for construction based organizations were found to be (i) the client (ii) the employee (iii) firms in the project coalition; and (iv) research centres/tertiary institutions. The innovation typologies and forms were also identified and discussed. Furthermore, there were discussions focusing on barriers to construction innovation and the conditions necessary for innovation to thrive in organizations. It is reasoned that understanding the nature, barriers and critical success factors for innovation would provide an excellent starting point for further exploring the innovation persistence phenomenon and the critical success factors for persistent innovation implementation during economic crisis. This chapter concludes with a review of available innovation management models as prescribed by previous studies and an assessment of their effectiveness or otherwise during economic crisis.

The next chapter explores and synthesizes the concepts of economic crisis and innovation persistence from available literature.

Chapter 4 : Literature review – Economic crisis & innovation persistence

4.0 Introduction

This chapter explores and synthesizes the concepts of economic crisis and innovation persistence. A brief account of economic crises in Nigeria is presented. It further discusses the key characteristics of economic crises and investigates their impacts on construction related activities and more specifically, firm level innovations. A case is made for firm level innovation persistence during economic crisis. This chapter concludes with a brief discussion on the overall findings from literature review (chapters 3&4) and the articulation of research questions for further empirical investigation.

4.1 Economic crisis

Pearson and Clair (1998) observe that a crisis represents "a low probability, high impact situation that is perceived by critical stakeholders to threaten the viability of the organization". Most global economic crises recorded so far fit in with what Taleb (2007) describes as "Black Swans" – highly improbable events. He argues that to qualify as a "Black Swan", the event first has to be an outlier, "as it lies outside the realm of regular expectations". Second, it must carry an extreme impact. Third, despite its status as an 'outlier', "human nature makes us concoct explanations for its occurrence after the fact, making it explainable and predictable". The present study views economic crisis as a period of economic recession characterised by negative GDP growth lasting at least two consecutive quarters (Stiglitz 2000). This includes periods of economic depression which are characterized by a decline in output for a prolonged period, typically, greater than 2 years, a drop in output of 10% or greater and an unemployment rate touching 20% (Romer 1992). This excludes periods of slow but not necessarily negative economic growth which can be referred to as economic stagnation.

There is currently little or no consensus amongst most scholars as to a common reason for the manifestation of economic crises. For instance, the Great Depression of the 1930s was considered a fallout of the chronic insufficiency of demand (Keynesian crisis) and the oil shock of 1970s was attributed to an external shock (Duhigg, 2008, Grewal and Tansuhaj, 2001), the

Brazilian crisis of the 1980s according to Grewal and Tansuhaj (2001) was blamed on governmental failures (excessive and distorted growth of the state), the Asian crisis was viewed as a consequence of obsolete banking and investment practices and cultural peculiarities, such as lack of transparency (Alon and Kellerman, 1999), the great recession of 2008 was attributed largely to the then pervasive culture of unethical risk-taking by the banks, the simultaneous extravagance and the largely unsupported appetite for credit by consumers in the West coupled with colossal failings in regulatory oversights (The economist, 2010). Nevertheless, economic crises are characterized by the overall shift in many macroeconomic indicators, including falls in real output (determined by GDP), hyper-inflation, a high unemployment rate, negative alterations in demands for goods and service and an unstable currency (Grewal and Tansuhaj, 2001).

Literature on organizational reactions to economic crisis focuses on countless dynamics that impact strategies for crisis management, "like the psyche of managers, the nature of crisis-triggering events, organizational structures and processes, and environmental variables" (Pearson and Clair 1998). Studies on organizational response, however, have chiefly concentrated on industrial crises (Smith, 1990). Industrial crises, such as those connected with negative consequences of product consumption (e.g. the PIP breast implants of, 2010) and industrial accidents (the 1984 Union Carbide gas leak incident in Bhopal, India), typically impact a single organization or industry at a time. On the other hand, economic crises, affect a country (e.g. Mexico in 1994; Greece in 2008, Portugal in 2009, Spain in 2009), a region (e.g., Asia in1997; Europe in 2008) or even globally (global economic downturn of 2008). Besides, "industrial crises commonly involve a struggle for legitimacy, in which organizational moral and ethical standards are subject to public scrutiny" (Pauchant and Douville, 1993). In contrast, economic crises alter demand patterns, thus testing organizational marketing (Block, 1979 cited in Grewal and Tansuha, 2001).

With the ever-growing inter-dependence and the emergent fluidity of the world's economies, economic turbulence at the world's stage now appears to be a near- constant. Dipping crude-oil price, a consequence of widespread oil glut creating pressures for economies that are dependent on oil revenues and at the same time causing deflationary drag on crude oil consuming economies; global market nervousness arising from signs that the Chinese

economy is slowing; possible interest rate hikes in the US and the UK and their implications for corporate borrowers; falling commodity prices; and stock market volatility around the world, are some of the current challenges (as at August, 2015) impacting the global economy. The point here is that this inter-dependence of the world's economies means that economic tremors felt even in remote economies like Brazil, South Africa, China and Nigeria reverberates almost all over the world and do have implications for even the established economies. Nigeria offers us a classic example of a country at the very mercy of the erraticism and vulnerability of the global economy. Figures from Nigeria's National Bureau of Statistics quarterly economic report for all the quarters in 2015, 2016 and 1st quarter of 2017 indicate that the country has been in economic recession. It is noted that economists generally agree that an economic recession could be viewed as an economic crisis (Martin, 2011).

4.2 Economic crisis and construction

Cyclical fluctuations according to Ruddock et al. (2014) are characteristic of economic cycle. Barras (2009 cited in Ruddock et al., 2014) adds that "this is the intrinsic relationship between the level of construction activity and the stage of the business cycle". During a recession, a significant decline in activity spreads across the economy (Ruddock et al., 2014). Thus, construction activities decrease during the contractionary period of the business cycle – economic crisis (Ruddock et al., 2014). Indeed, the effect of economic crisis on construction activity is reflected in the declining level of orders for new construction in the UK during the recession in 1992 and during the credit crunch of 2008 (Ruddock et al., 2014). Egbetokun et al. (2008) acknowledge that the state of affairs in Nigeria's construction industry during the 2008 economic crisis mirrored that of the UK. The common tendency for construction firms in Nigeria is to shelve innovation for a cost-cutting strategy in the face of uncertain economic conditions (Egbetokun et al., 2008). In fact, the increasingly complex challenge of managing construction innovation in Nigeria's often-turbulent economic environment has been broadly noted (Onasanya et al., 2007, Egbetokun et al., 2008). Construction based firms operating in Nigeria have continued to slash resources, shut down long-term investments, while focusing just on survival during uncertain economic periods. This apathy to innovation and improvement according to Obianyo (2010) has caused a significant increase in unmet clients' needs and expectations. The point here is that clients' requirements keep evolving, the precarious economic conditions notwithstanding. In fact, economic crisis is known to induce

and precipitate variation and changes in consumers' needs and requirements (OECD, 2012). Thus, causing an increasing level of client dissatisfaction in Nigeria's construction industry (Olugboyega, 1997).

4.3 Effects of economic crisis on construction based organizations

Although, the Schumpeterian economists are quick to point-out that economic crisis can be a source of opportunities for entrepreneurial firms (Anthony and Feinzaig, 2008), there is however little or no doubt that economic crisis is often of huge concerns to organizations (Grewal and Tansuhaj, 2001). These fears stem from the often-adverse effects of economic crisis on organizations. This study identifies several key effects of economic crisis on construction based firms. These key effects are presented in **Table** 4.1 below.

Table 4-1: Effects of economic crisis on construction contractors

S/N	KEY EFFECTS OF ECONOMIC CRISIS	KEY LITERATURE SUPPORT
1	Shrinking aggregate demand for products and services	OECD (2012); Bricongne et al. (2010); Barlevy (2007)
2	Increased operating costs	Gilchrist et al. (2017); Wang et al. (2014); Higgins (1977)
3	Increased delays in payments for jobs completed	OECD (2012); Odeh and Battaineh (2002); Mansfield et al. (1994)
4	Increased difficulties in accessing credits	OECD (2012), Lerner (2011), Aghion et al. (2008); Dell'Ariccia et al. (2008)
5	Declining revenue and profit levels	Donald et al. (2014); Kalemli-Ozcan et al. (2013); Pavlínek (2012)
6	Rise in employees' job dissatisfaction	Parvin and Kabir (2011); Rosenblatt and Ruvio (1996)
7	Surge in crime rate	Deflem (2011); Gould et al. (2002); Walberg et al. (1998); Box and Hale (1982)

The above highlighted effects of economic crisis as identified in literature are explored in the next sub-sections.

4.3.1 Shrinking demand for products

The works of OECD (2012), Bricongne et al. (2010) and Tambunan (2000) find that economic crisis often causes a reduction in the demand for durable products whose purchase can be deferred. The key reasons for this as adduced by economists are (i) drop in consumer confidence (Zurawicki and Braidot, 2005) and; (ii) liquidity dry-ups (Malherbe, 2014, Cornett et al., 2011). OECD (2012) similarly adds that economic downturns can reduce the demand for innovative products, because they are often more expensive, and/or durable products. The constructed product is a classic example of an expensive and durable product whose purchase can often be deferred during economic crisis

4.3.2 Increased difficulties in accessing credits

Financial institutions are often at the centre of systemic economic turbulence as liquidity usually dries-up during downturns (Tong and Wei, 2010, Cornett et al., 2011, Malherbe, 2014, Diamond and Rajan, 2005). Indeed, the "volume of venture financing varies with the business cycle" (Schoar, 2005 cited in OECD, 2012). The point here is that, failure in credit markets may get worse as lower cash flows mean firms have less collateral (Bernanke and Gertler, 1995). Consequently, "investors have fewer resources to allocate across investment projects" (OECD, 2012). This often implies that firms are often having to deal with a significantly constrained resource base.

4.3.3 Increased delays in Payments for completed jobs

Economic crisis often means lower public resources (OECD 2012). The impacts of economic crises on Nigeria's construction industry have often been particularly telling. Although, this is not surprising considering that the government (federal and states) is by far the largest client of the local construction industry, accounting for over 60% of local construction orders (Ayangade et al. 2009). With a widespread paucity of fund, various levels of governments in Nigeria have often deferred payments for construction projects approved and sometimes completed (Odeh and Battaineh 2002, Mansfield et al. 1994) and focusing instead on what they consider as key priorities of governance.

4.3.4 Increased operating costs

The works of Gilchrist et al. (2017), Wang et al. (2014) and Higgins (1977) find that inflationary pressures that often characterise economic crisis cause increases in the operating costs of firms. This is particularly consistent with events that unfolded during 2014-2017 economic

crisis in Nigeria. Like most economic crises Nigeria has witnessed in the past, the rate of inflation was significantly up. Nigeria's National Bureau of Statistics puts the CPI for February 2017 at 17.78% year on year.

In addition, Aibinu and Jagboro (2002) find that most construction materials and equipment utilised in Nigeria are still being imported. Similarly, the work of Mansfield et al. (1994) concludes that not only a bulk of construction materials but also human resource and equipment are imported into Nigeria. They add that this has enormous cost implication for the construction firm especially when clients are not willing to accept increased cost passed to them in the form of increased price.

4.3.5 Declining revenue and profit levels

Several factors as triggered by economic crisis culminate in a declining revenue base for construction contractors in Nigeria. A reduction in aggregate demand for the constructed product (OECD 2012), increased operating costs (Gilchrist et al. 2017) and non-payment or delays in the payments for projects as specified in contract terms are some of the reasons for the reported decline in the revenues and profit levels of construction contractors in Abuja, Nigeria. Firms' reaction to this is often one of prioritising survival over growth (Anthony and Feinzaig, 2008). The works of Donald et al. (2014), Kalemli-Ozcan et al. (2013), Pavlínek (2012) and Opler and Titman (1994) conclude that firm-level revenues and overall financial performance decline during economic crisis.

4.3.6 Summary – effects of economic crisis

This section investigated the key effects of economic crisis on construction contractors operating in Nigeria. Shrinking demand for products, increased difficulties in accessing credits, increased delays in payments for completed jobs, increased operating costs and declining revenue and profit levels were identified and discussed. It is argued that these key effects of economic crisis often lead to the emergence of the innovation constraining factors as will be discussed in section 4.5 below.

4.4 Economic crisis and innovation

Economists have paid little or no attention to the role of innovation in recent global and national economic crises. Similarly, the impacts of economic crises on innovation have not received the amount of scholarship interest its criticality deserves. Filippetti and Archibugi (2010) argue that the reason for this is possibly the general conviction that innovation has

little to do with economic crises. They argue that two extreme hypotheses can be outlined about the relationship between innovation and business cycles. First, the relationship is cyclical; hence, firms tend to reduce their innovation efforts during the downswing of the economy. Second, the relationship is instead counter-cyclical; hence, "economic downturns are a fertile environment for firms to innovate". It is worth noting that the latter supposition - which basically argues that economic downturn could be a source of opportunities for construction firms – shapes both the focus and viewpoint of this PhD study.

In Schumpeter's conceptualization, economic cycles are the consequence of innovation, while innovative activities and innovative organisations are re-shaped by economic crises (Freeman et al., 1982, Schumpeter, 1942). In fact, Schumpeter (1934) argues that innovation in specific firms or set of firms can have economy-wide effects. He concludes that during an upswing in the economic cycle, innovation is carried-out in a cumulative way. Thus, organizations innovate "along established technological trajectories and develop into incumbents that achieve innovation as a routine, and consequently, prevent the entrance of newcomers" (Archibugi et al., 2013, Schumpeter, 1942). Pavitt et al. (1989) view this process as "creative accumulation". On the other hand, economic turbulence often generates tremors in established industries and technological fields; new firms in new sectors play a relatively bigger role than incumbent firms in generating innovations (Archibugi et al., 2013). These new firms are often keen to exploit new technological or market opportunities as a way to challenge the established market players. This is consistent with Schumpeter (1934) assertion that "it is not the owner of the stage-coaches who builds railways", suggesting an increasingly significant role for emerging firms during economic turbulence.

4.5 Factors that constrain firm level innovations during economic crisis

Several environmental variables hamper the capacity of businesses to consistently innovate. One of these environmental variables is economic crisis. Findings from previous studies confirm that economic crises impact negatively on organizations' ability to innovate (Archibugi et al., 2013, Paunov, 2011). Grant (2003) argues that the increased volatility in an organization's external environment often makes systematic strategic planning – a key step towards innovation – more challenging. Previous studies focusing on abandoned innovation projects have found the existence of a common concern for security and the preference for avoiding risky decisions when faced with uncertain environments (Tan, 2001, Justin Tan and

Litsschert, 1994, Adler et al., 1992). Indeed, historically, firms' R&D expenditure and patent filings have moved in parallel with GDP, dipping noticeably during economic downturns (OECD, 2009). Data on trademark filings (which reflect the creation of new goods or services) suggest that economic crisis affects a wide range of innovation projects (OECD, 2009).

The present study identifies the specific factors that hamper firm level innovations during economic crisis. These are:

- Unstable funding regime
- Erosion of good organizational slack
- Increased apathy to costs by clients
- Reduced appetite for risks due to increased uncertainties.

The above highlighted factors are discussed in the next sub-sections.

4.5.1 An unstable funding regime

Delbecq and Mills (1985) remark that innovations depend on a firm's ability and willingness to commit not only the necessary time and leadership to research and development but also to have in place an appropriate funding regime. In the simplest terms, the standout characteristic of an innovative organization is that it is able and willing to follow up and follow through on the exploitation of new ideas (Delbecq and Mills 1985). O'Sullivan (2005) submits that innovation is an expensive process; significant resources must be expended to initiate, direct, and sustain it. This process takes time and requires that the resources that support it must be committed until the process is concluded. Indeed, funds are needed to transform creative ideas into an innovation without which the creative idea ends up just as an idea. Both funding and funded regimes impact on innovations. As creative ideas move from being mere ideas to fully developed products/processes, they pass through individual stages (assuming a linear view of the innovation process) within the innovation process for instance research and development, building capacity and capabilities etc. All these require a stable funding regime. In fact, it could be argued that funding oils the wheels for innovation to take place. Indeed, innovation is often an expensive endeavour requiring consistent and adequate funding. Innovative organizations will often earmark special funds for research and development to support experimental activities.

Indeed, innovation is a process that takes time to conclude which means that the resources that support it must be committed until the process is concluded. Thus, OECD (2012) argues that economic crisis negatively impacts firms' ability to persist with innovations because of gaps in funding, a consequence of the unavailability of external financing. They add that "small and young firms may lower their innovation investments as they face greater risks of being forced to exit and face stronger financing constraints". Similarly, Aghion et al., (2008) and Dell'Ariccia et al. (2008) find that the lack of financing negatively affects innovation during downturns.

As identified in section 4.3, economic crisis causes; declining revenues and profits level; increased delays in payments for jobs and; increased difficulties in accessing credits. These individual factors put together will represent a depletion of a firm's financial resource base and therefore, a reason for instability of an organization's funding and funded regimes. OECD (2012) concludes that economic crisis negatively impacts firms' ability to persist with innovations because of the resultant gaps in funding. Similarly, Aghion et al., (2008) and Dell'Ariccia et al. (2008) find that the lack of financing negatively affects innovation during downturns.

4.5.2 Erosion of good organizational slack

The work of Nohria and Gulati (1997) finds that "innovation and slack are concepts at the very core of organization theory. Innovation has been an outcome of central interest to organization development theorists because it is vital for organizational adaptation and renewal". Since its introduction to organizational literature by (Cyert and March, 1963), the concept of organizational slack has extensively been investigated and advanced. Simply put, organizational slack is theorized as the difference between the total amount of resources available and the necessary payments to the members of an organization to protect the coalition from dissolving (Cyert and March *1963*). Bourgeois (1981) offers a broader characterisation. He submits that organizational slack is "that cushion of actual or potential resources which allows the organization to adapt successfully to internal pressures for adjustment or to external pressures for change in policy, as well as to initiate changes in strategy with respect to the external environment". Organizational resources like financial, factual and human resources are key focuses of the organizational slack theory.

There are divergent views regarding the usefulness of organizational slack to a firm's ability to persist with innovations. Whilst organizational development theorists will argue that organizational slack is a positive factor, acting as a cushion against fluctuations in the operating environment. For instance, the work of Cyert and March (1963) argues that organizational slack plays a vital role in enabling organizations to innovate by allowing them to experiment with new strategies and innovative projects that might not be permitted in a more resource-constrained environment. Opponents of slack however, counter that "slack diminishes incentives to innovate and promotes undisciplined investment in R&D activities that rarely yield economic benefits" (Jensen, 1993 cited in Nohria and Gulati 1997). According to this school of thought, "slack encourages the pursuit of pet projects by agents who show little regard for the interests of the principals they serve" (Nohria and Gulati 1997). Following the work of Bourgeois (1981), a number of innovation studies have adopted different approaches in investigating the relationship between slack resources and innovation (Voss et al., 2008, Yang et al., 2009, Schmidt, 2009, Nohria and Gulati, 1996, Damanpour, 1991). In fact, there is a literature contention that organizational slack has a curvilinear relationship with innovations or firm performance (Herold et al., 2006, Tan, 2003). Furthermore, a number of innovation management studies conclude that organizational slack plays a moderating role in affecting innovation performance (Greve, 2007, Geiger and Makri, 2006, Voss et al., 2008). However, there is an increasingly growing argument in the body literature that different types of slack, such as absorbed and unabsorbed slack may have dissimilar impacts on innovation persistence (Tan and Peng, 2003, Geiger and Cashen, 2002). Huang and Chen (2010) accept that absorbed and unabsorbed slack do have different moderating effects on technological diversity and innovation performance link.

As firms begin to experience some of the effects of the economic crisis as discussed in Section 4.3 above, the overwhelming tendency is to slash resources, and shut down long-term investments (Anthony and Feinzaig, 2008). Anthony and Feinzaig (2008) add that R&D or other innovation-related areas are typical places to look when searching for areas to curtail to meet stricter budget targets. After all, these investments are not likely to offer instant returns, so reducing them won't hurt the company's ability to meet top-line revenue targets. Indeed, as firms encounter increasingly intense competition feel pressured to eliminate all forms of slack, organizational slack will come under sharp scrutiny (Nohria and Gulati, 1997).

They add that these "countervailing forces suggest a potential paradox". It is argued that if organizational slack is a form of inefficiency but also essential for innovation, organizations run the risk of eliminating slack to an extent that undermines their capacity to innovate (Nohria and Gulati, 1997). This work will however, follow Nohria and Gulati's contention that the relationship between slack and innovation is "curvilinear – too little slack is as bad for innovation as too much slack". Thus, finding areas of convergence between the submissions of the proponents and opponents of organizational slack. Indeed, organizational slack impact on experimentation. Too little slack constrains innovation because it deters any kind of experimentation whose success is uncertain (Nohria and Gulati 1997). On the other hand, too much slack inhibits innovation because it can cause complacency and a lack of discipline that makes it likely that more bad projects will be pursued than good (Nohria and Gulati 1997). It is equally a drag and a hindrance to resource flexibility required for organizational nimbleness. Nevertheless, the emerged finding on this theme that the effects of economic crisis cause erosion of good organizational slack and that this erosion of good organization slack inhibits innovation implementation; is one which firms seeking to persist with innovations during economic crisis must pay adequate attention to with a view to finding ways to resolve it.

4.5.3 Increased apathy to costs by clients

The increases in contractors' operating costs as discussed in Section 4.3.4, are often passed to the client in the form project price increases. Consumers display varying degrees of flexibility in their responses to price increases. However, the concept of price elasticity of demand provides that as price increases, less quantity is demanded. Kim et al. (1999) remark that indeed price affects product choice. While we have an adequate grasp of how consumers respond to prices changes in other market categories, little or nothing is known regarding how construction clients respond to changes in costs. Wong et al. (2000) find that clients want the best possible "value" from contractors and there is a realization that lowest-price does not necessarily achieve this. They however add that clients often display a preference for lowest tender price. Indeed, clients commonly put their projects on hold because of rise in construction costs (see Building.co.uk) especially if these increases are significant. This finding appears contradictory with the thesis advanced by classical economic theory which basically posits that clients act rationally using cost benefit analysis to make and come to conclusions. Economic crisis periods are uncertain times, fraught with heighted risks and low

client confidence. The present study argues that clients are not guided by rationality during this time. They are instead influenced by fears of not compromising the survival of their firms and guided by the need to limit risky undertakings and to focus on the core. Thus, there is often an increased apathy to costs by clients during economic crisis and this is of substantial concern to construction contractors attempting to persist with innovations during economic crisis.

4.5.4 Reduced appetite for risks due to increased uncertainties

There is harmony in the body literature that increased volatility of an organization's external environment makes systematic strategic planning more challenging (Grant, 2003). Because economic and market forecasts provide the basis for strategic planning, failure to accurately predict (due to increased volatilities) demand, prices, exchange rates and interest rates represent a fundamental challenge to an organization's ability to plan (Brown, 2003). OECD (2012) points out that economic uncertainty can negatively impact investors' appetite for risks. OECD's report argues that the sunk costs of investments provide incentives for investors, banks or firms to abandon investments. Fernandes and Paunov (2011) argue that organizations may be less willing to face uncertainties and risks associated with introducing new products and/or processes since their survival might be compromised if demand evolves unpredictably. OECD (2012) concludes that economic uncertainties can cause limited firm entry. Thus, firms prefer to wait until demand and financial markets have recovered before recommencing innovations efforts (OECD, 2012).

4.5.5 Summary – factors that constrain firm level innovations during economic crisis

Having established in section 4.4 that the effects of economic crises inhibit firm level innovations, this section explored the specific factors at play. It is reasoned that identifying the specific factors that impact firm level innovation from the effects of economic crisis will be a good starting point for understanding what are the fundamental factors that firm level innovation persistence during economic crisis. Thus, it is suggested that construction contracting firms seeking to persist with innovations during economic crisis should first adopt a management approach that takes cognisance of these identified key inhibiting factors and actively seek to address them.

4.6 Innovation persistence

Schumpeter (1942) conceptualises the relationship between economic crisis and innovation as that of "creative destruction". Building on the work of Schumpeter (1942), several studies have attempted to explore the relationship between the economic crisis and innovation (Doner 2017, Amore 2015, Makkonen et al. 2014, Archibugi et al. 2013a, Paunov 2012, Filippetti and Archibugi 2011, Whyte and Sexton 2011, Kanerva and Hollanders 2009, Anthony and Feinzaig 2008). However, these studies have mostly focused on comparing and contrasting firms' innovative behaviour during economic crises. Amore (2015) argues that "R&D activities conducted during past recessions improve a firm's ability to innovate during new downturns". Kanerva and Hollanders (2009) report no correlation between firm size and decline in investment during the 2008 economic recession. Their conclusions suggest that highly innovative organizations carry-on investing in innovation during downturns. In their work which explores the responses of Chilean manufacturing organisations to the financial crisis of 1998, Alvarez et al. (2010) find a positive relationship between firm size and organisational innovations, but no impact of financial constraints on innovation performance during the crisis. However, in their assessment of firms situated in Italy's Emilia-Romagna, Antonioli et al. (2010) report that SMEs are more innovation persistent when compared with large firms during the 2008 economic downturn. In an organization-based study in eight Latin American countries, Paunov (2011) finds that the 2008 recession impacted many firms' ability to carry on with ongoing innovation projects. Paunov (2011) identifies financial constraint and the depressing levels of demand as the key reason for abandoning innovation projects. He further argues that newer businesses supplying foreign multinationals are more exposed to export shocks and are more likely to stop innovating during economic crisis. Filippetti and Archibugi (2011) examine firms' innovation investments in Europe and conclude that economic slumps bring about a decline in the eagerness of organizations to raise investments in innovation. They conclude that during economic crisis, firms' innovative behaviours alter in response to the turbulence in their external environment. They however, add that "while some firms will exhibit a persistency in investing in innovation during recessions, others will not".

4.7 Merits of innovation persistence

The capability to continually innovate is a "key mechanism for organizational growth and renewal" (Lawson and Samson, 2001). In fact, innovation persistence has been acknowledged as critical to weathering the gales of creative destruction in times of environmental turbulences such as during an economic crisis (Danneels, 2002, Schumpeter, 2013). OECD (2009) observes that "many of today's leading firms such as Microsoft or Nokia were born or transformed in the creative destruction of economic downturns. And several of today's leading technology firms such as Samsung Electronics, or Google strongly increased their R&D expenditures during and after the "new economy" bust of 2001". The fact remains, of course, that seen from a sectorial and societal point of view and seeing business in a longer time frame, low innovation expenditures do represent lost opportunities and reduced growth (Orstavik et al., 2015). Oddly enough, constraints can stimulate innovation as discipline forced by bad times can compel organizations to impose sharp constraints that inspire creativity (Anthony and Feinzaig, 2008). Thus, as the economic cycle inevitably shifts upwards, organizations who have "dropped the innovation ball" will find their fortunes sagging just as the economy surges. Approaching economic turbulence in the right way could allow project-based organizations to do more with less and at the same time continue to move forward. Nonetheless, organizations are encouraged to be thoughtful concerning their approach to innovation during economic turbulence – simply because the margin for error decreases as time gets tougher. Bearing in mind that, the riskiness of an innovation depends on the choices people make, it follows that the more informed and conscious their choices are, the lower the risk will be. But as companies and policy makers think through the consequences of an innovation – how it will change the trade-offs people make and their behaviour – they must be mindful of the limitations of their innovation strategy during economic crises. Thus, this study sets-out to unravel how organizational capabilities may be used to manage these situations effectively with a view to persistently implement innovations during economic crisis.

Managers are instinctively more concerned with making sure that their organizations survive the turbulence wrought by economic crisis, often de-prioritizing the long term strategic interest of their organizations. Indeed, the overwhelming tendency is to slash resources, shut down long-term investments and focus on incremental improvements during economic crisis.

However, it is evident that previous dips in the economic cycle were not been hostile to disruptive innovation – the convenient, accessible, affordable innovations that transform existing markets and create new ones (Anthony and Feinzaig, 2008). Whilst it is tempting to cut resources, slow down product launches, and refocus only on the core, firms that continue their commitment to innovation are more likely to reap great rewards. And not only is innovation more critical in a down economy, it is also more valuable argue Anthony and Feinzaig (2008).

This study identifies the specific benefits of continuing with innovation implementation during economic crisis. These key benefits as identified from literature are; improved clients' satisfaction and brand loyalty, a more dynamic knowledge base, improved operational and resource efficiency, and increased revenues and profits levels. These factors are discussed in the next sub-sections.

4.7.1 Improved clients' satisfaction and brand loyalty

To continue meeting clients' needs and requirements, firms will have to persistently innovate even during economic crisis (Anthony and Feinzaig 2008). This suggests that firms that continue to innovate during economic crisis are more likely to sustain or even improve their clients' satisfaction levels. In their empirical investigation of the relationship between self-service technologies and customer satisfaction, Meuter et al. (2000) find the existence of a positive correlation between innovation and customer satisfaction. Nemati et al. (2010) remark that customers are keen for assurances that service/product quality will not be compromised no matter what happens to the firm or the market and this includes during economic crisis. The work of Meuter et al. (2000) is instructive in this regard. Meuter et al. (2000) find a positive correlation between innovation implementation and customer satisfaction. This finding is also implicit in the conclusions of Nemati et al. (2010). Whilst the work of Nemati et al. (2010) could not find a direct link between innovation and brand loyalty, they nevertheless uncovered a positive connection between innovation and customer satisfaction and brand loyalty. However, Anderson and Sullivan (1993 cited in Nemati et al. 2010) contend that customer satisfaction generates a positive impact on repurchase intentions. Reichheld and Sasser Jr (1989) remark that a strong customer loyalty should

normally be reflected in positive economic returns for firms because it ensures steady stream of future cash flows.

4.7.2 A dynamic knowledge base for the organization

Inability to persist with innovations as occasioned by limited problem solving, limited experimentation, and screening out new knowledge can undermine the development of competencies (Leonard-Barton, 1995). Therefore, to achieve dynamic capabilities, firms must ensure continuous renewal of their competences by persisting with innovations even in difficult economic situations. Achieving a dynamic capability is critical to a firm's ability to continually meet clients' changing needs (Leonard-Barton, 1995).

Indeed, a firm's expertise is developed by employees and embodied in machines, software, and institutional procedures (Leonard-Barton, 1995). Leonard-Barton (1992) finds that the constant renewal of a firm's core or strategic capabilities determines a firm's competitiveness and survival. Core capabilities must be managed to foster, not inhibit flow of critical knowledge. There is a dilemma here according to Leonard-Barton (1995). She argues that "core capabilities are also core rigidities when carried to an extreme or when the competitive environment changes". Hence, constant renewal of capabilities even in turbulent economic situations is advised.

4.7.3 Improved operational and resource efficiency

With so many firms scaling back their innovation efforts, the market often becomes less competitive and noisy. The Economist's EIU report for September 2016, points out that assets can be acquired more cheaply, so the relative cost of developing a new product can be lower than during a boom period. Construction contracting firms that maintain a focus on innovation will find it easier to lure talented engineers away from competitors that are cutting their investment (EIU, The Economist, 2016). The decision to persist with innovations during economic crisis often galvanizes the need to do more with less, requiring different thinking about the management of the innovation process (EIU, the Economist, 2016). Anthony and Feinzaig (2008) reckon that when resources are scarce, companies must become world-class at identifying when it is time to pull the plug. They add that "approaching the problem in the right way can allow companies to do more with less and continue to move forward".

Polimeni (2008) finds that innovations increase the efficiency with which a resource is utilized. Similarly, Rennings and Rammer (2009) submit that innovations lead not only to improvements in product/process quality but also cause an increase in the resource efficiency of products and processes. Therefore, it appears reasonable to infer that persisting with innovations during economic crisis would in turn cause a continuing improvement in operational and resource efficiencies during economic crisis. An improved operational and resource efficiency often mean lower operating cost in comparison with competitors. Thus, innovation persistent firms may afford to bid for jobs slightly cheaper than their competitors.

4.7.4 Increased revenue and profit levels

While it is tempting to cut resources, slow down product launches, and refocus only on the core, firms that continue their commitment to innovation during economic crisis are more likely to reap great rewards (OECD 2012, Antonelli et al. 2012, Anthony and Feinzaig 2008). And not only is innovation more critical in a down economy, it is also more valuable. A British study of 1,000 businesses showed that over the last 30 years, innovation investments in a recession generated a 24% return on capital while cost cutting only garnered 0.6% (Anthony and Feinzaig, 2008). As clients adopt a more frugal approach to their procurements, firms have an opportunity to introduce adjacency innovations (using core competencies to look beyond the current business into a space that is adjacent, for example, taking an existing product to a new customer segment or serving an existing customer with a new product) that capitalise on this trend (EIU, The Economist, 2016). Other factors as discussed above like improved resource efficiency, improved brand loyalty and increased market share often cause increases in not only revenues levels but also profits levels.

This finding is consistent with the contention of Cefis and Ciccarelli (2005) that persistent innovation implementation has a positive effect on organizational profitability. Similarly, Cozza et al. (2012) conclude that a “positive and significant innovation premium” is derivable from continuous innovation implementation. They however add that this “innovation premium” is particularly large for small firms and newly established firms.

4.7.5 Summary – merits of innovation persistence

It was determined in this chapter that although implementing innovations during economic crisis is a highly uncertain endeavour, there are key merits of persisting with innovations during economic crisis. The merits of innovation persistence were identified as follows; improved clients' satisfaction and brand loyalty, a dynamic knowledge base, improved operational and resource efficiency, and increased revenues and profits levels. Thus, the present study argues that innovation persistence is not only critical for withstanding the gales of creative destruction in times of economic crisis but also vital for long term growth beyond the downturn.

4.8 Critical success factors for firm level innovation persistence during economic crises

Most modern construction contractors understand the importance of continuous improvement in the value they offer and how they offer it. However, quite a number of these firms do not understand that breeding and nurturing innovation requires specific environmental conditions (Maxamadumarovich et al., 2012). Thus, they lack the basic knowledge of how to put in place the right conditions for innovation to flourish. This conducive environment within which innovation thrives has often been referred to as "the innovation ecosystem" (Jackson, 2011, Rohrbeck et al., 2009, Adner, 2006). Maxamadumarovich et al. (2012) submit that the innovation ecosystem entails a complex range of structural, economic, legal and societal inputs that lets innovation to flourish.

Previous studies have often explored the innovation ecosystem by attempting to identify and explain essential factors required for enabling innovations in organizations. These essential factors are identified and discussed in section 3.9. However, the current study extends beyond the identification of the fundamental factors for implementing innovations in organizations and instead focuses on what are the critical success factors for enabling innovation persistence during economic crisis. As such, whilst the factors identified in section 3.9 are considered critical to firm level innovation stimulation and management (thus, the current study builds on them), managing innovations in turbulent environmental situations for instance, economic crisis does entail much more than the afore-mentioned factors.

4.8.1 An effective national innovation system – a critical success factor

A good deal of theoretical, empirical and historical research has established that the national institutional setting has a significant impact upon how the economic agents behave and how firms perform (Filippetti and Archibugi, 2010, North, 2006). Filippetti and Archibugi, (2010) observe that national institutions shape not only the structural conditions of countries, but also their ability to respond to changes. It is argued that this is even more pronounced in the event of a major economic downturn. Indeed, the "National System of Innovation (NSI) approach – an institutional conception par excellence – has framed innovative activities and the way firms do things within the institutional national context" (Filippetti and Archibugi, 2010). Thus, it is argued that firm level innovations in countries with well-established National System of Innovation are less likely to be impacted by economic crisis (Filippetti and Archibugi, 2011). More specifically, Filipetti and Archibugi, (2011) agree that firms within a system (sectoral, regional and national) of innovation are more likely to retain the capacity to persist with innovation during economic crisis. Egbetokun et al. (2008) remarks that "external interaction with certain actors can provide missing external inputs into the learning process which the firm itself may not be able to provide". In fact, intermediary organizations i.e. trade organizations, public assistance agencies, industry associations, chambers of commerce, higher education etc. can be vital sources of information for the firm's innovation activities (Romijn and Albaladejo, 2002, Meeus et al., 1999a, 1999b). The work of Meeus et al. (1999a) finds that clients and suppliers are key actors within the NIS involved in innovation processes.

4.9 Summary – chapter 4

This chapter investigated the characteristics of economic crises and how they emerge. The major effects of economic crisis on construction contracting firms in Abuja, Nigeria were identified and discussed. It was determined in this chapter that economic crises are highly improbable events. They often emerge as surprises, have major effects, and often inappropriately rationalised after the fact with the benefit of hindsight. In addition, the key effects of economic crisis on construction contracting firms were identified and investigated. Lastly, this chapter explored the relationship between economic crisis and innovation and argues that the relationship is cyclical; hence, the present study considers economic crisis as a source of innovative opportunities for construction based firms.

4.10 Overall findings from literature review (chapters 3&4)

Because no single previous study specifically links all four elements of the current study – innovation, economic crisis, construction contractors and innovation persistence; this research is justified and contextualised through a review of relevant literature on innovation, economic crisis, construction contractors and innovation persistence as conducted in chapters 3 & 4. The key findings drawn from chapters 2 & 3 are summarised below.

- That; novelty (Nohria and Gulati 1996, Slappendel (1996), first use (Slaughter 2000, Rothwell 1976), non-triviality (Slaughter 1998, Johannessen et al. 2001) , value generation (Egbu, 2001a, Johannessen et al. 2001) and associated risks (Ling 2003, Slaughter 2000) are key characterizations of innovation (see section 3.1).

- That; the Schumpeterian view (Marceau 1995, Gilad and Levine 1986), resource based view (Barney 1991, Penrose 1959), Psychological view (McClelland 1987) and Social-construct view (Austin et al. (2006) are the four distinct schools of thought on the question of why organizations innovate (see section 3.3). However, the fundamental tenet that underpins PhD research draws predominantly on the Schumpeterian view and partly on the resource based view.

- That; the nature of construction and the constructed product (Blayse and Manley 2004), the structure of production in construction (Damanpour 1996), traditional contract procurement system (Walker and Hampson 2003), inadequate organizational resources (Blayse and manley 2004), overbearing industry regulators (Gann and Salter 2000), lack of project collaboration (Corwin et al., 2012) and lack of knowledge (Egbu 2004) are the common barriers to innovation in construction industry (see section 3.8).

- That wastes in construction processes (Gidado (2004), high cost of construction materials (Erguden (2001), lack of primary infrastructure (Akeju (2007), unpredictable government polices (Adeleye et al. 2009), inefficient supply chain (Egbetokun et al. 2008), weak customer demands (Oladapo, 2011), lack of skilled personnel (Egbetokun et al. 2008), legal restrictions (Egbetokun et al. 2008), uncertain domestic economic conditions (Egbetokun et al. 2008), lack of information on technology (Egbetokun et

al. 2008), lack of financing and high interest rate (Egbetokun et al. 2008), unfair tariff regime (Egbetokun et al. 2008) and long approval process within firm (Egbetokun et al. 2008) are the barriers to firm level innovations specific to Nigeria's construction industry (see section 3.9). The present study builds on these factors to further investigate the specific barriers to firm level innovation that emerge during economic crisis.

- That the conditions necessary for innovation to thrive in organizations as discussed in section 3.9 are; the presence of an innovation champion (Klerkx and Aarts (2013), committed leadership (Martins and Terblanche 2003, Nam and Tatum 1997), appropriate organizational culture (Jiménez-Jiménez and Sanz-Valle (2011), flat organizational structure (Townsend et al. (1998), adequate resources (Huang et al. (2001), a learning organization (Kontoghiorghes et al. 2005, Hurley and Hult 1998), motivated staff (Hooley et al. (2005) and well-trained staff (Macdonald et al. (2007). However, the present study builds on these identified conditions necessary for innovation to thrive in firms to identify and explore the critical success factors for firm level innovations during economic crisis (section 3.9).

- That the effects of economic crisis on construction based organizations as discussed in section 4.3 are as follows; shrinking aggregate demand for products (OECD 2012, Bricongne et al. (2010), increased difficulties in accessing credits (Malherbe 2014, OECD 2012), increased delays in payments for completed job (Ayangade et al. 2009), increased operating cost (Gilchrist et al. 2017) and declining revenue (Donald et al. 2014, Kalemli-Ozcan et al. 2013). These effects of economic crisis often culminate in constraints to firm level innovations.

- That the following factors constrain firm level innovations during economic crisis as highlighted in section 4.5; unstable funding regime (Aghion et al. 2008), erosion of good organizational slack (Anthony and Feinzaig 2008), increased apathy to costs by clients (Wong et al. (2000), reduced appetite for risks due to increased uncertainties (Fernandes and Paunov 2011).

- That innovation persistence is not only critical for withstanding the gales of creative destruction in times of economic crisis but is also important for the long-term growth of the firm. And that the key merits of innovation persistence during economic crisis as discussed in section 4.7 are improved clients' satisfaction and brand loyalty (Meuter et al. 2000), a dynamic knowledge base for the organization (Leonard-Barton 1995), improved operational and resource efficiency (Polimeni 2008), iincreased revenue and profit levels (Anthony and Fenizaig 2008).

- That there are organizational characteristics and capabilities that facilitate innovation persistence during economic crisis (refer to section 4.8). Having in place an effective national innovation framework is identified as critical success factor for firm level innovation persistence during economic crisis (Filippetti and Archibugi, 2010).

The present study submits that literature reviewed in sections 3.1 and 3.3 sufficiently addresses **Research Objective 1** as specified in section 1.4 above. Building on the above findings and to fully address the research problem, three research questions are formulated from a synthesis of literature and situated within relevant theoretical frameworks that adequately capture the meaning and purpose of **Research Objectives 2, 3 & 4** and are then used to shape and inform the methodology of the research, the design of the case study and subsequent data analysis. These research questions are:

- **Research Question One:** What are the specific factors that constrain firm level innovations during economic crisis?

- **Research Question Two:** What are the merits of firm level innovation persistence during economic crisis?

- **Research Question Three:** What are the critical success factors that enable firm level innovation persistence during economic crisis?

These research questions are further explored in Chapter six.

Chapter 5 : Research methodology

5.0 Introduction

This chapter outlines the research philosophy, approach and strategy adopted to address the research problem. It also identifies and examines the relevant theoretical background so as to better understand the various aspects of research methodology. This chapter further introduces the rationale behind the choice of the research philosophy, approach, method, and analytical process upon which this study is founded. It basically discusses what was done, how it was done and why it was done. Figure 5.1 below highlights the research onion as utilised for the present study.

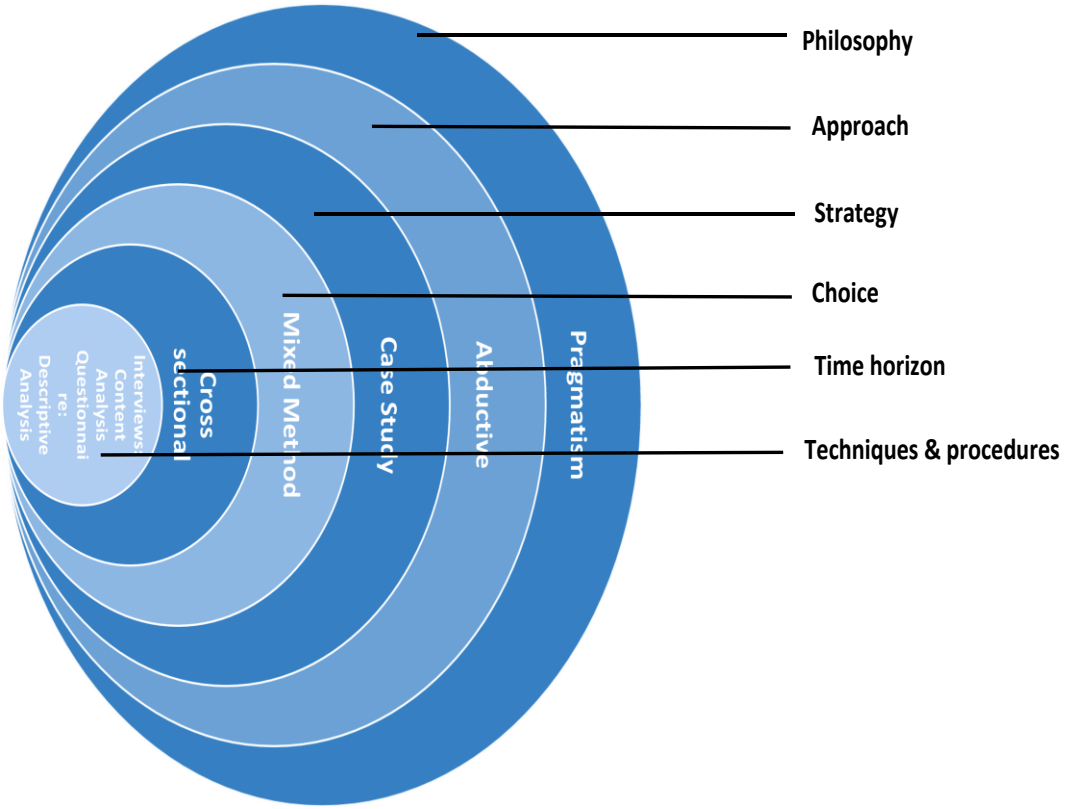


Figure 5-1: Research Onion as utilised for the present study (Adapted from Saunders et al., 2009)

An overview of the research methodology adopted for the present study is further highlighted in Figure 5.2 below.

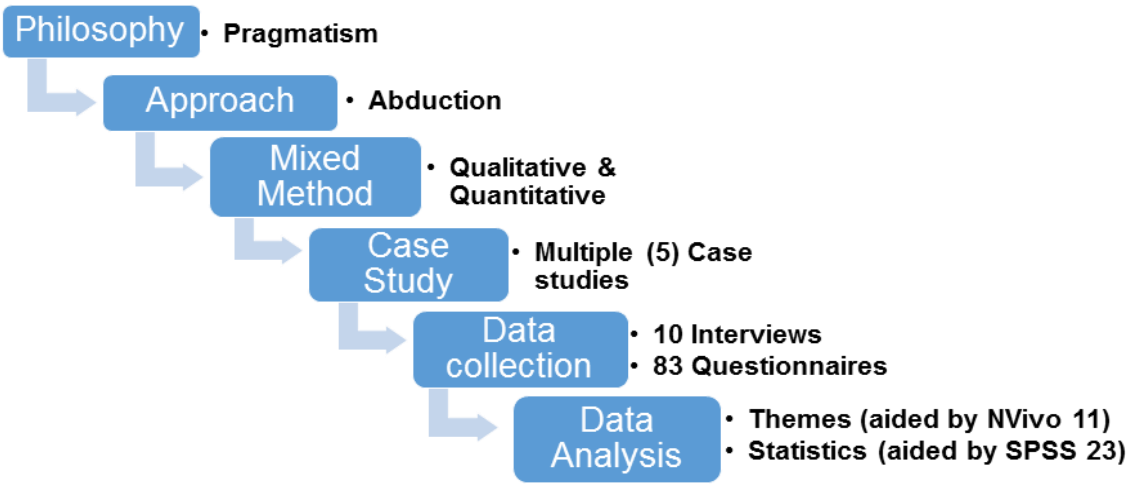


Figure 5-2: An overview of research methodology adopted for the present study.

5.1 Research Philosophy

This in a nutshell refers to the way one might want to view the world (Creswell, 2009a) and this in turn should influence research plans (Saunders and Lewis, 2016) . It encompasses the assumptions of how the world is viewed from different stand points (Saunders et al., 2009). A number of studies view research philosophy as a "paradigm" (Lincoln et al., 2011, Morgan, 2007). The work of Easterby-Smith et al. (2012) underscores the importance of philosophical stance in research by observing that the inability of researchers to think through the philosophical sphere can seriously affect the quality of the research outcomes. Building on the work of Gilner et al. (2000), Easterby-Smith et al. (2012) point out three reasons why understanding research philosophy is essential when conducting a research study. These are:

- It helps to explain the research design.
- It helps to outline the suitability and applicability of research design within the context of the study.
- It empowers the researcher to create a bespoke research design for the study.

There are broadly four philosophical positions that underpin social science enquiries. These are; positivism, realism, interpretivism and pragmatism. Whilst each of these can be viewed as separate, there is however, an apparent overlap and interplay between them. The four philosophical positions are briefly discussed in Table 5.1

Table 5-1: Summarised Comparisons of philosophical positions in Social Science Research

	POSITIVISM	REALISM	INTERPRETIVISM	PRAGMATISM
Ontology	Emphasizes that the researcher is external, objective and independent of that study	Researcher is objective and the object of social science enquiries exists independent of the human mind	Facts are socially constructed leading to subjective reasoning which may change with multiple realities	Researcher is external and focuses on how best to address the research problem
Epistemology	Facts are observed to prove credibility, focusing on causality and generalisations thereby reducing the phenomenon being investigated to the simplest elements	Assumes that observing an event proves credibility of facts; scarce data or facts creates imprecision and misinterpretations; focus only within contexts for explanations	Towards subjective meanings of social phenomena. Looks at details and the realities behind it.	Believes that either subjective or objective meanings can provide answers to the research problem, emphasizing practical application to issues by merging views to help interpret data
Axiology	Value free, hence independent of the data and objective in the analysis of the data	Value laden, hence, the researcher is biased by world views, culture, values, experiences and may impact research findings	Value bound, such that the researcher is part of what is being studied, not isolated from the studied and will be subjective	Value plays a vital role in interpreting results using subjective and objective reasoning
Approach	Quantitative but can still use qualitative	Approach adopted depends on the object of the empirical enquiry	Qualitative	Uses both qualitative and quantitative
Method	Mono method but can use mixed in certain cases	Method to use is based on the research problem or situation	Mixed or multiple methods	Mixed or multiple methods

Although, positivism allows for the collection of objective, trustworthy and generalizable data, it was however viewed as inflexible because of its insistence that everything can be measured and calculated. In addition, positivist studies often lack in-depth understanding of the research environment, thus cannot capture the full richness of

the empirical context (Gay, Mills and Airason, 2009). For the present study, it is important to build knowledge from the captured views of the study participants which will explain the peculiarities and dynamics of the case study environment. Consequently, positivism was not adopted for the present study. Similarly, realism was deemed inappropriate for the present study as meaning for the present study will emerge from participants' opinions as against the philosophical assumption of realism that knowledge can only emerge from what the observer sees. Furthermore, interpretivism was not chosen for the present study because of its inherent subjectivity, which allows for a great deal of bias on the part of the researcher. Research findings are difficult to be generalized because primary data generated is heavily influenced by personal viewpoint and values. **Pragmatism** was adopted for the present study because it allows the researcher to draw from the strengths of the positivist and interpretivist philosophical positions (Masadeh, 2012). The pragmatic research philosophy and the key rationales behind its adoption are discussed in the next sub-section.

5.1.1 Pragmatism

The pragmatic approach assumes that multiple realities exist and that the researcher's choice of paradigm is dependent on the research questions posed (Saunders et. al., 2009). For pragmatists, there is indeed such a thing as reality, but it is ever changing, based on actions and experiences. This emphasis on actions and their consequences creates a gap between pragmatism and most versions of interpretivism because it does away with the idea that the research participants are free to interpret their experiences in whatever way they see fit (e.g., relativism). Instead, actions have outcomes that are often quite predictable, and knowledge is created from experiences that link actions and their outcomes.

In justifying the adoption of pragmatism, the present study considered the finding of Kral et al. (2012) that pragmatism is the most appropriate paradigm for conducting research into complex human activities by utilising both qualitative and quantitative research paradigms. Such defining characteristics of the pragmatic paradigm according to Morgan (2007) provide the foundation for researchers to undertake investigations with what is traditionally seen as incompatible and conflicting paradigms. Johnson and Onwuegbuzie (2004) argue that adopting pragmatic research approach offers an explicitly knowledge-oriented practical approach to empirical inquiries. The present study focuses on investigating the critical

success factors for firm level innovation persistence during economic crisis. It is noted that innovation is fundamentally a social process (Sundbo, 2001) often requiring people to come together to solve a problem in a new way. As such, understanding the factors that enable firm level innovation persistence during economic crisis will require utilising the interview instrument (qualitative) to obtain, explain and interpret research participants' actions and experiences; and at the same time exploring the validity of the emerged interpretations on a larger population by using questionnaire survey tool (quantitative).

Furthermore, pragmatic philosophy adopted in the present study enabled the utilization of a mixed method for data collection and analyses. This enabled the present study to overcome the limitations of a single research design. The interview and the questionnaire survey instruments were utilized sequentially to explain and explore the research problem. This afforded the researcher the opportunity to be simultaneously subjective and objective in analysing the points of view of the participants (Saunders, et. al., 2009). It is noted that pragmatism unties the researcher from the paradigm war that continues to exist between qualitative-interpretivism and quantitative-positivism positions by drawing on their respective strengths (Masadeh, 2012). Indeed, pragmatism captures inferences offered by both qualitative and quantitative methodologies into a single research framework to investigate problems, particularly, where they are of multifaceted nature (Fidel, 2008).

5.2 Research Approach

Research approach (often referred to as "research logic") refers to how a theory is developed (Creswell, 2003). Three possible research approaches can be applied. These are inductive, deductive or abductive. Deductive logic is described as the process of developing a theory based on general law and then tested in a specific context for confirmation while inductive logic involves the development of a theory based on inferences drawn from the context to which the event is taking place (Denzin and Lincoln, 2009). However, the work of Saunders et al. (2012) points to a third approach which is termed "abductive". An abductive research approach is one which involves the combination of both inductive and deductive logic applied in a research at different stages (Saunders, et al., 2012). An **abductive** approach was adopted for the present study. The abductive research approach and the key rationales behind its adoption are discussed in the next section.

5.2.1 Abductive approach

As noted in section 5.2 above, the present study adopted an abductive approach. The abductive research approach involves moving from theory to data (deductive) and data to theory (inductive) that is, the combination of deductive and inductive approach (Saunders et al. 2012). Apparently, the abductive logic advanced from limitations of the lack of complete evidence or lack of certainty to explore or explain relationships among variables in a particular situation. Dew (2007) concludes that abductive reasoning entails making guesses about the best way to explain a collection of surprising and anomalous facts from research findings. It is worth noting that advances in science does not always follow a logical process, they are sometimes outcomes of intuitive leaps that come forth as a whole (Taylor et al., 2002).

In justifying the adoption of abductive approach, the present study considered that there is a paucity of literature on firm level innovation persistence during economic crisis. Therefore, this research cannot be definite in adopting either deductive or inductive reasoning (Dew 2007). Hence, abductive logic was considered more appropriate for this study (Dew 2007). It was reasoned that to enable a full exploration and explanation of the critical success factors for firm level innovation persistence during economic crisis, there was need to draw inferences from established related theories (deductive) and at the time, build inferences of a general law from particular actions and experiences as gathered from analysed empirical data.

Adopting an abductive approach enabled this study to gain insights into the research problem, from real life situations (inductive). Thus, enabling the collection of relevant information based on the perception and values of the research participants involved in the management of the innovation process during economic crisis. In addition, the abductive approach as adopted in the present study ensured that some inferences and explanations were derived from established related theories (deductive).

5.3 Research Strategy

Research strategy is defined by Denscombe (2010a) as a plan of action, process or design that underpins the choice and use of a particular method. It links the choice and use of methods to the desired outcomes. There are various research strategies that could be employed in a

research. Some commonly used research strategies were identified from the works of Creswell (2014), Saunders et al. (2009), Denscombe 2010 and Yin (2009). These include; survey, experiment, case study, ethnography, archival, grounded theory and action research. Yin (2009) argues that the research questions posed should be a key consideration when deciding the appropriate strategy to be adopted. Similarly, Robson (2011) observes that the type of questions and contextual settings of a research are major influences on the type of strategy that would be considered best suitable. The different types of research strategies available to the researcher are discussed below.

5.3.1 Experiment

This is used for the controlled testing of causal processes (Oates, 2006). However, this strategy can be used where there is time priority in a causal relationship, or where there is consistency in a causal relationship and the magnitude of the correlation is great. Experiments are founded on the positivist and objectivist position in terms of epistemological and ontological undertakings. Experiments are undertaken under a controlled environment (Baker, 2001). Also, in experiments, investigating and observing fact and the context are often constrained by the large number of variables involved (Yin, 2009). **Therefore, this strategy was considered inappropriate for the present study.**

5.3.2 Survey

This is often utilized in gathering information about individuals. This type of research strategy is commonly adopted in the field of psychology to collect self-report data from study participants. A survey may focus on factual information about individuals, or it might aim to collect the opinions of the survey takers (Oates, 2006). Surveys take the positivist and objectivist position in terms of epistemological and ontological undertakings. Also, in surveys, investigating and observing fact and the context is difficult because of the constraint of the number of variables (Yin, 2009).

This strategy was considered unsuitable for the present study because gathering information about the research participants are of no value to the research problem being addressed. However, questionnaire survey method was used to extend the explanations of the singularities in this research.

5.3.3 Action Research

Action research entails the researcher being involved with the phenomenon being investigated and influencing the attitudes and behaviours of the research participants.

This **strategy was considered inappropriate** for the present study because the research problem being addressed – an investigation of the critical success factors for firm-level innovation persistence – will entail the researcher being detached from the study and extracting the true, uninfluenced experiences of the research participants.

5.3.4 Grounded theory

Grounded theory research was **considered unsuitable** for the present study as it entails collecting empirical data without an initial theoretical framework and tested before a conclusion is drawn (Creswell, 2009). The present study builds from established theories to identify and explore the critical success factors for firm level innovation persistence during economic crisis.

5.3.5 Ethnographic research

Ethnographic research provides an insight into the norms and values of human, social and organisational aspects of social-cultural phenomenon (Saunders et. al., 2009). In addition, it takes a prolonged time though this may be flexible, particularly when involved in a real-life setting (Creswell, 2009, Burns, 2000). Consequently, this **was considered inappropriate** because these criteria and characteristics are inconsistent with the nature and focus of the present study.

5.3.6 Archival research

Archival research only allows research questions which focus on the past and changes over time to be addressed and it is purely limited by the nature and condition of the information held in the archive relevant to the work. In addition, some of the data could be withheld for confidentiality reasons or the researcher may be refused access to them. It is therefore argued that using an archival strategy will necessitate the research analysis to focus only on accessible or available data which may affect the achievability of the research objectives; **hence, this was considered unsuitable for the present study.**

5.3.7 Case study research

A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident (Yin, 2009). Whilst some of the research alternatives, such as action research, could potentially be adopted in this study, the level of investigations required to achieve the research aim and objectives and the type of questions posed in this study, as well as the philosophical position which was selected for this study (pragmatism), necessitated **the adoption of a case study strategy for the present study.** The key justifications for adopting a case study approach are discussed in section 5.4 below.

5.4 Case study

Yin (2009) defines case study as "an empirical enquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident". Willis (2014) observes that Yin's definition neatly captures the intended purpose of case studies – "unlike more superficial and generalising methods – to provide a level of detail and understanding, similar to the notion of "thick description" as advanced by Geertz (1973), that allows for the thorough analysis of the complex and particularistic nature of distinct phenomena". Grix (2010) remarks that "case study takes an example of a situation or contemporary phenomenon" (cited in Barlow, 2012) in its natural setting. The researcher possesses little or no control (Yin, 2003) over events and can triangulate multiple sources of data to carry-out an exhaustive enquiry. Oates (2006) highlights the strong points of the case study research. The key features of a case study strategy are:

- Focuses on in-depth rather than breadth
- The research problem is studied in its natural setting, not in a laboratory.
- The researcher is able to employ multiple sources of data
- Enables a holistic study as the researcher recognises the complexity of social truths.

5.4.1 Justifications for adopting case study strategy

Based on the features of case studies as discussed above and considering the aim of this study and the kind research questions posed, a case study strategy was adopted. Considering the apparent lack of evidence, with very few studies conducted in this particular area (firm level innovation persistence during economic crisis), the utilization of case studies aided the researcher in obtaining detailed, valuable and complete information from multiple sources

(Yin, 2009, Saunders et al., 2009). This enabled an exhaustive examination of the multifaceted issues involved in firm-level innovation persistence during economic crisis. Another key benefit of the case study strategy as adopted in this study is the close collaboration between the researcher and the participant, which allowed the participants to tell their stories (Baxter and Jack, 2008, Crabtree & Miller, 1999). Through these stories the participants were able to describe their views of reality and this allowed the researcher to achieve a better understanding of the participants' actions (Lather, 1992).

In justifying the selection of case study strategy for the present study, a number of key factors were considered. These are discussed below:

(i) Research approach adopted

This study adopted a pragmatic approach. Thus, the researcher was left with a choice of either case studies or action research. Action research was considered inappropriate because this research study does not intend to solve an immediate problem or to engage in a reflective process of progressive problem solving (Denscombe, 2010b). This study sets out to understand the innovation persistence phenomenon based on the opinions, experiences and suggestions of stakeholders involved in managing innovation persistence during economic crisis. Therefore, the case study strategy was considered more suitable for the present study.

(ii) Characteristics of the research problem

Remenyi et al. (1998) remark that a case study draws on multiple but triangulated sources of data to understand and illuminate the key problem in its broader context. There is often a detailed focus on an organization or on a phenomenon (the phenomenon for this research is innovation persistence). For the present study, case study strategy facilitated a more fine-grained analysis of the innovation phenomenon (Winch, 1998) where the focus of the research, was the persistent implementation of innovations by selected construction-based organizations, unhindered by economic crisis.

(iii) Expression of research questions

The research questions are expressed as mostly "what and "how" and these often act as an indication that a case study strategy is appropriate (Yin, 2003). Yin (2003) further remarks that "what" questions are generic exploratory technique for all research strategies and is

therefore appropriate for this research. In addition, "How" questions generate explanations from operational links (Barlow, 2012).

(iv) Research procedure

In contrast to the action research approach, the case study approach will not require the researcher to be immersed in the environment under investigation.

(v) Control of research environment

Case study technique does not attempt to change the systems or procedures of the environment under investigation as is the case with action research approach. Indeed, case study does not try in any way or form to control the environment being reviewed.

(vi) Data collection

The case study approach permits multiple data collection methods and this will enhance the robustness and validity of data.

5.4.2 Categories of case studies

Yin (1994) categorizes case studies into three broad types. These are explained in Table 5.2 below.

Table 5-2: Categories of case studies

S/N	TYPES OF CASE STUDIES	DESCRIPTION
1	Descriptive case study	Aims to describe and analyse a particular phenomenon (Yin, 1994).
2	Explanatory case study	Seeks to offer further explanation as to why an incident or event occurred as they did (Oates, 2006; Yin, 1994).
3	Exploratory case study	Attempts to define the question(s) in addition to helping the researcher understand a research question. This type of case study research is appropriate for when the research topic suffers from shortage of information and literature (Yin, 1994). **This type of case study was adopted for the present study.**

In the case of the present study, the research topic - firm level innovation persistence during economic crisis – suffers from shortage literature and other forms of evidence. Hence, an

exploratory case study strategy was adopted to enable an in-depth exploration of the research questions.

5.4.3 Single-case study design verses multiple-case study design

Yin (1994) observes that it is vital to identify and adopt an appropriate case study design in order to address the research questions that have been articulated. This study has the option of choosing either the single-case study design or multiple-case study design. However, because of the nature of the phenomenon being investigated - innovation persistence during economic crisis -, a multiple case study design was preferred. A multiple-case is one which involves more than one unit of analysis (in the same format) in two or more organizations within a single study. For the present study, the research problem – the critical success factors for firm level innovation persistence during economic crisis – was investigated within five construction based firms with similar features and size.

Adopting the multiple case study strategy allowed the findings that emerged from one case to be compared with what occurred in the other cases. This enabled a broader breadth of evidence to support the research conclusions and generalisation of research findings (Saunders et al., 2009; Yin, 2009). Furthermore, adopting a multiple case study design provided a better base for a purposive sample selection.

5.4.4 Holistic Vs. embedded single-case study designs

A multiple-case study design can either be holistic or embedded. A case study design examining only the global nature of a phenomenon is called a holistic design, while a case study design focusing on more than one sub-unit of analysis is referred to as an embedded case study design (Yin, 2009).

An embedded multiple-case study design was adopted in this study for the following reason. Firstly, this approach provided a means of integrating qualitative and quantitative methods into a single research study (Yin, 2003; Scholz and Tietje, 2002). Furthermore, the identification of sub-units allowed for an in-depth and exhaustive investigation of the research problem with a view to achieving the research objectives. The present study conducted the analysis of all the sub-units on the five (5) construction contracting firms. Although, these five firms are owned and managed separately, they share similar features

and facilities. The case study participants in this study were management level employees of these five (5) construction contractors.

5.5 Selection of cases

In response to the initial questionnaire survey distributed to all 150 construction contracting firms based in Abuja, Nigeria (refer to section 5.12.1), 16 firms indicated that they have persisted with innovations during the last economic crisis (refer to section 5.12.2). Of these 16 innovation persistent firms, 5 firms showed interest to participate in the interview phase of this research. These 5 firms are all fairly large sized. To confirm that the 5 firms have actually persisted with innovation during economic crisis, the researcher conducted an initial visit to the offices and work sites of these 5 firms so as to directly observe the implemented innovations.

Therefore, these 5 selected innovation persistent construction contractors provided this research with the organizational boundaries within which to study the research problem.

5.6 Case study descriptions, with a brief highlight of innovations implemented during economic crisis

This section discusses the 5 construction contracting firms that provided the boundaries within which the research problem was investigated. These construction firms all have significant presence in Abuja, Nigeria and together accounts for over 50% of public-sector related construction projects currently being implemented in Abuja. Most importantly, these 5 construction contractors had persisted with innovations during last economic crisis in Nigeria. The 5 construction contractors are coded as CS1, CS2, CS3, CS4, and CS5; and are briefly discussed below.

5.6.1 Case study 1 (CS1)

Founded in Egypt in 1955, CS1 is one of the leading construction companies in the Middle East and Africa. CS1 has over 77,000 employees globally. Around 5000 of these employees are in Nigeria including around 100 expatriates mostly from Egypt. Their areas of expertise include; public buildings, bridges, roads, airports, tunnels, water and sewage systems, power stations, ship building, etc. Over 95% of its clientele in Nigeria is public sector related. Its global head office is situated in Cairo, Egypt.

CS1 introduced and continued to implement innovative solutions that were often focused on saving money, time and enhancing the overall project performance during the last economic crisis. For instance, during the last economic crisis, CS1 introduced drone technology to navigate and survey complex construction sites. These drone flights produced accurate data within a fraction of the time utilised by other traditional methods. This not only saved money but did also enhance site security and overall project performance.

5.6.2 Case study 2 (CS2)

Established nearly 40 years ago, CS2 is rated among the top construction firms in Nigeria. With a staff strength of around 3000 employees including over 80 expatriates most occupying top technical and management positions. Among the projects executed by CS2 are several housing estates, bridges, flyovers, highways, airport runways. Nearly 100% of its clientele is public sector related. Its vision is to be amongst the top construction organizations working in the Middle East and Africa within the next five years.

CS2 pioneered the introduction and mass production of prefab housing estates in Nigeria during the last economic crisis. It exploited the vast human and materials resources available in Nigeria to facilitate the cheap and quick production of these prefab housing units during economic crisis. This led to a significant increase in its clientele and consequently, a positive impact on its revenues.

5.6.3 Case study 3 (CS3)

CS3 is a multinational engineering and services group that include over 30 semi-autonomous companies operating within the public and private sector. It has about 20,000 employees globally and over 6000 employees in Nigeria. CS3 retains ownership of equipment and machineries worth over N30 billion (2016 estimates). Its mission is to continuously embrace new ideas and learn continuously. 0ver 90% of its current clientele (2017) is public sector related.

During the last economic crisis, CS3 introduced innovative solutions to the incessant problem of time overrun by utilizing modularisation and building information modelling as part of its overall approach to meeting project timing requirements. This innovation enhanced the speedy delivery of project requirements without impacting quality or safety.

5.6.4 Case study 4 (CS4)

CS4 is a transnational construction and development group, with subsidiaries in several countries. Its first foray into Nigeria was in 1956. Some of the notable construction projects CS4 has executed in Nigeria includes universities, hotels, offices, embassies, commercial, residential, industrial schools and hospital buildings, various regional water projects, major highways, urban and rural roads, as well as bridges and runways for major airports in Nigeria. CS4 currently employs over 4000 individuals, with expatriates forming a large chunk of top management. About 90% of its client base is public sector related.

During last economic crisis, CS4 adopted the use of mobile devices to file reports and share information on project sites thereby streamlining the construction process. This enabled the project team to have easier access to information that ordinarily would have required trips or calls to the project site. This reduced project cost and enhanced the quality and reliability of project reports.

5.6.5 Case study 5 (CS5)

CS4 was established in 1988. It has over time become one of the largest infrastructure and construction companies in Nigeria. It currently has over 3000 employees in Nigeria including over 150 expatriates, mostly Israelis. CS5 is experienced in all areas of civil engineering constructions like roads, bridges, office buildings, residential buildings etc. Over 85% of her client base is public sector related.

During the last economic crisis, CS5 introduced safety practices, combined with technology to prevent jobsite accidents. This innovation according to CS5, reduced the number of monetary claims made by accident victims and also work stoppages following accidents.

5.7 Data collection choices

Collins and Hussey (2003) refer to data collection technique as the approach adopted to obtain and record data. The collection of data for any study in the words of Fellows and Liu (2003) is a “communication process” between the researcher and the respondents, which is fundamental to an understanding of the phenomenon under study. Deciding on the type of data collection technique to adopt will to a large degree depend on the research methodology and the overall objectives of the study (Naoum, 2007, Fellows and Liu, 2003).

This study adopted a sequential exploratory mixed research method. This method is characterised by an initial phase of qualitative data collection (using semi-structured interview and documentation) and analysis followed by a phase of quantitative data collection (utilising questionnaire survey) and analysis (Cameron, 2009). The findings that emerged from the analysed qualitative data informed the make-up of the questionnaire survey which was utilised in obtaining quantitative data for the present study.

The mixed method was adopted primarily to enable an in-depth exploration of the research questions articulated (Cameron, 2009) and to identify variables and themes (using semi-structure interview instrument), which were further investigated using the questionnaire survey instrument. This allowed for a triangulation of findings so as to provide stronger evidence and a better representation of the social world of the phenomenon (innovation persistence) being studied (Saunders et al., 2009). Indeed, combining such data collection techniques enhanced the "explanatory power above and beyond the sole use of a qualitative or quantitative approach" (Castro et al. (2010) and yields more accurate interpretation and understanding of firm level innovation persistence during economic crisis. In addition, adopting a mixed method allowed the present study to overcome the limitations of a single design (Onwuegbuzie and Johnson (2006). Other reasons supporting the preference for the mixed research method according to Onwuegbuzie (2004) are as follows:

- Words, images and descriptions can be used to add meaning to figures and vice versa.
- Offers stronger evidence by converging and corroborating findings.
- Provides broader insights and understanding than the single approach methods.
- Offers deeper insights and understanding than the single methods.
- Offers a more complete knowledge necessary to inform theory and practice.

5.7.1 Summary of data collection choices

A recap of the purpose and the respondents for each data instrument utilised in the present study is presented in Table 5.3 below.

Table 5-3: Data collection tools utilized in the present study

INSTRUMENT	PURPOSE	RESPONDENT (S)	SAMPLE (N)
Questionnaire A (Qualitative)	• To determine the number of construction contractors that have persisted with innovations during economic crisis	• One (1) identified key employee of each of 150 construction contractors identified as active in the databases of Nigeria's Corporate Affairs Commission and The Federal Territory Development Authority, Abuja, Nigeria.	150
Pilot A	• To refine the content of interview questions and procedure to be followed in administering the interviews.	• Four (4) local construction experts from two market leading construction contracting firms in Lagos, Nigeria	4
Semi-structured interview (Qualitative)	• To explore the articulated research questions	• Key management employees of five (5) case study firms.	10
Pilot study B	• To test the feasibility of the structure of the questions asked and not the content of the questionnaire survey	• Five (5) of the researcher's colleagues	5
Questionnaire survey B (Quantitative)	• To obtain data from a large number of respondents in order to validate or refute findings that emerged from the interview phase.	• Key mid-level professionals employed by the sixteen (16) innovation persistent firms.	83
Documentation (qualitative)	• To enhance evidence from other sources.	• Contract documents • End of year report • Work flow reports • Monthly HR reports • TV programme on innovations in Nigeria's construction industry.	5

The process followed to obtain data for the present study is further depicted in Figure 5.3 below.

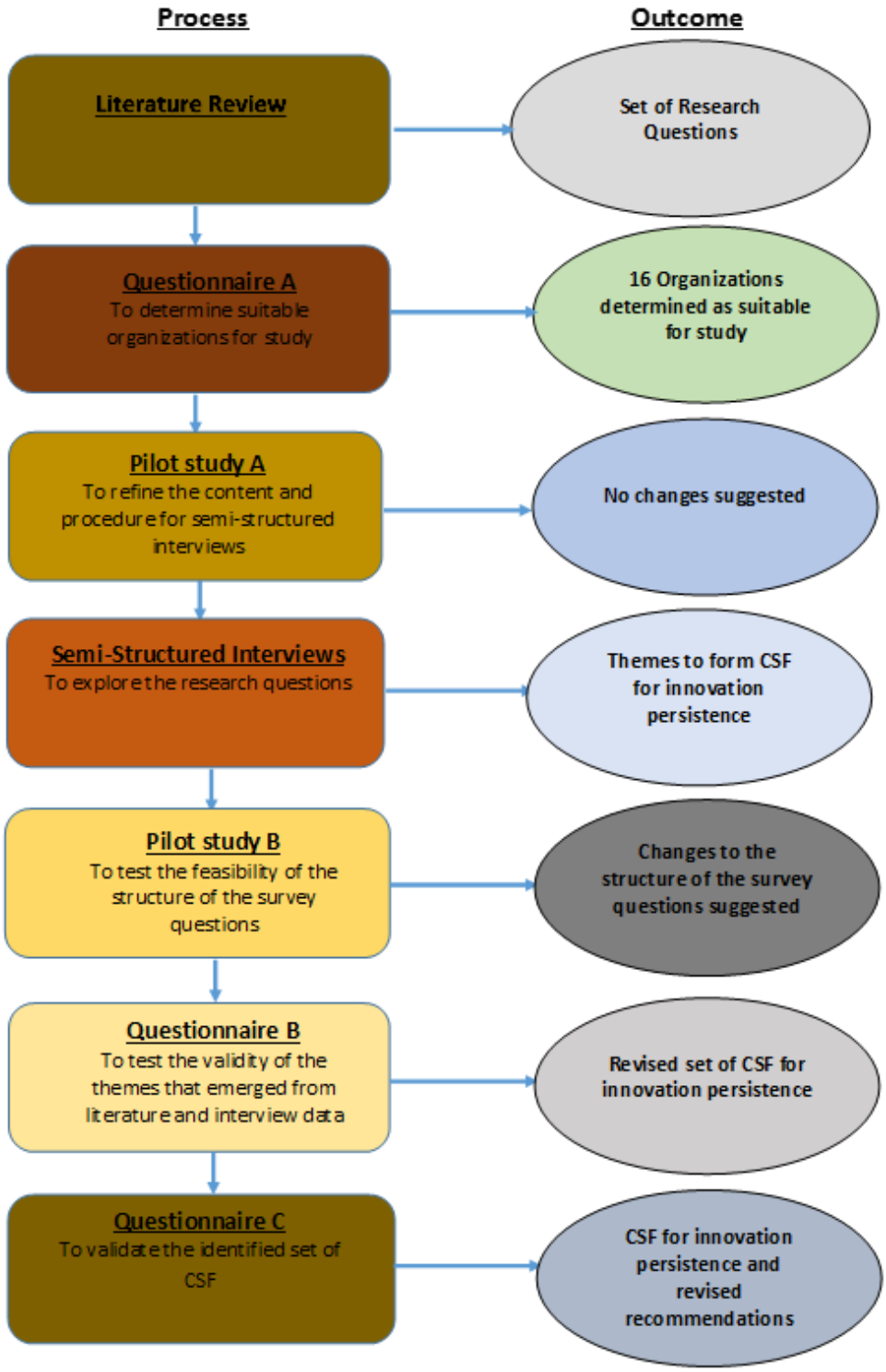


Figure 5-3: The research process followed

5.8 Semi-structured interview (Qualitative)

The semi-structured interview is essentially an interaction between the researcher and participant in which the researcher has a general plan of inquiry including the topics to be covered but not a set of questions that must be asked in a particular order and containing only the specified words (Babbie, 2008). In addition to the potential of semi-structured interviews in producing detailed findings, the interactive nature of these interviews ensures a relaxed atmosphere where the participants will be put at ease in having a conversation with the researcher rather than being distant in filling a survey (Woods, 2011). Due to these benefits, the semi-structured interview was selected as the most suitable tool for qualitative data collection.

Qualitative research concerns the study of occurrences from the participants' viewpoints (Akotia, 2014). Burke (2007) argues that because the fundamental objective is hinged on the understanding of the participants' opinions, behaviours and experiences, it is viewed as the most suitable way of exploring social phenomena. Furthermore, qualitative data enables a better understanding and an in-depth exploration of complex issues in a social context. Based on its interactive approach to investigations, it utilizes a relatively open-ended data collection approach (Bryman, 2006). Primary data is collected in a non-numerical form and relies heavily on logical inductions to interpret data.

As noted in section 5.8 above, the semi-interview instrument was utilised in the present study to obtain qualitative data. The semi-structured interviews as utilized were intended to explain the phenomenon under investigation – firm level innovation persistence. This was done through an in-depth examination of the research questions as articulated at the end of literature review in section 4.10. The qualitative evidences obtained enabled the development of research themes and classifications. The process followed to develop and conduct the semi-structured interviews is briefly discussed below.

5.8.1 Semi-structured interview development and conduct

Since the goal of the interview instrument is to explore in detail, information on the key subject of this research – firm level innovation persistence - from real-life experiences, and more specifically in the context of an economic crisis, this study was left with two options, namely; unstructured or semi-structured interviews. However, as the unstructured

interviews are known to be typically difficult to analyse, requiring a lot of time to analyse, the semi-structured interview format was justifiably adopted for this study. In addition, semi-structured interview format offers a good degree of flexibility required for a detailed investigation of pertinent issues concerning firm level innovation persistence during economic crisis (Cachia and Millward, 2011). Indeed, the use of semi-structured interviews in this study provided an effective means to uncover new knowledge and capture the account of experts in the field in a more transparent, consistent and systematic manner than offered by the standardised approaches, such as questionnaire surveys (Qu and Dumay, 2011).

The interview process was commenced in October 2015 and concluded in May 2016. The researcher visited Abuja, Nigeria on two separate occasions during this period. The 5 construction contractors that provided the contexts within which to investigate the research problem are all located in Abuja, Nigeria. While making an appointment was fairly difficult, getting the interview participants to keep to appointments was even more problematic. All 10 semi-structured interviews were eventually carried-out, however, the scheduling difficulties had enormous financial and logistical implications for the researcher.

Detailed face-to-face, semi-structured interviews were conducted with 10 key management employees of 5 construction based firms that have been successfully implementing innovations during economic crisis. The rationale for preferring face-to-face interview in this research study is that it provides the opportunity to meet with the participants directly which confirms that the person who actually responded is the one the interview was intended for. The interview aimed to specifically extract the opinions and perceptions of participants on innovation, economic crisis, the factors that constrain firm-level innovations during economic crisis, firm-level innovation persistence, merits of firm level innovation persistence and critical success factors that enable innovation persistence in order to address the research questions articulated. The interviews basically focused on exploring the following research questions which were articulated at the conclusion of literature review in section 4.10. These research question are as follows:

- **Research Question One:** What are the specific factors that constrain firm level innovations during economic crisis?

- **Research Question Two:** What are the merits of firm level innovation persistence during economic crisis?

- **Research Question Three:** What are the critical success factors that enable firm level innovation persistence during economic crisis?

To obtain access to the interview participants, formal letters and proposals were sent to these 5 construction contractors for consent and approval to use their firms for the qualitative study. Follow up telephone calls were also made to these construction contractors to further explain the purpose and the context of the study. The purpose, objectives and aim of the study was made clear to all interview participants. To ensure that interviewees were uninhibited in their participation, it was explained to them that their names and responses would be treated confidentially and anonymously. They were also reminded that they were free to decline to answer any question and to withdraw at any stage of the interview. The ethical approval details for this study is presented in Appendix E. These participants are well informed in the research area and were able to produce valuable data needed for the study based on their experiences and knowledge of what it takes to implement and manage the process of innovation during economic crisis. These participants included the Operations and Technical Managers, Quantity Surveyors, Architects, Engineers, Project Managers and Finance Manager. Interviews lasted an average of about 70 minutes. A sample copy of the interview guide is presented in Appendix B. Details pertaining to the profession, roles, assigned ID and interview duration for the interview participants are highlighted in Table 5.4 below.

Table 5-4: The number and roles of the interview participants

ORGANISATION	PROFESSION	ROLE	ASSIGNED ID	INTERVIEW DURATION
CS1	Civil Engineer	Chief Engineer	CECS1	70 Mins
CS1	Project Manager	Chief Operating Officer	PMCS1	90 Mins
CS2	Architect	SM, R&D	SMRDCS2	60 Mins
CS2	Estate Manager	General Project Manager	GMCS2	75 Mins
CS3	Quantity Surveyor	General Manager, Operations	GMOCS3	62 Mins
CS3	Project Manager	Project manager	PMCS3	55 Mins
CS4	Chief Architect	Managing Director	MDCS4	100 Mins
CS4	Structural Engineer	Project manager	PMCS4	85 Mins
CS5	Architect	Senior Manager, R&D	SMRDCS5	65 Mins
CS5	Project Manager	General Project Manager	GMCS5	60 Mins

5.8.2 Overview of the semi-structured interview

A total of 17 questions were put to the interview participants. The semi-structured interview questions were made up of two parts. The first part (Section A) contains a total of 6 questions and focused on investigating the participants' length of experience and involvement with key decisions regarding innovative inputs in the construction project process. The key focus here is to ensure that the interview participants have an appropriate background for the study. The second part (Section B) contains a total of 11 questions and aimed at assessing; the participants opinion regarding the effects of economic crisis on their respective firms; how these effects of economic crisis inhibit innovations (the factors at play); the merits of innovation persistence during economic crisis; and the critical success factors for enabling innovation persistence during economic crisis (*see* Appendix B for the semi-structured interview template).

5.9 Questionnaire survey (Quantitative)

Questionnaires refer to methods of data collection in which the respondents are requested to respond to a pre-determined and similarly set of questions.

The questionnaire survey tool was utilized to collect quantitative data for the present study. The themes and patterns that emerged from the semi-structured interviews informed the design and content of the questionnaire survey as utilised in the present study (Greene et al. 1989). The questionnaire survey was articulated and developed with closed-ended questions to enable the researcher to obtain specific information to confirm facts or opinions from respondents (Saunders et al., 2009) so as to validate or refute the results that emerged from the semi-structured interviews and to possibly identify new themes. It is argued that empirical data obtained in the quantitative phase enabled the researcher to generalize results to different groups (Morse, 1991), to test aspects of the emergent themes and patterns (Morgan, 1998) and to explore the innovation persistence phenomenon in depth, with focus on the constraining factors, the merits and critical success factors.

The design of the questionnaire survey tool and the approach adopted in collecting questionnaire survey data are briefly explained in the next section.

5.9.1 Questionnaire survey design

Saunders et al. (2009) identify the different types of survey questionnaires. These include; internet questionnaires, postal questionnaires, delivery and collection questionnaires, and telephone questionnaires. This study adopted the delivery and collection questionnaire method. This type of questionnaire offers convenience, costs less, takes less time and the respondent can be contacted in person to check that it is the respondent that actually responded to the questions. In addition, respondents are able to participate fully, as the design of the questions is simple to understand (Dillman, 2000, Saunders et al., 2009). On the design of the questionnaire, multiple questions were organised in a pre-determined fashion in order to ensure their uniform interpretation by respondents and to gather valuable data from a significant number of respondents from multiple organizations. In addition, the researcher preferred the multiple choice “tick box” and “close-ended” questions, adopting the five point Likert-scale rating technique. Oppenheim (2000) identifies the advantages of close-ended questions. He observes that they require little time to complete, often requiring

no extended time; they are easy to process; they cost less, useful for testing hypotheses; and requires less interviewer training. Nevertheless, Kumar (1999) observed that a fundamental disadvantage of closed-ended questions is that information obtained through them often lack depth and variety.

The overview of the questionnaire survey tool as utilised in the present study is discussed in the next section.

5.9.2 Questionnaire survey overview and administration

The questionnaire was divided into four main sections, with a total of 12 questions asked. The first section focused on basic data relating to the demographics of the respondents. The second section centred on establishing the factors that constrain the respondents' firms' ability to persist with innovations during economic crisis. The third section aimed to confirm the merits of firm level innovation persistence during economic crisis. Lastly, the fourth section focused on determining the critical success factors that enable the respondents' firms' ability to persist with innovation during economic crisis. A sample of the questionnaire utilized in the present study is presented in Appendix C.

To obtain access to the questionnaire respondents, formal letters and proposals were sent to the 16 construction contractors that indicated they had persisted with innovations during economic crisis (refer to section 5.5) for consent and approval to use their firms for the quantitative study. Follow up telephone calls were also made to these construction contractors to further explain the purpose and the context of the study. All 16 firms accepted to participate in the questionnaire survey phase. 8 mid-level employees from each of the 16 firms were identified as suitable participants for the questionnaire survey. The purpose, objectives and aim of the study were made clear to all survey respondents. To ensure that participants were uninhibited in their responses, it was explained to them that their names and responses would be treated confidentially and anonymously. They were also reminded that they were free to decline to answer any question and to withdraw at any stage of the survey. The ethical approval details for this study is presented in Appendix E. A total of 128 questionnaires were dispatched to mid-level employees of the 16 construction contractors that indicated that in the initial survey that their firms have persisted with innovation during economic crisis.

To address the problem of non-response bias, all the questions contained in the questionnaire survey were made mandatory. More so, this study effectively addressed the problem of non-response bias through a triangulation or the application of different set of data (interviews and questionnaire survey) (Rogelberg and Stanton, 2007). Using both data obtained under different conditions substantially enabled the mitigation of the effect of non-response bias for the present study. The questionnaire survey process commenced in O 2016 and concluded in

5.10 Documentation

Documentation refers to the review and analysis of documents that contain information about the phenomenon being investigated - innovation persistence (Bailey 1994). The documentary technique can be utilized in identifying, investigating, categorizing and interpreting the limitations of physical sources of most commonly written documents available in private or public domain. Yin (2009) adds that written and audio-visual documents are a suitable data gathering tool. To critically evaluate documents, this researcher followed the criteria as advanced by Scott (1990). Taking cognisance of these criteria provided a benchmark for any document used in this study (Bryman, 2008). These criteria are:

- ***Authenticity*** – aims to verify whether a document is genuine, complete and reliable;
- ***Credibility*** – aims to verify whether a document is free from error and distortion;
- ***Representativeness*** – aims to verify whether a document is typical of its kind, and if not, is the degree of its untypical nature known;
- ***Meaning*** – aims to verify whether a document is clear and comprehensible.

Throughout the research process, the present study utilized the documentation tool in order to corroborate and augment the evidence from other sources of data. The use of documentation also provided valuable and rich information about the phenomenon being investigated, often filling the gaps that could not be filled by other sources of evidence. Various forms of documentations were utilized in this study. These include printed, online and visual materials. This ranges from up-to-date and archival statistical documents and records; administrative documents; timetables, job order sheets, end of year statements, end of year reports, HR reports, bulletins, procures, newspaper articles. The researcher also examined and evaluated television programmes on innovations in Nigeria's construction

industry as presented by Nigeria's Television Authority on 29th of June 2016. A number of the documents reviewed were obtained privately from the five (5) construction firms case studied. Others were available in the public domain. The researcher maintained a personal diary throughout the fieldwork, in which the documents were coded, from which the researcher extracted evidence to support the findings of this study. The review and analysis of documents were carried out continuously throughout the span of this research.

5.11 Sampling approach

To achieve a valid conclusion as an outcome of a research, it is essential for the researcher to consider the mode and sources from which information can be obtained. Every researcher's aim is to draw sufficient information for a meaningful analysis to be carried out so that a credible conclusion can be arrived at (Akotia, 2014). Sarantakos (1998) argues that the major challenge researchers are often confronted with when conducting empirical investigations, is how to estimate the number of respondents required to provide them with the information, as well as the processes through which sufficient information can be generated, to achieve their research objectives (cited in Akotia, 2014). A sampling technique is regarded as the most appropriate means through which such estimation and information can be gained in a manner that allows them to achieve the research objectives. Bryman (2001) finds that the essentiality of adopting a sampling technique is fundamental to any study, because sampling techniques are founded on sound criteria, and their adoption allows researchers to estimate, identify and obtain in-depth information from a reasonable number of respondents within a targeted population. The sampling technique adopted when using a mixed method approach, will certainly be determined by the dominant research paradigm preferred by the researcher. For this reason, researchers using a mixed method approach will require a combination of different sampling techniques considered to be most suitable, to address their research questions and objectives (Saunders et al., 2009).

There are two main types of sampling techniques available to researchers. These are probability or random and non-probability sampling techniques (Sarantakos 2013, May 2011). Probability sampling techniques utilise well-structured and rigorous procedures for the identification and selection of samples from the target populations (Sarantakos 2013). This allows researchers to statistically generalize "from sample to population" (May 2011). They are beneficial in studies where a high degree of reliability and generalization of the findings

are necessary (Sarantakos, 1998). This includes the random, systematic, cluster and multi-stage and stratified sampling techniques (Denscombe, 2010a). Non-probability sampling techniques on the other hand, utilize approaches that are less stringent, and with less emphasis on representation of samples from the larger population (Sarantakos, 1998). May (2011) finds that non-probability sampling techniques are mostly adopted in studies with no well-defined sampling frames, and yet the general characteristics of the population are already known to the researcher. Qualitative researchers often prefer the non-probability sampling techniques because of their characteristic flexibility when deciding which sample sizes are most appropriate for the research (Sarantakos, 1998). This includes quota, purposive, theoretical, snowball and convenience sampling techniques (Saunders et al., 2012, Denscombe, 2010).

Considering that a mixed method approach was adopted for this research, the sampling technique utilized was a combination of probability and non-probability sampling. The focus of the study is on the critical success factors that enable innovation persistence during economic crisis. Therefore, to guarantee sufficient representation, experience and balance of knowledge, a well-defined sampling frame was utilized. The sampling frame used is further explained in the next section.

The sampling approach followed in the present study is depicted in Figure 5.4 below.

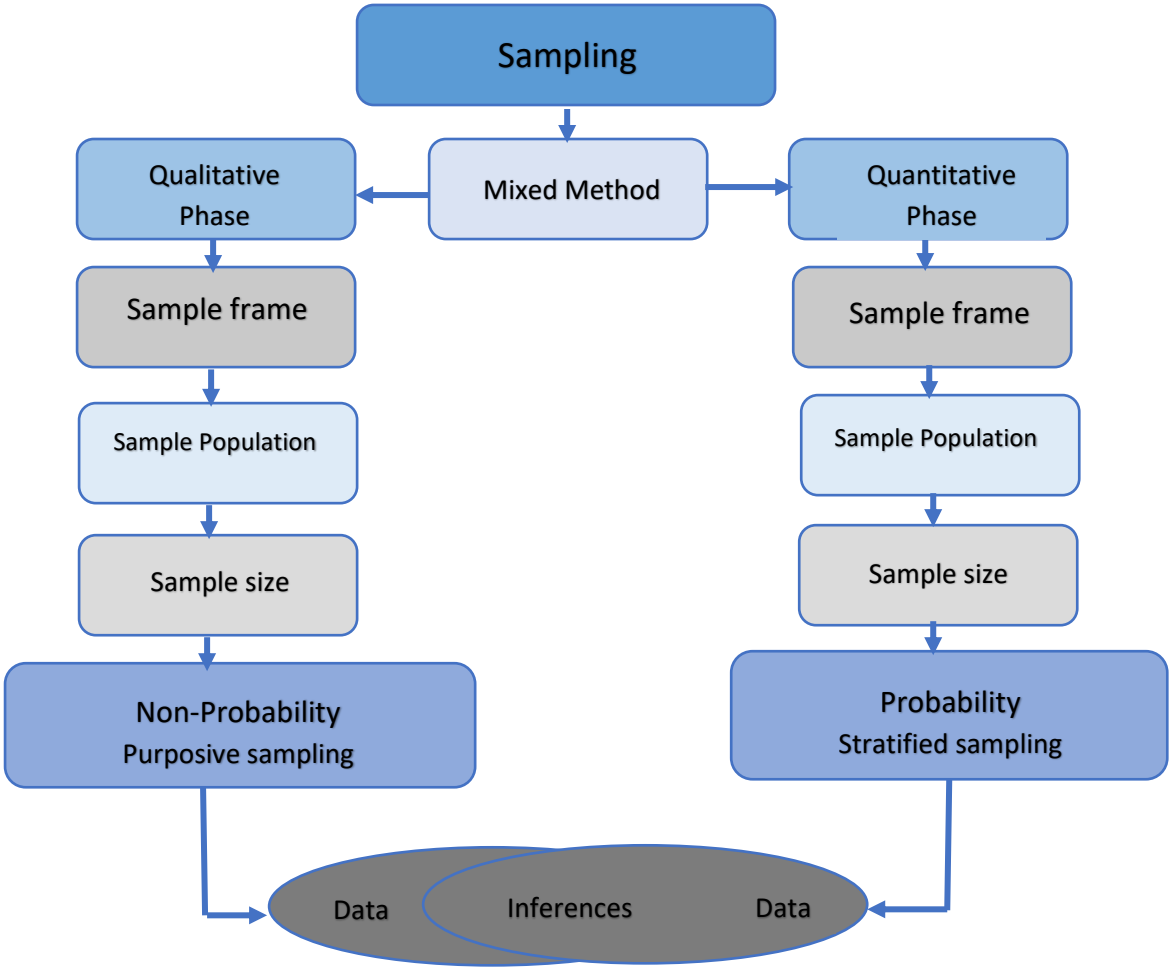


Figure 5-4: The sampling approach adopted (Adapted from Saunders et al., 2009)

5.12 Interview sampling approach

For the interview phase, a purposive sampling technique was employed. This was done through the identification and selection of management level employees of construction contracting firms based in Abuja, Nigeria involved in the implementation and management of innovations during economic crisis. Purposive sampling techniques allowed the researcher to select a case from among other cases by identifying specific characteristics and procedures relating to the research objectives (Silverman, 2013).

The procedure adopted in this regard is explained in the next sub-sections.

5.12.1 Sample frame – interview phase

This is concerned with information about the sample population which can take the form of list of names, addresses or contacts of those represented in the sample population from which the sample size will be collected.

The sample frame for the interview phase of this study includes all management level employees of construction contracting firms based in Abuja. These construction contractors were those identified as active in the databases of Corporate Affairs Commission and the Federal Territory Development Authority, Abuja, Nigeria. A total of 150 construction contractors were identified as active in the Abuja Nigeria. Therefore, the sample frame for this study is the total number of management level employees of these 150 construction contractors.

The reason for focusing on the management level employees of innovation persistent construction contractors is that whilst a disproportionate number of creative ideas emerge from the factory floor, the decision to explore these creative ideas often come from the management level of a firm (Noble, 1999, Damanpour, 1991, Bradford and Florin, 2003, Gupta and Singhal, 1993). Therefore, for this study to adequately explore the innovation persistence phenomenon, especially the critical success factors that enable it, it was important to obtain the views of the management level practitioners of innovation persistent firms.

5.12.2 Sample population – interview phase

This refers to the items in the category of things that are being studied rather than the total people in a context.

For the interview phase of this study, it is important to have a comprehensive sample population of management level employees of construction contractors based in Abuja Nigeria which is representative of the general body of construction contracting firms in Abuja, Nigeria that were implementing innovations during the 2014-2017 economic crisis. An initial survey was conducted primarily to determine the number of construction contractors that have persisted with innovations out of the 150 construction contractors identified as active in the databases of Nigeria's Corporate Affairs Commission and The Federal Territory Development Authority, Abuja, Nigeria. One initial questionnaire survey was administered to

an identified key employee of each of the 150 construction contractors active in Abuja, Nigeria. A total number of 16 firms out of the 105 construction contractors that responded to the initial questionnaire survey indicated that they have persisted with innovation economic crisis. Thus, the sample population for the qualitative research phase is the total number of management level employees of these 16 construction contractors that have persisted with implementing innovations during economic crisis.

5.12.3 Sample size – interview phase

This is concerned with the items within the sample population that have been chosen to be involved in what is being studied.

The 16 construction contracting firms identified as innovation persistent were contacted by phone and email to verify their activities and addresses; and to make them aware of the researcher's interest. From the 16 construction contractors contacted, 5 indicated interest to participate in the interview phase of the present research. To confirm that these firms were persisting with innovation during economic crisis, the researcher visited the 5 firms to directly observe the innovations being implemented. The researcher subsequently settled for 2 management level practitioners from each of these 5 innovation persistent construction contractors.

Thus, the sample size for the interview phase of the present study is 10 management level practitioners employed by 5 innovation persistent construction contractors as discussed above.

5.13 Questionnaire survey sampling approach

A stratified random sampling approach was utilised for the questionnaire survey. This is further discussed in the next sub-sections.

5.13.1 Sample frame – questionnaire survey phase

The questionnaire-survey phase focused on obtaining evidence from mid-level employees of innovation persistent construction contractors. Therefore, the total number of low to middle level employees of the 16 construction contracting firms that have persisted with innovations during economic crisis is the sample frame for the quantitative phase of this study.

5.13.2 Sample population – questionnaire survey phase

Those employees adjudged as significantly involved with the persistent implementation of innovations during economic crisis were identified as the sample population for the quantitative phase of the present study. This study worked with a sample population of 128 mid-level employees of the 16 construction contracting firms that have persisted with implementing innovations during economic crisis (i.e. 8 participants for each construction contractor). A total number of 128 questionnaires (8 for each identified organization) were randomly distributed to mid-level employees of the 16 innovation persistent construction contractors that are based in Abuja Nigeria. These 128 individuals make up the sample population for the quantitative phase of this study.

5.13.3 Sample size – questionnaire survey phase

The sample size for the questionnaire survey phase of this study was 83 mid-level employees of 16 innovation persistent construction contracting firms from the sample population of 128. A total of 83 completed questionnaires were returned from the sample population of 128. Thus, this study achieved a response rate of about 65% which is well above the average response rate for questionnaires in the construction industry. Al-Tmeemy et al. (2011) and Dulaimi et al. (2003) agree that that the typical response rate for survey questionnaires in the construction industry is anything between 20-30%. However, effective follow-up measures as recommended by Egbu (1994) were put in place to achieve this response rate. The breakdown of the questionnaire distribution, completion rate, and the response rate is presented in Table 5.5 below.

Table 5-5: Questionnaire survey distribution, completion and response rate

ORGANISATION CATEGORY	QUESTIONNAIRES DISTRIBUTED	COMPLETED AND RETURNED QUESTIONNAIRES	QUESTIONNAIRES NOT RETURNED	RESPONSE RATE (%)
Construction contractors	128	83	45	65%
Total (Nr)	**128**	**83**	**45**	**65%**

The questionnaire survey for the study was targeted at mid-level practitioners directly involved in the implementation of innovations during economic crisis within their respective construction contracting firm. Table 5.6 presents the statistical breakdown of the key practitioners who participated in the questionnaire survey.

Table 5-6: Results and statistical breakdown of respondents of the questionnaire survey

PARTICIPANTS	FREQUENCY	PERCENT	CUMULATIVE PERCENT
Project Manager	24	28.9	28.9
Departmental managers	5	6.0	34.9
Structural Engineer	16	19.3	54.2
Client relationship managers	6	7.2	61.4
Accountant	3	3.6	65.1
Civil Engineer	6	7.2	72.3
Quantity surveyor	8	9.6	81.9
Architect	12	14.5	96.4
Design Manager	3	3.6	100.0
Total	**83**	**100.0**	

5.14 Research techniques and analytical procedure

This refers to the process that involves examining, categorising, tabulating or recombining data so as to address the research problem (Yin 1994). For this study, a coding method was utilised in the analysis of both qualitative and quantitative data obtained. Coding and classification of information that emerged from the empirical dataset enabled the researcher to evaluate the differences, similarities, frequencies and relationships between emergent themes and patterns.

The strategy adopted for the analyses of both qualitative and quantitative data are discussed in the next section.

5.14.1 Overview and procedure for qualitative data analysis

The qualitative data analysis process adopted for the present study as illustrated in Figure 5.5 is consistent with the process outlined by (Creswell, 2009b).

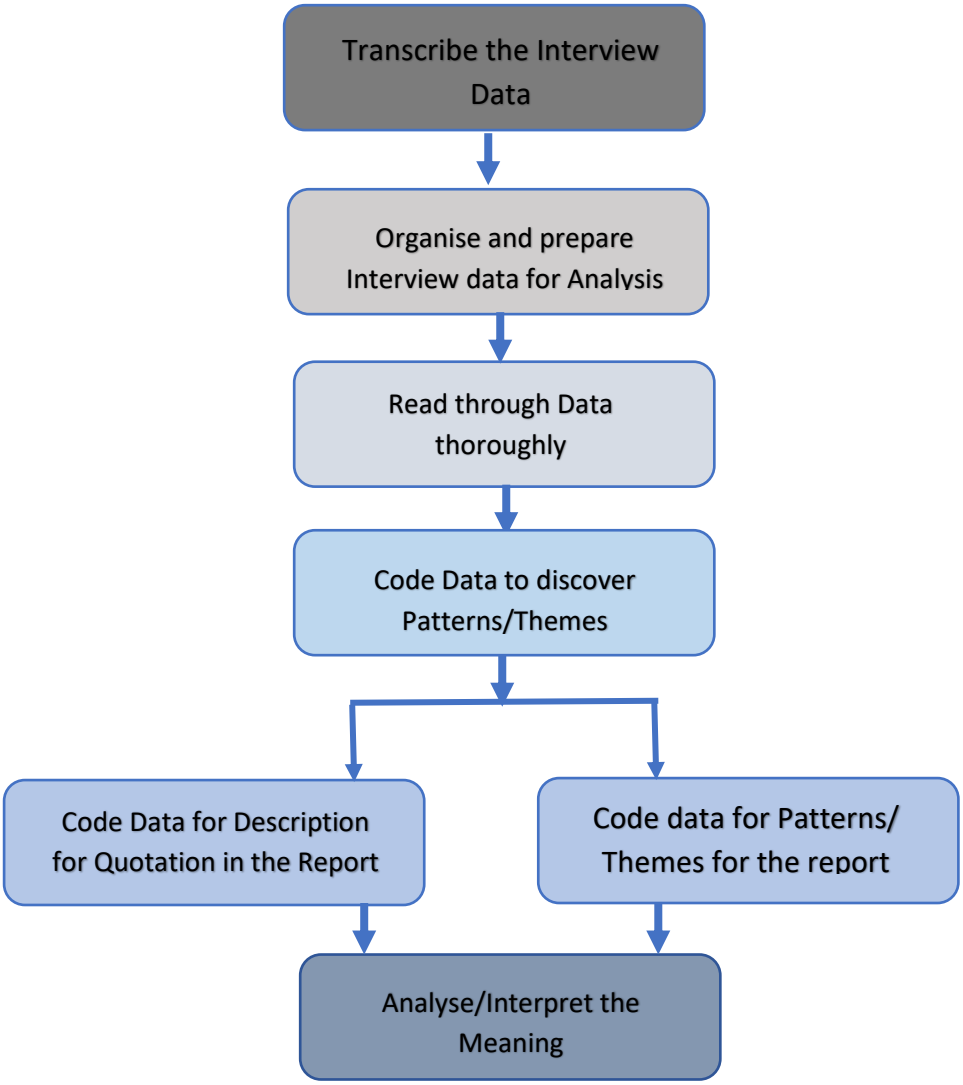


Figure 5-5: Qualitative data analysis process (Adapted from Creswell, 2009b)

Two key processes as facilitated by NVivo 11 software package were followed in the analysis of the obtained qualitative data. These key processes are:

- Creating interview transcripts;
- Generating thematic framework nodes and/ or pattern coding.

To gain a more detailed knowledge and understanding of the obtained qualitative data, digital interview files were converted into fully transcribed, word processed documents. This entails manually transcribing recorded interviews from spoken words to texts to enable readability. Indeed, transcribing the recorded interviews is a vital part of the qualitative data analysis process often requiring a substantial amount of time and caution to ensure that the validity of the transcribed data is not compromised (Kulatunga et al., 2011). Open coding approach was utilised which allowed the interview transcript to be assessed several times, sentence-by sentence. This enabled the researcher to identify emerging themes and patterns from dataset and label them under distinct names (Bernard, 2000). The iterative pattern coding of the interview transcripts is illustrated in Figure 5.6. This entails reading the transcribed words of the interview participants and assigning units of meaning to the descriptive statements (nodes), which were accumulated to build thematic framework or group; and the various thematic frameworks or groups were then coded. This process was revised severally through an iterative reading and content analysis which resulted in the creation of forty-two (27 Nr) thematic and sub-thematic nodes. In addition, text segments identified as key recurring themes were also coded for use as quotations (Basit, 2003) to highlight relevant references identified during the analysis of interview findings. This according to Bazaley (2007) is critical for achieving credibility and reliability of the emerged findings. Furthermore, cognitive mapping was utilized to organize and analyse concepts; and to establish causal relationships between themes (Kulantunga et al., 2011).

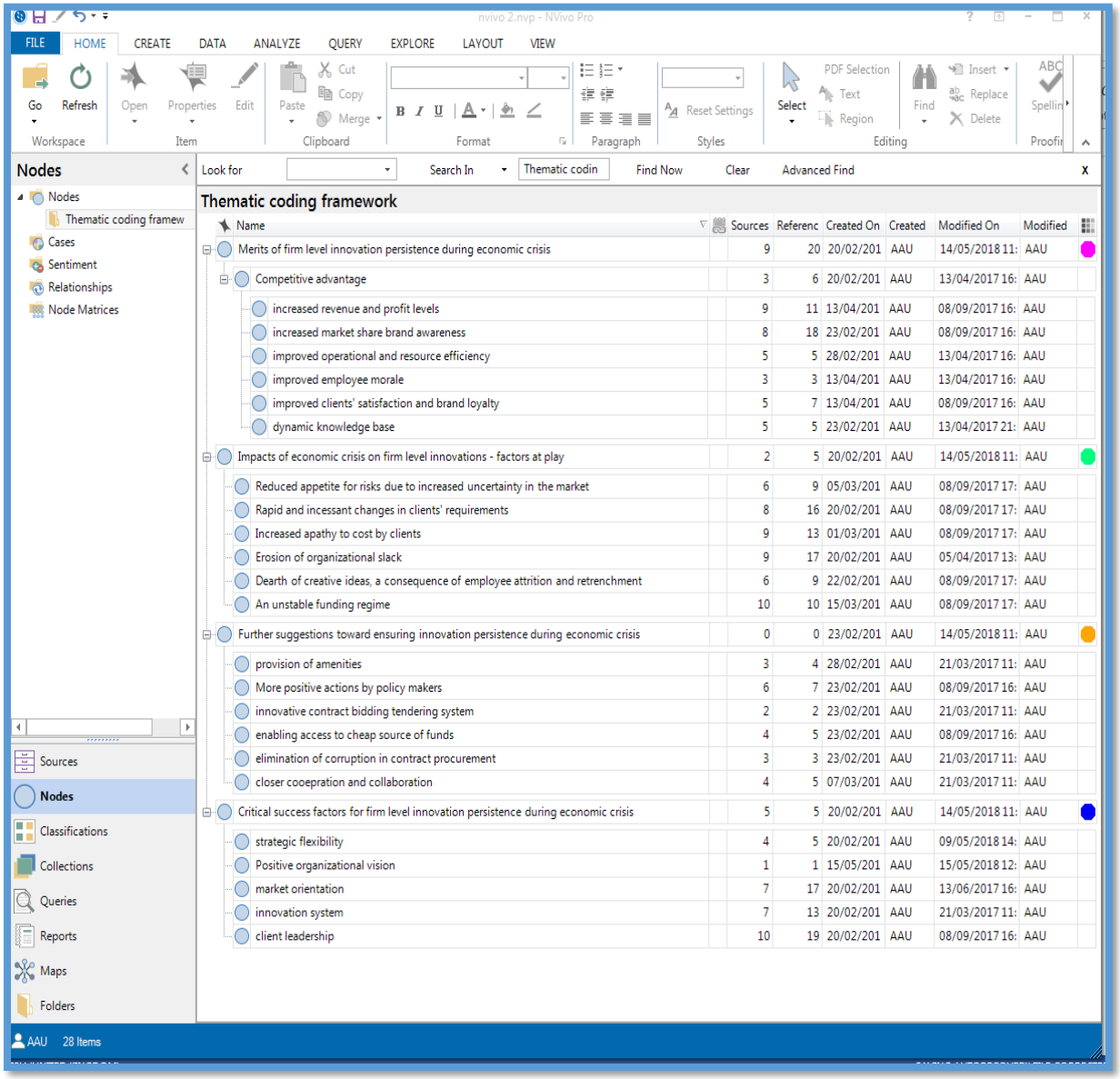


Figure 5-6: Thematic development and synthesis in NVivo 11

The above discussed processes allowed for the definition of the several descriptive nodes generated using the interview participants' perceptions, as well as permitting the study to generate themes and draw precise conclusions from the empirical dataset. The full analyses of the semi-structured interview data are presented in chapters six of the thesis.

5.14.2 Overview and procedure for quantitative data analysis

To ensure that the analysis of the quantitative data generated from questionnaire survey is conducted in a systematic and logical manner, Serenko (2013) prescribes the following six steps when undertaking computer aided analysis. These six steps are as follows:

- Preparation of the collected data by cleaning and checking for possible errors and omissions.
- Entering the prepared data into the SPSS for analysis.
- Presenting the findings from the analysis in graphical and table forms.
- Conducting inferential statistics analysis of the data.
- Presenting the data with tables and figures, and explaining the findings, and
- Finally, drawing a conclusion from the analysis of the findings

The present study followed the above six steps to analyse the survey data. Following these six steps according to Saunders et al. (2009) has the potential to reduce the possibility of errors and the opportunities for misinterpretation and the drawing of wrong conclusions from the research findings. In line with the above, the first step in the data analysis process for this study was the preparation of data, as it allowed the researcher to check and edit the raw data obtained for any possible errors or omissions and inconsistencies within the data set. This was done after the responses from the questionnaire survey were downloaded from the Survey Gizmo software and then exported into an excel spread-sheet. The edited data was then exported into the Statistical Package for the Social Sciences (SPSS) for the analysis processes to commence. Using computer software for the analysis was viewed as the best way to ensure validity and reliability of the research findings because of the standardised procedures SPSS adopts for data processing and analysis (Sarantakos, 2013). The researcher was "able to explore and analyse them far more quickly and thoroughly than by hand" (Saunders et al., 2009).

With the data cleaned and entered into the SPSS software (version 23), the descriptive analysis phase commences. Descriptively analysing quantitative data provides a general overview and picture of the research findings (Naoum, 2012). Descriptive analysis is typically conducted to provide statistical information such as the mean, median, and standard deviation as well as percentages of the variables (Pallant, 2010). The determination of the mean, median and the mode values offers a measure of central tendency, while the standard deviation value provides an indication of dispersion of the data (Seale, 2010). This analytical approach has been adopted by a number of recent construction management studies. For instance, Ihuah (2015) and Akotia (2014) utilised this approach when analysing quantitative data. Therefore, the quantitative data collected for this study was subjected to descriptive

analysis to establish the mean values, standard deviation and percentage values. Doing so also allowed the researcher to describe and compare the results both graphically and numerically. Following that, the researcher was able to apply further statistical analysis approaches to establish relationships and assist in the interpretation of the results.

For quantitative studies, two tests are typically conducted. These are parametric and non-parametric tests. The type and nature of the collected data determine the type of test to be conducted. Non-parametric tests make fewer assumptions about data and are adopted in studies where the data collected is considered not to be normally distributed. They are most appropriate for a relatively small amount of data which can be measured on nominal and ordinal scales, and are more flexible to apply (Pallant, 2010). On the other hand, parametric tests are based on an assumption concerning the population from which the data is obtained (Fellow and Liu, 2008). They rely on interval-scale based on a normal distribution of data. Their data analysis processes are typically more difficult and complex than the nonparametric tests. Therefore, a good analysis can only be conducted if the researcher is cognisant of the analytic procedures and assumptions underpinning their choices. For the present study, the data collected was nominal (questions 1-5) and ordinal (questions 6-42) data.

5.15 Time Horizon

Time horizon refers to the practicability of undertaking a research within a given time or period (Saunders et al., 2012). There are two possible research time horizons, namely; the cross-sectional and longitudinal time horizons. The cross-sectional time horizon denotes a research carried-out within a constrained period of time while the longitudinal time horizon is adopted in studies that set-out to monitor changes and developments over a long period of time. As this study leads to the award of a PhD at its successful completion within a given timeframe, the adoption of a cross sectional time horizon was deemed more appropriate.

5.16 Pilot study

A pilot study is an important task in any research process, which assists the researcher to assess the reliability and validity of indicators before undertaking the study (De Vaus, 2002). Furthermore, pilot study is a necessary step aimed at improving the quality of the case study research (Easterby-Smith et al., 2002). Yin (2009) finds that pilot studies assist researchers to refine their data collection plans with respect to both the content of data and procedure to be followed. Once a data collection instrument has been designed, each question in the instrument has to be evaluated using a pilot study before the final administration. This enables the researcher to evaluate how respondents interpret the meaning of each question and also, to check if the range of response alternatives are sufficient.

The present study conducted pilot studies on both the semi-structured interview questions and the questionnaire survey questions. The interview questions utilised were pilot tested with four (4) local construction experts from two market leading construction contracting firms in Lagos, Nigeria. These experts were meticulously selected to represent just about a similar level as those to be interviewed. The pilot study was useful in testing the appropriateness and reliability of the interview questions in relation to the research questions raised toward the achievement of the study objectives. Furthermore, the pilot study did also provide an opportunity to verify the clarity or otherwise of the interview questions and to ensure that the questions are relevant to the research themes. Based on the pilot study the researcher developed the main interview questions (Appendix B), utilized within CS1, CS2, CS3, CS4 and CS5.

Furthermore, the survey questions were pilot tested with five (5) of the researcher's colleagues. This pilot study was intended to test the feasibility of the structure of the

questions asked and not the content of the questionnaire survey. All chosen colleagues possess an excellent grasp of and are reasonably experienced in carrying out questionnaire surveys, as well as most of them coming from Nigeria. The pilot study was useful in testing the appropriateness and reliability of the survey questions in exploring the themes that emerged from the qualitative phase of the present study. Based on the pilot study, the researcher developed the survey questions (Appendix C), utilised within the 16 construction contracting firms that indicated in the initial survey that they have continued to implement innovations during the current economic crisis.

5.17 Triangulation of data

Yin (2003) notes that case study data triangulation relies on multiple sources of evidence collected with different techniques and at different times in order to support research conclusions. Love et al. (2002) add that data triangulation is important in ensuring that the study overcomes the problem of bias. Triangulation of data balances any possible flaw in one data source with the strength in another. The analysed results of both qualitative and quantitative data were triangulated using content analysis allowing for the application of conceptual and logical reasoning in the research (Robson, 2005). Empirical data retrieved through semi-structured interview of case study participants were considered as the primary source of data and triangulated against additional evidences as provided by questionnaire survey of selected relevant professionals, data obtained from the researcher's review of relevant documents. This is illustrated in Figure 5.7 below.

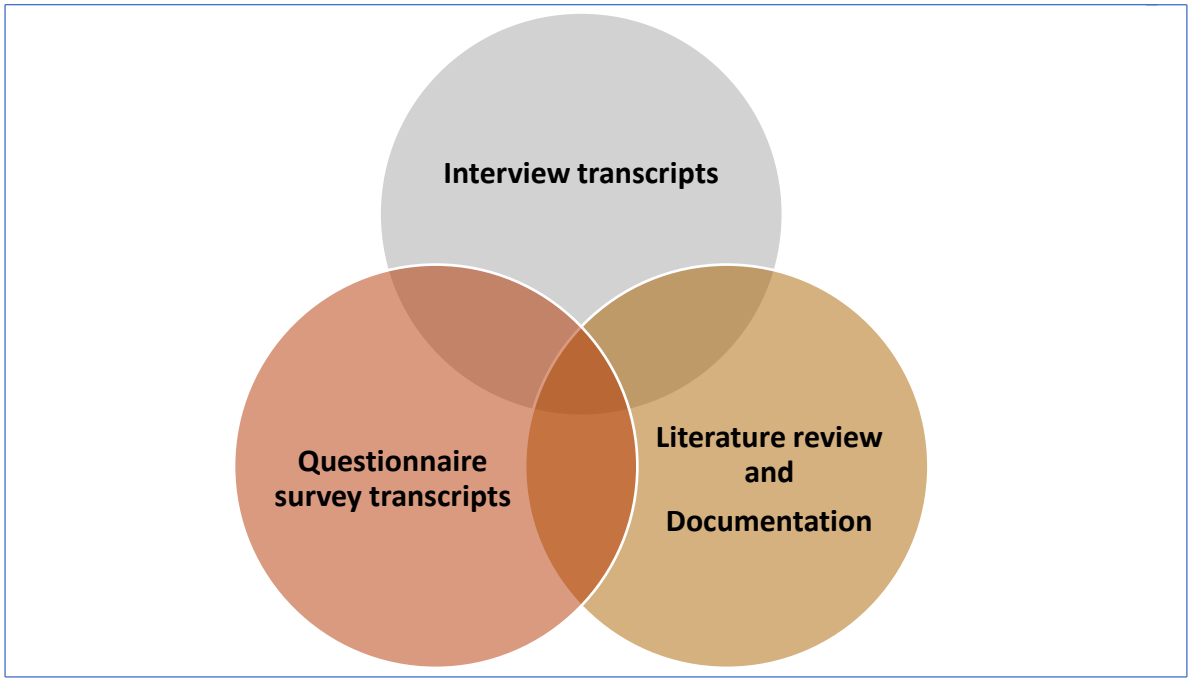


Figure 5-7: Summary of data sources for triangulation

5.17.1 Synchronizing research objectives, research questions and data source.

A synopsis of the research objectives, research questions articulated and the sources of data utilised are presented in 5.7.

Table 5-7: Highlight of the objectives, research questions and methods of data collection utilised

S/N	RESEARCH OBJECTIVES	RESEARCH QUESTIONS	METHODS OF DATA COLLECTION
1	To examine and synthesize relevant literature in order to better understand the nature of innovations and the different schools of thought on why firms innovate.		• Literature review
2	To explore the nature of economic crisis and the specific factors that constrain firm level innovation persistence during economic crisis.	What are the specific factors that constrain firm level innovations during economic crisis?	• Literature review • Semi- structured Interviews • Questionnaires • Sighted documents

3	To determine and evaluate the key merits of firm level innovation persistence during economic crisis.	What are the merits of firm level innovation persistence during economic crisis?	• Literature review • Semi- structured Interviews • Questionnaires • Sighted documents
4	To establish and validate the critical success factors that enable firm level innovation persistence during economic crisis for construction contractors based in Abuja, Nigeria.	What are the critical success factors that enable firm level innovation persistence during economic crisis?	• Literature review • Semi- structured Interviews • Questionnaires • Sighted documents

5.18 Reliability and validity measurement

Yin (2009 argues that in case study research, reliability and validity are two measures that should concern every researcher. The work of Easterby-Smith et al. (2008) submits that:

> "*Reliability is the extent to which your data collection techniques or analysis procedures will yield consistent findings and can be assessed by posing the following three questions: (a) Will the measures yield the same results on other occasions? (b) Will similar observations be reached by other observers? And (c) Is there transparency in how sense was made from the raw data?"*

The work of Robson (2002) lists four possible threats to the reliability of obtained empirical data. These include; subject or respondent error, respondent bias, observer error, and observer's bias. Robson (2002) further finds that the threats to research validity stems from history, testing, instrumentation, mortality, maturation and ambiguity of the data collection and analyses techniques utilised in the present study.

The researcher employed several approaches in ensuring the reliability and validity of the empirical data obtained and the findings which emerge from the dataset. These approaches as adopted in this regard are:

- Utilising multiple sources of qualitative and quantitative data (interviews, observations, documentation and questionnaire survey). This enables the triangulation, combination and comparison of gathered evidences.
- Personally distributing the questionnaires to the respondents and ensuring that the respondents understood the questions.
- Providing a sample size large enough to reduce potential bias.
- Using clear, simple and unambiguous language in all the interview and survey questions.

5.19 Generalisation

Saunders et al. (2009) refer to generalisation as "external validity. It denotes the degree to which research outcomes can be generalised. Yin (2009) finds that generalisation in case study research is credible. Whilst the geographical context of this research is limited to within the FCT Abuja, the generalisation of the findings to every part of Nigeria is possible, although, there has to be consideration for other soft factors like cultural norms and values, environment, level of development and the number of construction projects being implemented in that state.

5.20 Summary – chapter 5

This chapter presented the research design, research strategy and data collection methods adopted in this study. Regarding the research design, it was reasoned that to enable an adequate exploration of the research problem, a sequential exploratory research design would be most appropriate for the present study. The key justifications for adopting a sequential exploratory design were outlined. In respect of the research strategy utilised for the present study, it was narrated that an embedded multiple-case study strategy was adopted. They key justifications for preferring this research strategy were also outlined. Furthermore, the steps followed to analyse the empirical data collected were presented. For the qualitative data collected, it was noted that the analysis process was facilitated by the use of the NVivo 11 software. For obtained quantitative data, the analysis process was facilitated by the use of the SPSS (version 23) statistical package. In addition, there were brief discussions on how empirical data was handled to ensure the reliability and validity of the research findings. The chapter also dealt with the pilot study conducted.

The empirical data analyses and research findings are presented in the next chapter.

Chapter 6 : Qualitative analysis and findings

6.0 Introduction

This chapter explains in greater details the qualitative data analysis undertaken for this research. Firstly, the method of data collection and sample size shall be reiterated and briefly discussed. The aim, design, process and sample size of the semi structured interviews are reiterated. An in-depth discussion of the qualitative data analysis procedure as aided by the NVivo 23 software package is also included within this chapter. Finally, the key findings from the interview data analysis are presented at the end of this chapter.

6.1 Qualitative data collection – semi-structured interview

As previously mentioned in section 5.8, qualitative data was obtained using semi-structured interviews. This section describes the aim of these interviews, the interview design, interview process, the interview sample size and the method of data analysis preferred for the qualitative phase of the present study.

6.1.1 Aim of interview

The interview conducted in the present study is exploratory in nature and focuses on investigating the three research questions articulated at the conclusion of literature in section 4.10. These research questions are:

- **Research Question One:** What are the specific factors that constrain firm level innovations during economic crisis?
- **Research Question Two:** What are the merits of firm level innovation persistence during economic crisis?
- **Research Question Three:** What are the critical success factors that enable firm level innovation persistence during economic crisis?

Thus, whilst the main aim of the interview is to establish from industry practitioners what the critical success factors are for persisting with firm level innovations during economic crisis. However, the interview also seeks to determine the factors that constrain firm level innovation in Nigeria and to ascertain the merits of firm level innovation persistence during economic crisis.

6.1.2 Interview design

As noted in section 5.8, the semi-structured interview tool was adopted to provide both the stability to follow a predetermined route of enquiry, and the flexibility to probe further where the interview participants felt that additional information was valuable to bring new insights into the discussion, or to strengthen their responses to pre-set questions (Sexton et al. 2006). The design of the interview schedule was underpinned mainly by the key literature findings in relation to the three research questions being explored as highlighted in section 6.1.

As discussed in section 5.8.2, a total of 17 questions were put to the interview participants. The semi-structured interview questions were made up of two parts. The first part (Section A) contains a total of 6 questions and focused on the participants' demographics. The second part (Section B) contains a total of 11 questions and aimed at exploring the participants' opinion regarding how the effects of economic crisis inhibit innovation implementation (the factors at play); the merits of innovation persistence during economic crisis; and the critical success factors for enabling innovation persistence during economic crisis (*see* Appendix B for the semi-structured interview template).

6.1.3 Interview process

As noted in section 5.9, the interview utilized in the present study is semi-structured, comprising mostly of "what" and "how" questions, and all delivered face-to-face in an inquiring manner. The rationale for preferring face-to-face interview in this research study is that it provides the opportunity to meet with the participants directly which confirms that the person who actually responded is the one the interview was intended for. The interviews were recorded using a handheld voice recorder and transcribed in Microsoft Word. The data was then organized according to each theme as planned in the interview schedule.

The interview process commenced in October 2015 and concluded in May 2016. The researcher visited Abuja, Nigeria on two separate occasions during this period. The five construction contractors that provided the contexts within which to investigate the research problem are all located in Abuja, Nigeria.

6.1.4 Interview sample size

As noted in section 5.12, a purposive sampling technique was adopted for the interview phase of the present study. Purposive sampling techniques allowed the researcher to select a case from among other cases by identifying specific characteristics and procedures relevant to the research objectives (Silverman, 2013). This sampling approach provides a measure of confidence that the interview findings are capable of providing relevant insights into the critical success factors that enable firm level innovations during economic crisis for construction contractors in Abuja Nigeria. However, as with all case study research, the interview findings cannot be generalized with total confidence to the whole population of innovation persistent construction contracting firms in Abuja Nigeria (Sexton et al., 2006).

Therefore, the sample size for the interview phase of the present study comprises of 10 management level employees of five construction-based firms that were identified as innovation persistent during economic crisis (refer to section 5.6). The rationale for selecting management level employees for the interview phase has been elaborated in section 5.12. For the purpose of anonymity and keeping in line with the ethical research requirements, the participants shall be labelled as CECS1, PMCS1, SMRDCS2, GMCS2, GMOCS3, PMCS3, MDCS4, PMCS4, SMRDCS5 and GMCS5. Details pertaining to the profession, roles, assigned ID and interview duration for the interview participants are highlighted in Table 6.1 below.

Table 6-1: Details of interview participants

ORGANISATION	ASSIGNED ID	PROFESSION	ROLE	INTERVIEW DURATION
CS1	CECS1	Civil Engineer	Chief Engineer	70 Mins
CS1	PMCS1	Project Manager	Chief Operating Officer	90 Mins
CS2	SMRDCS2	Architect	SM, R&D	60 Mins
CS2	GMCS2	Estate Manager	General Project Manager	75 Mins
CS3	GMOCS3	Quantity Surveyor	General Manager, Operations	62 Mins
CS3	PMCS3	Project Manager	Project manager	55 Mins
CS4	MDCS4	Chief Architect	Managing Director	100 Mins
CS4	PMCS4	Structural Engineer	Project manager	85 Mins
CS5	SMRDCS5	Architect	Senior Manager, R&D	65 Mins
CS5	GMCS5	Project Manager	General Project Manager	60 Mins

6.1.5 Interview data analysis

As noted in section 5.14.1, the qualitative data obtained from the semi-structured interviews was analysed using content analysis method. The aim of content analysis was to achieve a condensed and broad description of the phenomenon, and the outcome of the analysis is concepts or categories describing the phenomenon.

In this analysis, the categories for coding are derived from the data itself. The process begins with organizing the qualitative data, which involves open coding, creating categories and abstraction (Vaismoradi et. al. 2013, Elo and Kyngas, 2008). The stages involved in content analysis conducted in this research are as follows:

- Open coding – Notes and headings are written in the interview transcripts while reading. The transcript is read through again, and as many headings as necessary are

written down in the margins to describe all aspects of the content. Headings are collected from the margins to form categories for the next stage. This stage of analysis is done manually on paper.

- Categorization – Categories are grouped under higher order headings. In this research the categories are organized according to the questions in the interview schedule. The aim of this stage is to reduce the number of categories by removing the categories which are similar and grouping them for further analysis. This stage of analysis is done electronically, with the aid of Nvivo 11 software.

- Abstraction – formulating a general description of the research topic through generating categories, where each category is named using content-characteristic words. This process yields the most concise categories for the data, which is used in describing the findings for this research words. This process yields the most concise categories for the data, which is used in describing the findings for the study.

6.1.6 Application of NVivo 11 in data analysis

NVivo 11 software package was utilised to simplify and organize the qualitative data analysis. Utilising NVivo 11 software package enabled the coding of data from interview transcripts into “nodes” through the process of content analysis. Interview participants’ own responses to each interview questions were coded. All responses related to the codes were then housed in parent nodes in NVivo 11. The frequency in which the data appears in each code is recorded, and the analysis is conducted based on this information. The use of NVivo 11 software enabled the researcher to simplify the whole process of content analysis, by showing the number of responses coded at each node. From this stage, the researcher was able to determine the pattern which existed in the data to draw conclusions on. Figure 6.1 is a screen shot of NVivo 11 software package as utilized for content analysis in the present study.

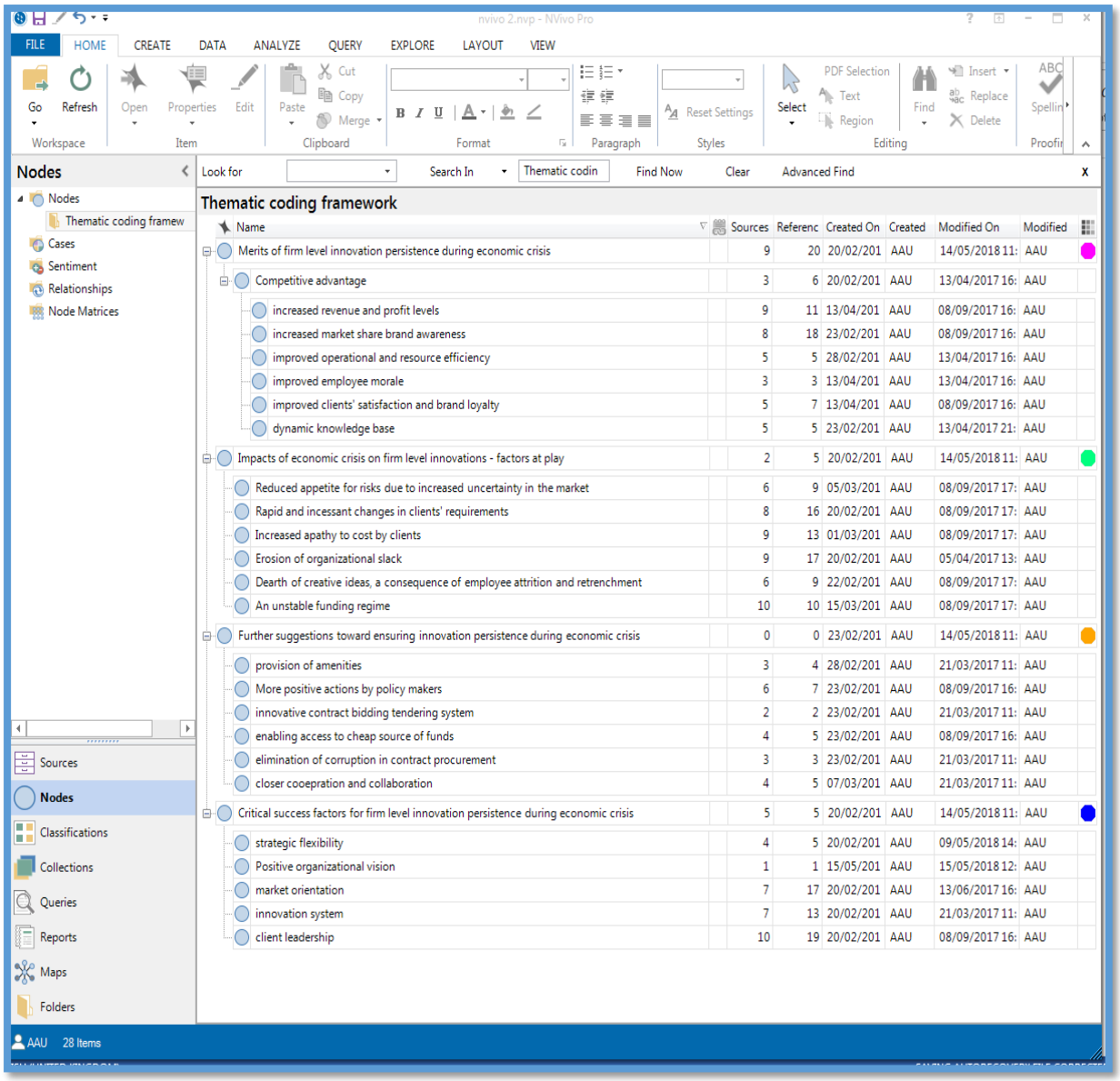


Figure 6-1: Thematic coding framework for interview data in NVivo 11

Prior to the analysis stage, member checking was carried out on all of the interviews. This enabled the participants to verify the accuracy of the interview transcripts. Reliability and validity measures as described in section 5.18 were taken to ensure the quality of analysis conducted for the interview data.

6.2 Factors that constrain firm level innovations during economic crisis (RQ1) – analysis of findings

A review of literature as conducted in section 4.5 reveals four factors that constrain firm level innovations during economic crisis. The four factors are:

- Unstable funding regime
- Erosion of good organizational slack
- Increased apathy to costs by clients
- Reduced appetite for risks due to increased uncertainties.

Thus, this section aims to use the obtained interview data to confirm the validity or otherwise of these identified factors and to possibly identify any new one.

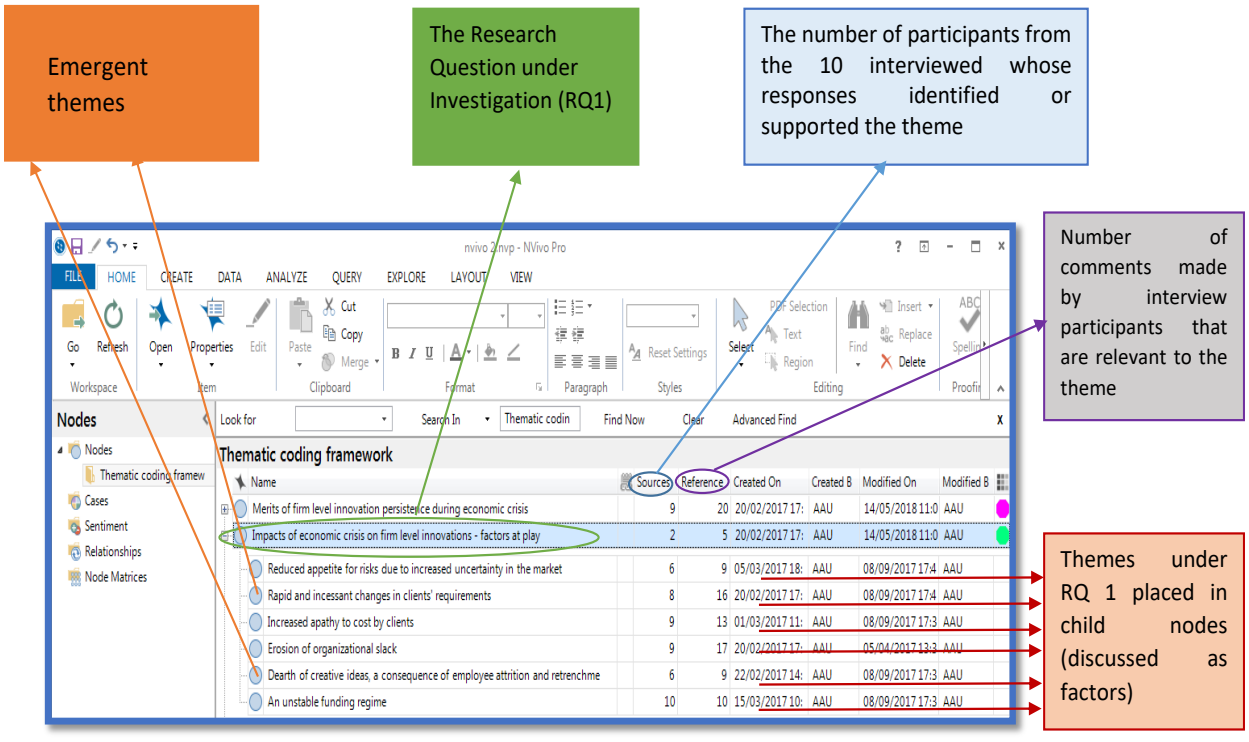


Figure 6-2: Thematic coding framework for interview data in NVivo 11 relevant to RQ1

As can be seen in Figure 6.2 above, comments made by interview participants are placed in child nodes, with labels for these child nodes derived from the answers given by the

participants. The identified constraining factors against firm level innovation persistence are presented in their order of ranking in Table 6.2 below.

Table 6-2: Interview results of the factors that impact firm level innovations during economic crisis

FACTORS THAT IMPACT INNOVATIONS DURING ECONOMIC CRISIS	RANKING BASED ON NUMBER OF RESPONSES	NO OF ORGANIZATIONS = 5 TOTAL NO. OF PARTICIPANTS = 10		
		NO OF RESPONSES	PERCENTAGE (%) RESPONSE	NO. OF REFERENCES
An unstable funding regime	1st	10	100%	10
Erosion of good organizational slack	2nd	9	90%	17
Increased apathy to cost by clients	3rd	9	90%	13
Rapid and incessant changes to clients' needs and requirements	4th	8	80%	16
Dearth of creative ideas	5th	6	60%	9
Reduced appetite for risks	5th	6	60%	9

The results that emerged from the analysis of the semi-structured interviews as presented in Table 6.2 above, show that all 10 (100%) semi-structured interview participants unanimously report that an ***unstable funding regime*** is a key factor that constrain firm level innovations during economic crisis major. Furthermore, 9 (90%) of the 10 semi-structured interview participants identify ***increased apathy to cost by clients*** as a factor that inhibit firm level innovations during economic crisis. Similarly, 9 (90%) of the 10 semi-structured interview participants cite the ***erosion of good organisational slack*** as a key constraining factor. While ***reduced appetite for risks*** was identified by 6 (60%) of the interview participants as a key factor that constrains firm level innovation during economic crisis. Furthermore, two new factors were identified from analysed interview data. In this regard, 8 (80%) participants identified ***rapid and incessant changes to clients'*** **needs and requirements'** as a key factor that impact firm level innovations during economic crisis, while 6 (60%) participants identify the ***dearth of creative ideas*** as a key factor.

These factors are discussed according to their order of ranking in the next subsections.

6.2.1 An unstable funding regime

This identified factor that constrain firm level innovations during economic crisis emerged from literature and discussed in section 4.5.1. As presented in Table 6.2 above, all 10 (100%) semi-structured interview participants identify an unstable funding regime as a key factor that impact firm level innovation during economic crisis. They mostly argue that initiating and implementing innovations are typically expensive endeavours and do require a stable funding regime. SMRDCS4 puts it more succinctly. He remarks that:

> *"Creative ideas are quite costly to manage into innovations. Simply put, innovations are costly. With reduced resources at our disposal during economic crisis, we found it almost impossible to fund innovations on our own like we did in the past".*

GMOCS5 reinforces the above observation with his view that:

> *"Our depleted resource base made it almost impossible to initiate and fully manage innovations without endangering the very existence of our firm".*

Furthermore, COOCS1 remarks that:

> *"There was also the problem of restricted access to funds often required for innovation during economic crisis. So, we have had to find innovative ways to access funds during this period".*

From the foregoing, there seems to be a consensus among all the interview participants regarding the validity of this theme. In addition, the emerged results indicate that from the interviewees' perspectives, an unstable funding regime is the most significant of all the factors that constrain innovations in construction contractors in Nigeria during economic crisis. This finding is consistent with key literature position on this as discussed in section 4.5.1. The works of OECD (2012), Aghion et al. (2008) and Dell'Ariccia et al. (2008), O'Sullivan (2005) and Delbecq and Mills (1985) are instructive in this regard. They find that lack of adequate and committed financing negatively affects innovation during downturns. It is noted that innovation is an expensive process; significant resources must be expended to initiate, direct, and sustain it. (O'Sullivan 2005). Thus, Delbecq and Mills (1985) conclude that innovations depend on a firm's ability and willingness to commit not only the necessary time and leadership to research and development but also to have in place an appropriate funding regime.

6.2.2 Erosion of good organizational slack

This identified factor that constrain firm level innovations during economic crisis emerged from literature and discussed in section 4.5.2. As presented in Table 6.2 above, 9 (90%) of the 10 semi-structured interview participants cite the erosion of good organizational slack as a key factor that impacts firm level innovations during economic crisis. The interview participants' responses are generally indicative of the importance of organizational slack as a cushion to the turbulence in the operating environment. The point here is that with the declining revenue and profits levels as often witnessed during economic crisis, organization are forced to dip into their reserves. PMCS1 reports that:

> *"Some of the contracts we are currently executing were procured before the onset of the current economic crisis. The pricing of these contracts was based on what were the realities then. But today, there is a very high inflation rate and a collapsed naira value. Thus, the prices of raw materials and our expatriates pay have all gone up so exponentially. This leaves us with no margin for error".*

GMOCS3 adds that:

> "*The steep increase in operating costs impacts our reserves. So, we have become more careful about the kind of things we go into and how we go about these things".*

The above views are in harmony with views of Cyert and March (1963) that organizational slack plays a vital role in enabling organizations to innovate by allowing them to experiment with new strategies and innovative projects that might not be permitted in a more resource-constrained environment. Indeed, organizational slack impacts experimentation by acting as a cushion against resource fluctuations. Too little slack constrains innovation because it deters any kind of experimentation whose success is uncertain (Nohria and Gulati 1997). The interview participants mostly claim that prior to the economic crisis, their organizations were able to maintain resource reserves and that this enabled them to invest in innovations by giving them a sense of security and cover if experimentations go wrong. They suggest that because of the extra pressures brought about by the increases in operating costs, their firms have had to dip into these reserves and that this is a key constraining factor against firm level innovation persistence during economic crisis.

However, PMCS4 disagrees with the above views. He argues that:

> *"Although the current economic crisis in the country has caused an increase in our costs which in turn has made us to continue to draw from our reserves, however, I fail to see how dipping into our reserves to fund our investments and operations affects innovations in our firm. In fact, I think it is the right thing to do to continue innovating".*

PMCS4 adds that:

> *"I really don't think carrying too much reserve is on its own a good thing. Firstly, in a way, it gives a false sense of security and so can cause the firm to be docile. Secondly, it generally encourages wastes".*

PMCS4's view is consistent with the contention of Jensen (1993 cited in Nohria and Gulati 1997) that "slack diminishes incentives to innovate and promotes undisciplined investment in R&D activities that rarely yield economic benefits". Whilst the above stated argument against the usefulness of organizational slack to innovation persistence is appreciated, this work will however, follow Nohria and Gulati's contention that the relationship between slack and innovation is "curvilinear – too little slack is as bad for innovation as too much slack". Thus, finding areas of convergence between the submissions of the proponents and opponents of organizational slack.

6.2.3 Increased apathy to costs by clients

This identified factor that constrain firm level innovations during economic crisis emerged from literature and discussed in section 4.5.3. As presented in Table 6.2 above, 9 (90%) of the 10 semi-structured interview participants identify an increased apathy to costs by clients as a key factor that constrain firm level innovations during economic crisis. The view of PMCS2 appears instructive in this regard. He notes that:

> *"Money is a big problem for our clients in this economic period. In fact, some of them get too price savvy. Meaning that we find it a bit more challenging to convince these clients on the positive cost/benefit impact of new processes/products/services".*

The above view suggests that clients find it especially difficult to appreciate the cost/benefit value of innovation investments during periods of economic crisis. GMRDCS1 offers us an interesting perspective in this regard. He points out that:

> *"They are more conscious of value to costs and often don't ask for cheaper options and discourage every form of experimentation. We know that economic crisis hits their pockets and that they are struggling with other priorities".*

GMOCS3 offers a similar view to that of GMRDCS1 by remarking that:

> "*The client is much more conscious of cost implications of new developments during economic crisis. Cost-benefit analysis of planned new developments is very key during these times".*

The above views are in harmony with the contention of Wong (2000) and Kim et al. (1999 that price affects product choices and that clients often display a preference for lowest tender price. However, GMCS5 disagrees with the above views. He remarks that:

> "*The cost of almost everything in the country has gone up. All our clients are aware of this and mostly understand that some aspects of our services will have to be costlier. In my opinion, as long as a thorough cost benefit analysis is conducted and the clients are carried along about the new product or services, they usually accept* any changes in price".

Furthermore, company documents reviewed (correspondences between these firms and their clients) in CS1, CS2, CS3 and CS4 reflected the difficulties experienced by these construction contractors in getting clients to buy into their innovation efforts. Clients' predominant concern as revealed by an analysis of these sighted documents is the cost of such an effort. Therefore, from the above presented evidence, it appears safe to conclude that the analysed interview data support the validity of this factor as emerged from literature.

6.2.4 Rapid and incessant changes in clients' needs and requirements

This factor was identified from the analysed interview data. As shown in Table 6.2 above, 8 (80%) of the 10 semi-structured participants identify rapid and continual changes in clients' needs and requirements as a key impediment to firm level innovation during economic crisis. For instance, CECS1 remarks that:

> *"In my opinion, it is more difficult to maintain good relationship with clients during economic crisis. Key reason here is that clients are more difficult to be satisfied during these times. I observed that their needs and requirements change more frequently during periods of unstable economic conditions. Fluctuation in prices and other priorities could be the reasons for this".*

COOCS1 offers a similar view that:

> *"Economic crises are uncertain times; clients' behaviours change pretty fast. What they want today is quite different from what they will want tomorrow. The rate of change is quite rapid, honestly. This creates problems for innovative*

firms since the outcome of their innovation efforts may become irrelevant following changes in clients' requirements".

GMRDCS1 explains that:

"Clients' buying behaviours and requirements change quite substantially and rapidly during economic crisis, we have had to adopt a pull innovation strategy. Whilst our new products/process/service developments motivated clients to seek us out pre-economic crisis, we now actively motivate our clients to offer ideas that will lead to and drive innovations (pull innovation strategy)".

Whilst there is no explicit literature support for this factor, there is however a broad acceptance in the body literature that, typically, demand patterns and clients' needs alter during turbulent economic periods (OECD, 2012; Fernandes and Paunov, 2011). The point being made by the interview participants is that the frequency and scale of the changes in clients' needs and requirement during economic crisis are such that firms find it difficult to maintain alignment between clients' needs and innovation investments. Therefore, based on the interview participants' comments as highlighted above, the present study identifies this factor as a significant constraint to firm level innovation during economic crisis.

6.2.5 Dearth of creative ideas, a consequence of employee attrition and retrenchment

This factor was identified from the analysed interview data. As shown in Table 6.2 above, 6 (60%) of the 10 interview participants cite the dearth of creative ideas as a significant constraint against innovation persistence during economic crisis. The interview participants mostly attribute this to the staff retrenchments which occurred in their organizations. They argue that this often leads to a decline in employees' creativity, thus, a dearth of creative ideas from the retained employees. The comment made by GMRDCS1 was quite unequivocal in this regard. He notes that:

"*Our employees have always been a good source of creative ideas for us. We invest heavily on their skill improvements and renewal. We constantly sought to recruit fresh and experienced professionals who often come to our organization with fresh ideas. However, the economic crisis conditions mean we have had to work extra hard to do this".*

GMRDCS1 adds that:

"Attracting and motivating high quality employees are doubly difficult during economic crisis".

PMCS3's remark is even more instructive in this regard. He narrates that:

> *"We continue to cut-back on our staff strength. In fact, we shed over 7000 employees nationwide in the past year alone and there are indications that we may continue to lose some of our highly skilled and creative employees. We have also had to move the contract of some of our permanent staff to temporary arrangements just to manage our costs. We know these impact on the quality of their output and level of commitment but we have taken other actions to mitigate this".*

Furthermore, SMRDCS4 points out that:

> "*Our employees were quite resourceful and we were able to draw on their resourcefulness to drive innovations in the past. With the recent retrenchments and employee attritions, we are not able to generate as much creative ideas from our employees like we did in the past".*

It is important to note that this problem stems directly from the decline in employees' level of job satisfaction, a consequence of the massive retrenchments by most construction contractors in Abuja, Nigeria during the current economic crisis. Whilst employers often seek to implement measures aimed at minimizing the unintended impacts of downsizing, usually by applying appropriate change management techniques; however, the effects of cut backs on the retained workforce will in most cases be unsettling. Indeed, employees feel less secure following personnel cutbacks (Makawatsakul and Kleiner, 2003). They may also lose the belief that their contribution to the business will be rewarded in future (Wiley, 1997). These possible reactions could threaten business performance. Furthermore, survivors of downsizing can become unduly risk averse and narrowly focused, and therefore less creative and open to change (Agunda, 2014, Outa, 2011). Indeed, this seems to be the point being made by the 6 interview participants that identified this factor as a key constraint to firm level innovations during economic crisis.

6.2.6 Reduced appetite for risks due to increased uncertainties

This identified factor that constrain firm level innovations during economic crisis emerged from literature and discussed in section 4.5.4. The results retrieved from the analysed interview data as presented in Table 6.2 above, show that 6 (60%) of the 10 semi-structured participants cite a reduced appetite for risks as a key factor that inhibit firm level innovations during economic crisis. They mostly blame this on the increased uncertainties in the operating environment. For instance, GMOCS5 reports that:

> *"With the uncertainties, currently being experienced in the market, we were not sure that any new product or services will find an adequate market, so we actively mindful of this".*

Similarly, PMCS2 maintains that:

> *"Innovations are fraught with risks and uncertainties. One thing firms do not like is compounding these already existing risks by innovating for a very uncertain market. Unfortunately, this is what happens during economic crisis".*

The above comments by GMOCS5 and PMCS2 are consistent with the contention of Fernandes and Paunov (2011) that organizations may be less willing to face uncertainties and risks associated with introducing new products and/or processes during economic crisis since their survival might be compromised if demand evolves unpredictably. Likewise, OECD (2012) points out that economic uncertainty can negatively impact investors' appetite for risks. SMRDCS5 further offers an insightful dimension to this problem. He remarks that:

> *"Innovations require long term planning and an appropriate organizational approach in place. The uncertainty in the business environment is such that planning is extremely difficult".*

The above point made by SMRDCS5 tallies with the conclusions reached by the works of Grant (2003) and Brown (2003) that uncertainties that characterize economic crisis periods often make strategic planning more challenging. However, COOCS1 disagrees with the above submissions. He argues that:

> *"Every market is uncertain. As long as there is a good and effective relationship between us and the client, I don't see how the uncertainties can be a problem. It has never been a problem to us. We do not innovate in isolation even in stable economic periods. We ensure that our clients buy into this from the onset".*

GMCS2 adds that:

> *"There is always going to be a window of opportunities in uncertain market conditions. I honestly don't see the so called increased uncertainties as a key problem for our firm".*

Whilst there is a clear divergence in the views of the interview participants regarding the validity of this finding, the present study however, accepts the validity of this finding based on the superiority of the number of participants (6) that indicated that this factor is valid as against those that diverged (4). Nevertheless, the validity of this factor will be further tested in the questionnaire survey stage of the present study.

6.2.7 Summary – factors that impact firm level innovations during economic crisis

A review of literature in section 4.5 identified four key factors that impact firm level innovations during economic crisis. These key factors are; an unstable funding regime, erosion of good organizational slack, an increased apathy to costs by clients and a reduced appetite for risks due to increased uncertainties. The results of the analysed interview data confirm that these four factors are valid. The present study, however, identifies two new factors from analysed interview data. These new factors as discussed in this section are; rapid and incessant changes in clients' needs and requirements and a dearth of creative ideas. The validity of these six factors will be further tested using questionnaire survey. This is presented in chapter 7.

6.3 Merits of firm level innovation persistence during economic crisis (RQ2) - analysis of findings

A review of literature as conducted in section 4.7 identifies the key merits of firm level innovation persistence during economic crisis. These are:

- Improved clients' satisfaction and brand loyalty.
- A dynamic knowledge base for organizations.
- Improved operational and resource efficiency.
- Increased revenues and profits levels.

This section therefore aims to use obtained interview data to confirm the validity or otherwise of these identified factors and to possibly identify any new one. Comments made by interview participants in response to the questions asked under this theme are placed in relevant child nodes. As presented in Figure 6.3 below, the emerged child nodes are appropriately labelled to reflect the theme being considered.

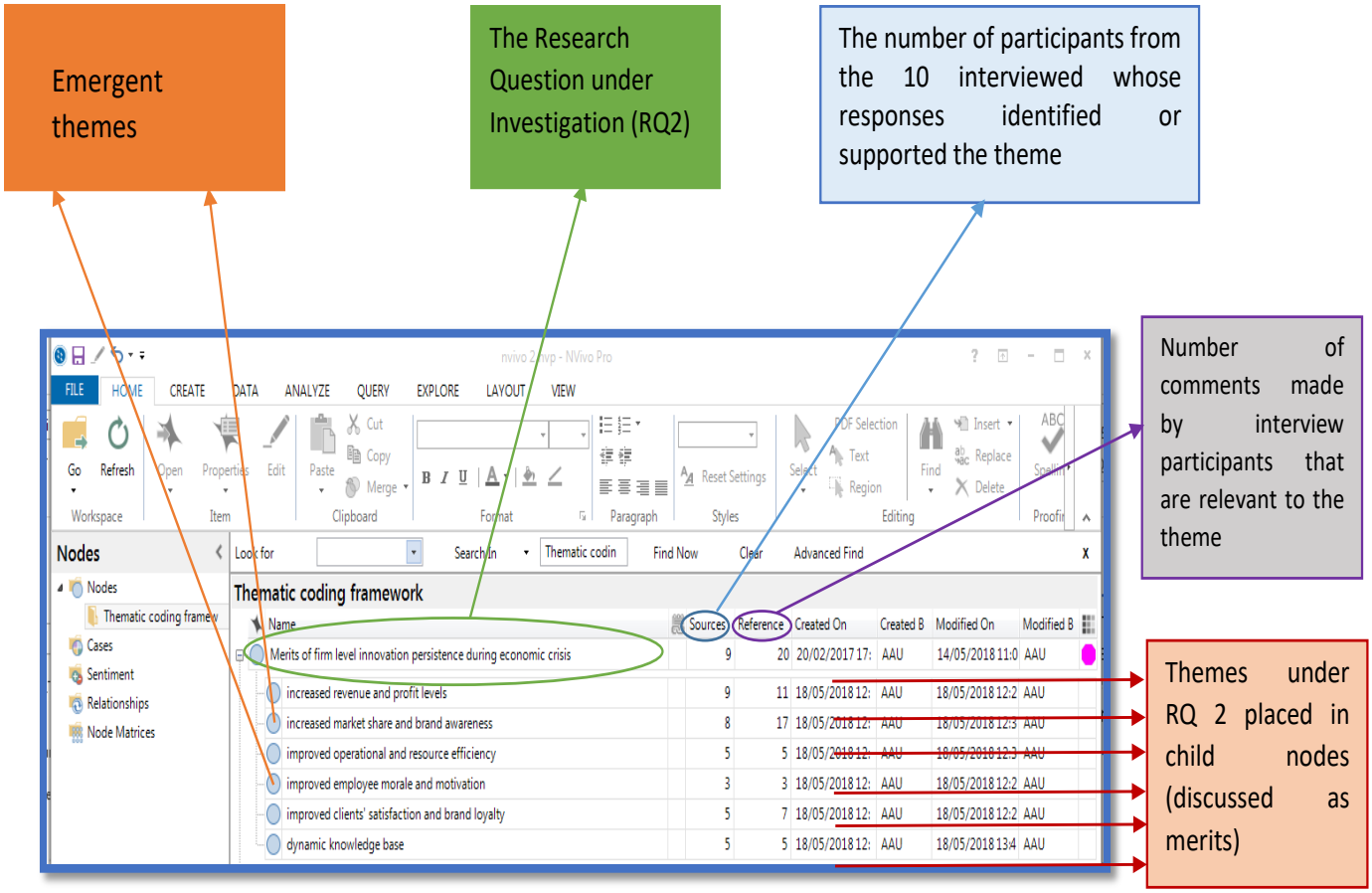


Figure 6-3: Thematic coding framework for interview data in NVivo 11 relevant to RQ2

The merits of firm level innovation persistence as identified from interview data are presented in their order of ranking in Table 6.3 below.

Table 6-3: Interview results of the key benefits of firm level innovation persistence

KEY BENEFITS OF INNOVATION PERSISTENCE DURING ECONOMIC CRISIS	RANKING BASED ON NUMBER OF RESPONSES	NO OF ORGANISATIONS = 5 TOTAL NO. OF PARTICIPANTS = 10		
		NO OF RESPONSES	PERCENTAGE (%) RESPONSE	NO. OF REFERENCES
Increased revenues and profit levels	1st	9	90%	11
Increased market share and brand awareness	2nd	8	80%	17
Improved clients' satisfaction and brand loyalty	3rd	5	50%	7
Improved operational and resource efficiency	4th	5	50%	5
A more dynamic knowledge base	4th	5	50%	5
Improved employee morale	5th	3	30%	3

The key merits of firm level innovation persistence as highlighted in Table 6-3 above are discussed according to their order of ranking in the next subsections.

6.3.1 Increased revenues and profits level

This identified merit of firm level innovation persistence during economic crisis emerged from literature and discussed in section 4.7.4. As presented in Table 6.3 above, 9 (90) of the 10 interview participants identified an increased revenue and profit levels as a key merit of firm level innovations persistence during economic crisis. GMCS2 is quite clear on this. He remarks that:

> *"An increased market share has led to an increase in our revenues. I believe our profit levels will improve soon".*

PMCS3 echoes the above remark. He reports that:

> *"Our profit level has picked-up in the past one year. It's ironical really, but aside from the first year of this current crisis in 2014, our profit level has consistently grown".*

The above comments are in agreement with key literature position on this. Previous studies conclude that firms that continue their commitment to innovation during economic crisis are more likely to reap great rewards (Cozza et al. 2012, OECD 2012, Antonelli et al. 2012, Anthony and Feinzaig 2008, Cefis and Ciccarelli, 2005). Indeed, the work of Anthony and Feinzaig (2008) finds that innovation is not only more critical in a down economy, it is also more valuable. Cefis and Ciccarelli (2005) similarly conclude that persistent innovation implementation has a positive effect on organizational profitability. Furthermore, CECS1 offers a more pragmatic view on this. He notes that:

> *"We have definitely made inroads into new markets but considering the increases in our operational costs, it seems too early to say if our profit level will go up but I will say, that our revenue is likely to have gone up".*

However, MDCS4 differed from the above views. He remarks that:

> *"Although, we now have more businesses because we have had to expand the breadth of our operations and have improved the efficiency of our operations, but like I told you earlier on, we are currently faced with huge increases in our operating costs. So, to be honest, I don't think we will have much joy in terms of increased profits".*

The above responses give the impression that the participants appear to be mostly in agreement that their firms have made inroads into new markets by continuing to be innovative during economic crisis. These new markets according to them are beginning to have positive effects on their revenues and on their profit levels. Therefore, the results of the analysed interview data suggest that this merit of firm level innovation persistence as identified from literature in section 4.7.4 is valid for construction-based firms in Abuja Nigeria.

6.3.2 Increased market share and brand awareness

This theme was discovered from analysed interview data. As presented in Table 6.3 above, the results of the analysed interview data show that 8 (80) of the 10 interview participants accept that an increased market share and brand awareness is a key merit of firm level innovation persistence during economic crisis. For instance, CECS1 reports that:

> *"……. we know that economic crisis creates gaps in the market which needs to be met. These gaps represent potential markets for us".*

SMRDCS5 remarks that:

> *"We have witnessed a substantial expansion in the size of our clientele because we have continued to provide for emerging markets during this economic crisis".*

The view of PMCS3 is even more insightful. He observes that:

> *"We have kept on winning new markets. The reason is simple. Clients seek-out firms that can consistently guarantee value for the money they are paying. They are keen to move over to firms who are consistently able to meet their needs and satisfy them". We have consistently done this not only during this economic crisis but also during stable times".*

However, 2 of the 10 interview participants disagree with the sentiments expressed above. For instance, MDCS4 states that:

> *"I haven't seen any indication that our market share has increased. And as the Managing Director of this firm I should know if there has been an increase. So, in effect, I am saying to you that our market share hasn't improved. In fact, it has dwindled a little".*

On the other hand, PMCS1 agrees that there has been an increase in their market share but is sceptical as to the reason why this has happened. He remarks that:

> *Yes, our market share has increased. But then this can be attributed to a number of factors. For instance, a significant number of construction-based firms around Abuja have packed-up in the last year alone. It could be that we are now getting some of their customs".*

As noted above, this finding emerged from analysed interview data. Whilst a review of literature finds no explicit support for this emerged theme, however, a number of previous studies have found that innovation has a positive effect on return patronage (Pae and Hyun, 2002, Hollingsworth, 1998) and new client acquisition (Nambisan and Sawhney, 2007).

6.3.3 Improved clients' satisfaction and brand loyalty

This identified merit of firm level innovation persistence emerged from reviewed literature as discussed in section 4.7.1. As shown in Table 6.3, 5 (50) of the 10 interview participants cite improvements in clients' satisfaction level and brand loyalty as a key benefit of firm level innovation persistence during economic crisis. They argue that clients are often keen to stay with firms that can consistently meet their needs and requirements irrespective of the economic situations. This point appears consistent with the finding of Nemati et al. (2010) that customers are keen for assurances that service/product quality will not be compromised no matter what happens to the firm or the market. To this end, PMCS4 argues that:

> *"…… a pool of mostly unsatisfied clients emerges during economic crisis. Meet their needs and requirements and you win for yourself loyal customers".*

CECS1 adds that:

> "*Because we have managed to keep our costs down through a number of innovative approaches we have adopted during this economic crisis. This cost effectiveness, leads to cheaper products for our clients. This is quite important during economic crisis as clients become more price sensitive. We now have more private clients than ever before".*

In the same vein, GMOCS3 remarks that:

> "*There is an increase in the number of positive feedbacks we get from clients. This in my judgement can be linked to our ability to continually satisfy them even during this economic crisis period".*

The above views are in harmony with the conclusions reached in the work of Nemati et al. (2010), Meuter et al. (2000) and Anderson and Sullivan (1993). Indeed, Meuter et al. (2000) find a positive correlation between innovation implementation and customer satisfaction. Furthermore, Anderson and Sullivan (1993) contend that customer satisfaction generates a positive impact on repurchase intentions. However, MDCS4 and GMCS5 argue that determining clients' satisfaction and brand loyalty is difficult and often takes time to materialize. Therefore, this cannot possibly be viewed as a merit of firm level innovation persistence during economic crisis. In this regard, GMCS5 notes that:

> "*I think it is too early to ascertain this. So, I really cannot agree with this". May be with time, we will begin to understand more about this".*

Furthermore, PMCS1, SMRDCS2 and PMCS3 remark that it is difficult to find a direct relationship between their firms' persistence with innovations during economic crisis and improved clients' satisfaction and brand loyalty. For instance, PMCS1 comments that:

> *"We have always had good relationship with our clients. So, our clients are generally satisfied with our services even before the current economic crisis, and generally do come back. So, I don't agree that this is specifically a merit of innovation persistence during economic crisis".*

As can be seen from the comments and analysis made above, most interview participants believe that because their firms have continued to meet the requirements of their clients during the current economic crisis by persistently innovating, their clients tend to be more satisfied. Therefore, the results of the analysed interview data suggest that this merit of firm level innovation persistence as identified from literature in section 4.7.1 is valid for construction based firms in Abuja Nigeria.

6.3.4 Improved operational and resource efficiency

This identified merit of firm level innovation persistence emerged from reviewed literature as discussed in section 4.7.3. As presented in Table 6.3 above, 5 (50%) of the 10 interview participants' comments suggest that improved operational and resource efficiency is one of the key benefits accruable from firm level innovation persistence during economic crisis. Indeed, the five interview participants whose comments appear to support the validity of this theme mostly argue that approaching the problem of continuous innovation during economic crisis in the right way allows firms to do more with less and continue to move forward. CECS1 offers an insightful view on this. He notes that:

> *"Because we have managed to keep our costs down through a number of innovative approaches I mentioned earlier, this cost effectiveness, leads to cheaper products for our clients. This is quite important during economic crisis as clients become more price sensitive……"*

Similarly, GMOCS3 points out that:

> *"To be able to move ahead during this economic crisis, we have continued to work to improve our processes and this positively impact our operational efficiency. Therefore, we have continued to enjoy low cost advantage when compared with our competitors".*

GMOCS3 adds that:

> *"A number of innovations we have had to implement during this economic crisis have focused on improving our processes as a way of enhancing our overall operating efficiency. Improvements in our efficiency levels undoubtedly have positive impact on our costs. In my opinion, efficiency savings are even more important during economic crisis".*

The above comments are actually harmony with the findings reached by the works of Polimeni (2008) and Rennings and Rammer (2009) that innovations increase the efficiency with which a resource is utilized. It is however important to note that 50% of the interview participants questioned the validity of this claim. One of the participants (PMCS4) remarks that:

> *"I find it disingenuous to claim that continuing with innovations during economic crisis leads to an improved operational and resource efficiency. How can that be? Of course, our firm is nimbler now, but the key reason for this is the strategic retrenchment we have had to carry out two years ago". I don't think it has anything to do with the innovations we have implemented during the current economic crisis".*

GMCS5 was even more sceptical. He states that:

> *"How can you say that continuing with innovations during economic crisis leads to improvements in resource efficiency? You know that innovations are all about experimenting with ideas and most times, these ideas do not come to fruition. So, how can that improve our resource efficiency? Unless we are talking in the long term, which if that is the case, I do not know yet".*

Nevertheless, the present study is satisfied that the comments offered by the five participants is robust enough to confirm the validity of this theme at this stage of the empirical investigation. Thus, the results of the analysed interview data confirm that improved operational and resource efficiency is a key merit of firm level innovation persistence during economic crisis.

6.3.5 A dynamic knowledge base for the organization

As noted in section 4.7.2, one of the key merits of persisting with innovation during economic crisis is a dynamic knowledge base for the firm. As presented in Table 6.3 above, 5 (50%) of the 10 interview participants made comments that support the validity of this literature finding. Participants offered slightly contrasting but enriching views regarding how innovation persistent firms can develop a dynamic resource base through constant renewal of what (and how) they offer to clients. GMOCS3 remark addresses this point. He submits that:

> *"As we continue to renew knowledge domiciled within the organization by persisting with innovations in order to adequately adapt to the requirements of the changing business environment, we will continue to have an advantage over our competitors".*

SMRDCS2 expresses a similar view that:

> *"Continuing to implement innovations during economic crisis have enabled our firm to continue to retain a workforce that is active, energetic and responsive to clients".*

Indeed, the inability to persist with innovations can undermine the development of competencies argues Leonard-Barton (1995). Conversely, the persistent implementation of innovations will lead to a continuous renewal of organizational competencies. Thus, enabling the organization to achieve dynamic capabilities. It is noted however, noted that 5 (50%) interview participants could not offer explicit support for the above claim. PMCS1 and GMCS5 in particular argue that the validity of this claim is difficult to gauge and that they cannot confirm or refute this. For instance, PMCS1 noted that:

> *"To be honest, I cannot say this is what I have observed. In my opinion, it is difficult to establish if this is true or not".*

However, the present study argues that the proportion of interview participants whose comments back this is such that it can be viewed as a compelling claim. Therefore, it is argued that the results of the analysed interview data support the literature finding that construction based firms in Nigeria can achieve a more dynamic knowledge base by persisting with innovations during economic crisis.

6.3.6 Improved employee morale and job satisfaction

This theme emerged from the analysed interview data. As presented in Table 6.3 above, 3 (30%) of the 10 interview participants identify an improved employee morale and job satisfaction as one of the key merits of firm level innovation persistence during economic crisis (see Table 6.3 above). These 3 participants generally report that their firm have been able retain and in some cases, improve workplace excitement and motivation during economic crisis by stimulating, engaging and developing new ideas during economic crisis. The point here is that persisting with innovations during economic crisis keeps employees engaged and motivated, thus, ultimately enhancing employees' morale and job satisfaction. The remark of PMCS4 absolutely captures this notion. He reports that:

> *"Because we keep improving our processes, there is a growing positive impact of this on overall working environment. Our employees are more excited and engaged, and the working environment is in fact energised by the innovations we have continued to carry out during the current economic crisis".*

Similarly, GMCS2 argues that:

> "*Having managed to keep our employees creatively engaged during the current and previous economic crises by continuing to execute new ideas. We think this actually help to up the job satisfaction level of employees".*

There is indeed a positive relationship between creativity (and by extension, innovation) and job satisfaction (TAHERKHANI, 2015). It is further argued that this relationship is cyclical in nature. In order words, an increased job satisfaction level should (all things being equal) lead to an increased employee creativity. Likewise, an increased employee creativity should cause a positive improvement in workforce motivation and job satisfaction. This suggests that an improved employee morale and job satisfaction is one of the merits of persisting with firm level innovations during economic crisis.

6.3.7 Summary – merits of firm level innovation persistence during economic crisis

A review of literature in section 4.7 identified four key merits of firm level innovation persistence during economic crisis. These key merits are; improved clients' satisfaction and brand loyalty, a dynamic knowledge base for organizations, an improved operational and resource efficiency and increased revenues and profits levels. The results of the analysed interview data confirm that these four benefits of firm level innovation persistence are valid for construction based firms in Nigeria. The present study, however, identifies two new merits of firm level innovation persistence from analysed interview data. These are; increased market share and brand loyalty and an improved employee morale and job satisfaction. The validity of these six factors are further tested on a larger population size using questionnaire survey. This is presented in chapter 7.

6.4 Critical success factors for firm level innovation persistence during economic crisis (RQ3) - analysis of findings

Several conditions necessary for innovations to thrive in organizations have been identified by previous studies. These are dealt with exhaustively in section 3.9. However, the current study extends beyond these and instead focuses on the fundamentals that facilitate firm level innovation persistence during economic crisis. These factors resolve the innovation constraints that emerge during economic crisis.

A review of literature in section 4.8 was only able to identify one (1) critical success factor that enables firm level innovation persistence during economic crisis. The CSF as identified and discussed in section 4.8.1 is as follows:

- The presence of an effective innovation system (Filippetti and Archibugi, 2010).

Therefore, this section aims to use obtained interview data to ascertain the validity or otherwise of this identified factor and to possibly discover any new one. Comments made by interview participants are placed in relevant child nodes. As can presented in Figure 6.4 below, the emerged child nodes are appropriately labelled.

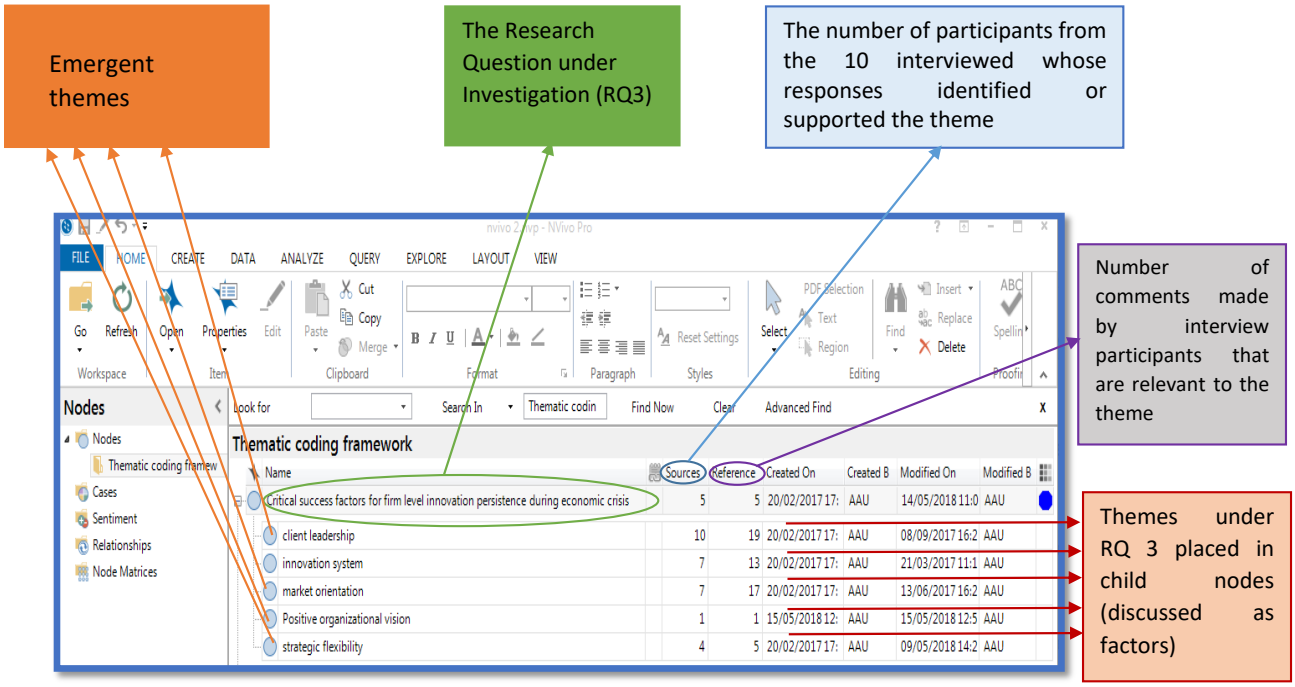


Figure 6-4: Thematic coding framework for interview data in NVivo 11 relevant to RQ3

These critical success factors as identified from interview data are presented in their order of ranking in Table 6.4 below.

Table 6-4: Interview results on the critical success factors for enabling innovation persistence

CRITICAL SUCCESS FACTORS FOR ENABLING INNOVATION PERSISTENCE	RANKING BASED ON NUMBER OF RESPONSES	NO OF ORGANISATIONS = 5 TOTAL NO. OF PARTICIPANTS = 10		
		NO OF RESPONSES	PERCENTAGE (%) RESPONSE	NO. REFERENCES
Clients' leadership of the innovation process	1st	10	100%	19
A culture of market orientation	2nd	7	70%	17
The presence of a strong and effective innovation system	3rd	7	70%	13
The capacity to maintain strategic flexibility	4th	4	40%	5
A positive organizational vision that promotes continuous innovativeness	5th	1	10%	1

The critical success factors for firm level innovation persistence as highlighted in Table 6-4 above are discussed according to their order of ranking in the next subsections

6.4.1 Leadership of the innovation process by the experienced client - a critical success factor for enabling firm level innovation persistence during economic crisis

This theme emerged from the results of the analysed interview data as presented in Table 6.4 above. As shown in Table 6.4, all 10 (100%) interview participants report that their respective firms have had to integrate varying degrees of the client leadership concept with their overall innovation strategy to enable innovation persistence during economic crisis. To buttress the importance of this factor, interview participants made a total of 19 separate comments that are related to this factor (see Figure 6.4). The interview participants advance several key benefits of this approach. For instance, to mitigate against the identified problem of a dearth of creative ideas (see section 6.1.6), GMCS2 narrates that:

> *"We have established credible channels of communication and exchange of ideas with our clients. Consequently, we get regular valuable service feedbacks and creative ideas from our clients".*

Similarly, SMRDCS2 reports that:

> *"There are a good number of our clients who are quite experienced and knowledgeable in the area of construction and we try as much as possible to nudge them into offering us ideas that will move us ahead. Over time, this has formed a good platform from which we develop innovations. The point here is that feasible ideas which emerged from the clients are much more likely to be accepted by them".*

As a panacea to the problem of rapid and incessant changes in clients' requirements as identified in section 6.1.5, CECS1 explains that:

> *"Because our clients are key stakeholders in the outcomes of our innovation efforts, we ensure that they not only lead the innovation process but that they also drive it".*

He adds that:

> *"……. the key peculiarity when innovating during economic crisis is the added importance of ensuring that at each stage of the innovation process, the client input is incorporated. This ensures that there is agreement between what is being done and what the client really require at every point in time".*

PMCS3 offers an instructive remark in this regard. He notes that:

> "*The client is a good source of creative ideas for us not only during periods of economic crises but during stable times. They are however, a critical source of creative ideas during economic crisis. Their criticality as a source of creative ideas can be a solution to the constant variation in their needs often witnessed during economic crisis".*

Furthermore, as a solution to the issue of increased apathy to cost by clients as identified in Section 6.1.3, GMOCS3 explains that:

> *"We have had to tailor our new product/process development in response to changes in clients' needs and requirements. In my opinion, these changes are caused to large extent by reduced cash flow on the side of the client and the perceived lack of confidence in the economy. This ensures that the client is constantly kept abreast of the cost implications of our innovation efforts".*

It appears safe to conclude that the contentions of the interview participants as analysed above are premised on the fact that today's clients are knowledgeable of not only what they want but also how they want it delivered (Prahalad and Ramaswamy, 2004). Indeed, the finding on this theme is consistent with the conclusions reached in the works of Von-Hippel, (1998; 1986) and Johnson, (2007) regarding the role of the knowledge client as a critical source of information to the innovation process. However, the result of the analysed interview data further extends this to the critical role the clients and the information obtained from them play in firm level innovation persistence during economic crisis.

6.4.2 A culture of market orientation - a critical success factor for firm level innovation persistence during economic crisis

This theme emerged from the analysed interview data. As presented in Table 6.4 above, 7 (70%) of the 10 interview participants made comments that suggest that their respective firms adopted one or more aspects (client, product, sales, competition and environmental orientation) of the market orientation concept. To buttress the importance of this factor, interview participants made a total of 17 separate comments that are related to this factor (see Figure 6.4). The participants reveal that the need to adopt this strategy becomes even more compelling against the backdrop of an increased uncertainty in not only the clients' requirements but also the extensive market conditions. A comment made by SMRDCS2 appears quite useful in this regard. He states that:

> *"We have continued to monitor the market more closely than ever before. We are now better in anticipating changes in the market and our entire external environment and re-jigging our efforts to be in tandem with these fluctuations. We now possess an improved understanding of our clients' needs and because of this we can better manage and satisfy their requirements".*

GMOCS3 offers an interesting dimension to this. He explains that:

> *"We are now able to anticipate changes in their demand levels and requirements. Thus, affording us more clarity regarding the marketability or acceptance of creative ideas before investing in them".*

The basis of the participants' submissions is that focusing on delivering innovative products/processes designed according to clients' desires, needs and requirements in addition to product/service functionality and production efficiency is fundamental to the success of an innovation persistence strategy during periods of economic crisis. The comment made by MDCS3 clearly reflects this. Below is his observation:

> *"We know that changes in market conditions provoke these alterations in clients' requirements. So, we dedicate a substantial chunk of our resources to constantly monitor our market. In addition, we focus on better understanding the entire behaviours of our clients with a view to better anticipating changes in their needs and requirements and have positioned our operations proactively to continue to be able to satisfy the market by shaping our innovation investments with information gathered".*

In light of the fact that an increased apathy to costs by clients (refer to section 6.2.3), a reduced appetite for risks due to increased uncertainties (refer to section 6.2.6) and the rapid and incessant changes to clients' needs and requirements (refer to section 6.2.4) constrain firm level innovations during economic crisis; the criticality of constantly monitoring the clients, their needs and requirements, market conditions and wider environmental dynamics and adapting innovation efforts to align with perceived changes cannot be overstated. This is consistent with the conclusion reached in the work of Foss et al. (2011) that "firms that attempt to leverage user and customer knowledge in the context of innovation must design an internal organization appropriate to support it". The present study argue that innovation persistent firms not only focus on having a better understanding of their clients' purchase behaviours, they also seek to understand the clients better. This equips them with a better ability to anticipate changes in their clients' requirements. Organizational procedures

identified as being utilised for achieving this include established platforms for effective communication with clients like feedback mechanisms and frequent surveys of clients.

6.4.3 The presence of a strong and effective innovation system - a critical success factor for firm level innovation persistence during economic crisis.

This theme emerged during literature review and discussed in section 4.8.1. Therefore, the interview conducted was aimed at confirming or refuting this literature finding. The result of the analysed interview data is presented in Table 6.4 above. As shown in Table 6.4, 7 (70) of the 10 interview participants submit that their respective firms have had to leverage on established links with other firms and institutions to drive innovations during economic crisis. They argue that their respective firms have had to broaden and deepen the scope of their collaborations, interactions and networking with other organizations and institutions in order to drive innovations during economic crisis. A total of 13 comments relevant to this theme was made by the interview participants. CECS1 narrates that:

> *"Before the onset of this current economic crisis, we were guilty of focusing almost entirely inwards for creative ideas and platform for moving these ideas into realities. We now focus more on external sources, platforms as well as pathways for exploiting innovations".*

CECS1 adds that:

> *"We have had to enter into partnerships with universities, financial institutions and other firms. The good thing is that we have ended up spending just a fraction of what we used to spend on experiments and research. We found out that working on innovations alone is quite expensive and risky during good times talk less of during harsh economic times".*

Similarly, SMRDCS2 remarks that:

> "*We are pooling resources together with other firms and institutions like some financial organizations, excellent research centres etc. to initiate and drive innovations. This includes closer collaboration with other good construction contractors".*

Interview participants mostly indicate that a key reason behind the expansion of the breadth and depth of their firms' collaboration with other organizations and institutions during economic crisis was to ensure that adequate resources are available to fund innovative projects. This is consistent with the contention of Meeus et al. (1999a) that resource deficiencies within an organisation is a precursor of external relationships. Egbetokun et al. (2008) find that "the higher the resource deficits/shortages and the lower the alignment of

innovative activities within the firm, the more likely the search for complementary resources externally, which increases the likeliness of external relationships". PMCS4 makes a point of this by remarking that:

> *"Of course, economic crisis often leads to cutbacks in personnel and other cost areas. To pluck the gap this may create in terms of having adequate resources available, we have had to collaborate extensively with other organizations like suppliers and other construction based firms".*

However, 3 (30%) of the 10 interview participants contested the validity of this factor. Their central argument being that effective networking and collaboration with other organizations and institutions is a sine-qua-non for every innovation project and not only during economic crisis. They point out that no organization can innovate in isolation, the economic condition notwithstanding. This point is clearly reflected in the comment made by MDCS4 that:

> *"As a highly innovative organization, we have always collaborated extensively with other organizations. In my opinion, it is the very basic platform from which every innovation is built. So, this has nothing to do with economic crisis".*

The 7 interview participants that confirmed this factor as valid for their organizations generally reason that by collaborating with other organizations and institutions, resources are pooled, risks are shared and burdens are lessened. Thus, taking care of some of the constraining factors that emerge during economic crisis as discussed in section 6.2. Indeed, to mitigate against the effects of an unstable funding regime (refer to section 6.2.1), the erosion of good organizational slack (refer to section 6.2.2), a dearth of creative ideas (refer to 6.2.5) and a reduced appetite for risks due to increased uncertainties (refer to section 6.2.6), the benefits of developing and extending the breadth of a firm's interaction and collaboration with other firms and institutions by leveraging on the fundamentals of an innovation system cannot be overemphasized.

This finding is consistent with the conclusion reached in the work of Filippetti and Archibugi (2010, 2011) that strong National Systems of Innovation facilitate the retention of organizations' investments in innovation during economic crisis. It is also implicit in the conclusions reached by Ansell and Gash (2008) and Chesbrough (2006, 2004).

6.4.4 The capacity to maintain strategic flexibility – a critical success factor for firm level innovation persistence during economic crisis.

This theme emerged from the results of the analysed interview data as presented in Table 6.4 above. As shown in Table 6.4 above, 4 (40%) of the 10 interview participants made comments that assisted the present study in identifying strategic flexibility as a critical success factor for firm level innovation persistence during economic crisis. A total of 5 separate comments relevant to this theme was made by the interview participants. The central argument made by the interview participants is that maintaining strategic flexibility during economic crisis enables their respective firms to achieve resource agility at a time when possessing this capability can be the only difference between remaining in business and the demise of the business. They add that maintaining strategic flexibility ensures that resources are more easily switched from an innovation project that has failed to a more viable one. PMCS1 narrates:

> *"Because of the pressures of operating in an uncertain business environment in the past two years, we have had to be quicker in redirecting our resources in response to perceived changes in the external environment. This in my opinion, has not only minimized wastages, but has ensured that we always keep our eyes on what matters".*

PMCS4's comment is even more instructive. He points out that:

> *"Economic crisis is a period that is often characterised by extreme resource insufficiency and turbulence in the market. Therefore, we have had to be elastic in our strategic choices to ensure that resource deployments are made more swiftly in response to changes in the market".*

Considering the constraining factors that emerge during economic crisis especially the unsteady funding regime (refer to section 6.2.1), the erosion of good organizational slack (refer to section 6.2.2) and rapid and incessant changes in clients' needs and requirements (refer to section 6.2.4); the importance of strategic flexibility to organizations persisting with innovations during economic crisis cannot be overemphasized. Furthermore, the participants' responses suggest that this theme – strategic flexibility – builds on the market orientation strategy as discussed in section 6.4.2. This point is reflected in the comment made by SMRDCS2 that:

> *"Like I mentioned earlier, we monitor the market more closely during economic crisis and are better in anticipating changes and refocusing our resources to evolving developments".*

Indeed, the effectiveness of the strategic flexibility concept not only rests on the firm's ability to continually monitor and evaluate market conditions but also on its ability to swiftly recognise emerging threats and opportunities. Precisely, as the business environment becomes more complex and unpredictable during economic crisis, strategic pivoting becomes a necessary adaptive strategy in many industries (Leonard Barton 1992, 1995). Aaker (1984) argue that strategic flexibility is all about "surprise management". Shimizu and Hitt (2004) find that the concept of strategic flexibility is multi-dimensional as measures can be conceived both before and after triggering of events. It is also noted that, strategic flexibility can be an offensive action as well as a defensive reaction.

6.4.5 A positive organizational vision that promotes continuous innovativeness

This theme emerged from the results of the analysed interview data as presented in Table 6.4 above. As shown in Table 6.4 above, 1 (10%) of the 10 interview participants made a comment that identified this theme as relevant to the research question being investigated. The point here is that an organizational vision that identifies innovation as pivotal for the firm's survival and growth will often inspire, challenge and support employees to adapt to change and to continuously seek out change. More importantly, it will create an effective platform for managers to direct organizational resources towards continuous innovation. MDCS4 points out that:

> "*I think it is important not to forget the role of the organizational vision in the whole of this. Ours is a vision that that mandates and supports continuous improvements in all facets of our operations".*

It is important to note that the importance of organizational vision to firm level innovations have been exhaustively dealt with by previous studies (Sarros, Cooper and Santora 2011, Gumusluoglu and Ilsev 2009, Collins and Porras 1991). However, the role this plays towards enabling firm level innovation persistence during economic crisis virgin has not been highlighted by previous studies. Nevertheless, this emerged theme is noted and is further explored at the survey questionnaire stage.

6.4.6 Summary – critical success factors for firm level innovation persistence

A review of literature in section 4.8 identified an effective national innovation system as a critical success factor for firm level innovation persistence during economic crisis. The results of the analysed interview data confirm that this critical success factor is valid for construction

contractors in Nigeria. The present study, however, identifies four novel critical success factors for firm level innovation persistence from analysed interview data. These are; leadership of the innovation process by the experienced client, a culture of market orientation, ability to maintain strategic flexibility and a positive organizational vision. The validity of these five factors are further tested on larger population size using questionnaire survey. This is presented in chapter 7.

6.5 Summary – chapter 6

The chapter commenced with a reiteration of the interview aim, design, process, sample size as well as the interview data analysis procedure utilized. The three research questions articulated for the present study were explored using data collected from the interviews and shall be briefly described in this section.

On **Research Question One** which focused on the specific factors that constrain firm level innovation during economic crisis, it was apparent from the participants' comments that the biggest impediment to firm level innovation persistence during economic crisis is the unstable funding regime as caused by the emergent resource insufficiency. Other factors that constrain firm level innovation persistence during economic crisis as discussed in this chapter are; erosion of good organizational slack, increased apathy to costs by clients, rapid and incessant changes in clients' needs and requirements, dearth of creative ideas and reduced appetite for risks. It was reasoned that firms seeking to persist with innovation during economic crisis must proactively devise a strategy that address these constraining factors. Research Question Three addresses the key elements of the strategy for addressing these constraining factors.

Research Question Two centred on the merits of firm level innovation persistence during economic crisis. The result of the interview conducted to address this research question was presented in this chapter. The four merits of firm level innovation as discovered from literature in section 4.7 namely; improved clients' satisfaction and brand loyalty, dynamic knowledge base for organizations, improved operational and resource efficiency and increased revenues and profits levels were confirmed as valid for construction contractors operating in Nigeria. In addition, two novel merits of firm level innovation persistence during economic crisis were identified from analysed interview data. These are; increased market

share and brand loyalty and an improved employee morale and job satisfaction. It was argued that whilst it might be difficult to see the upside potentials of innovation proposals during economic crisis, firms assessing their innovation options during economic crisis should take cognizance of the merits of innovation persistence as identified in this chapter.

Research Question Three sought to address the factors that constrain firm level innovation persistence during economic crisis by establishing the critical success factors for firm level innovation persistence during economic crisis. It is noted that the review of literature in section 4.8 identified an effective national innovation system as a critical success factor for firm level innovation persistence during economic crisis. The results of the analysed interview data established that this critical success factor is valid for construction contractors in Nigeria. In addition, four novel critical success factors for firm level innovation persistence during economic crisis were identified from the analysed interview data. These are; leadership of the innovation process by the experienced client, a culture of market orientation, ability to maintain strategic flexibility and an organizational vision that promotes continuous innovation.

The next section discusses the analysis of quantitative data which is needed to further test the validity of the findings that emerged from the analysed interview data as discussed in this chapter and to draw conclusions for this research by merging both sets of empirical data.

Chapter 7 : Quantitative analysis and findings

7.0 Introduction

This chapter discusses the quantitative data analysis conducted for this research. It begins with a brief description of the questionnaire survey tool as utilized for quantitative data collection. The design of the questionnaire utilized is explained, as well as the strategy adopted for the quantitative investigation. A brief recap of the questionnaire survey sample is also presented in this chapter. The chapter further highlights the findings extracted from analysed quantitative data, which was conducted with the aid of SPSS 23 software. This chapter ends with a summary of key findings from the analysed quantitative data.

7.1 Quantitative data collection – questionnaire survey

As previously discussed in section 5.9, quantitative data was obtained using the questionnaire survey tool. The following sub-sections briefly describe the aim of the questionnaire survey as utilized in the present study, the questionnaire design, the survey process, the survey sample size and the method of data analysis employed for the quantitative phase of the present study.

7.1.1 Aim of questionnaire survey

The questionnaire survey aims to obtain specific information to confirm facts or opinions from respondents (Saunders et al., 2009). It basically aims to test the validity of the findings that emerged from the semi-structured interviews. Furthermore, the quantitative data obtained from the questionnaire surveys will enable the researcher to generalize results to different groups (Morse, 1991), to test aspects of the emergent themes and patterns (Morgan, 1998) and to explore the innovation persistence phenomenon in depth, with focus on the constraining factors, the merits and critical success factors.

7.1.2 Questionnaire design

The design of the questionnaire was made simple to understand so as to encourage respondents' full participation (Dillman, 2000, Saunders et al., 2009). Multiple questions were organised in a pre-determined fashion in order to ensure their uniform interpretation by respondents in order to gather valuable data from a significant number of respondents from multiple organizations. In addition, the researcher preferred the multiple choice "tick box"

and “close-ended” questions, adopting the five-point Likert-scale rating technique. Close-ended questions were preferred because they require little time to complete, are easy to process, cost less and are useful for testing hypothesis (Oppenheim 2000).

The questionnaire was divided into four main sections, with a total of 12 questions asked. The first section focused on basic data relating to the demographics of the respondents. The second section centred on establishing the factors that constrain the respondents’ firms’ ability to persist with innovations during economic crisis. The third section aimed to determine the merits of innovation persistence. Lastly, the fourth section centred on confirming the critical success factors that enable firm level innovation persistence during economic crisis from the respondents’ perspective. A sample of the questionnaire as used in this study is presented in Appendix C.

7.1.3 Questionnaire survey process

This study adopted the delivery and collection questionnaire method. This type of questionnaire offers convenience, costs less, takes less time and the respondent can be contacted in person to check that it is the respondent that actually responded to the questions (Oppenheim 2000).

To obtain access to the respondents, formal letters and proposals were sent to the sixteen (16) construction contractors that participated in the quantitative phase of the study (refer to section 5.13) for consent and approval to use their firms for the quantitative study. Follow up telephone calls were also made to these construction contractors to further explain the purpose and the context of the study. The purpose, objectives and aim of the study were made clear to all survey respondents. To ensure that participants were uninhibited in their responses, it was explained to them that their names and responses would be treated confidentially and anonymously. They were also reminded that they were free to decline to answer any question and to withdraw at any stage of the survey. This is in line with the ethical research requirements for the present study (refer to Appendix E).

7.1.4 Questionnaire survey sampling procedure and sample size

As mentioned in section 5.13, a stratified random sampling approach was utilised for the questionnaire survey. A total of one hundred and twenty-eight (128) questionnaires were dispatched to mid-level professionals employed by the 16 construction contractors that participated in the quantitative phase of the present study (refer to section 5.14). As pointed

out in section 5.13.3, this study achieved a response rate of about 65% (83 completed and returned questionnaires out of the total selected sample of 128) which is well above the average response rate for questionnaires in the construction industry. Al-Tmeemy et al. (2011) and Dulaimi et al. (2003) agree that that the typical response rate for survey questionnaires in the construction industry is anything between 20-30%. However, effective follow-up measures as recommended by Saunders et al. (2009) and (Egbu, 1994) were put in place to achieve the response rate of 65%. The statistical breakdown of the respondents who participated in the questionnaire survey is presented in Table 7.1.

Table 7-1: Statistical breakdown of the questionnaire survey respondents

PARTICIPANTS	FREQUENCY	PERCENT	CUMULATIVE PERCENT
Project Manager	24	28.9	28.9
Departmental managers	5	6.0	34.9
Structural Engineer	16	19.3	54.2
Client relationship managers	6	7.2	61.4
Accountant	3	3.6	65.1
Civil Engineer	6	7.2	72.3
Quantity surveyor	8	9.6	81.9
Architect	12	14.5	96.4
Design Manager	3	3.6	100.0
Total	**83**	**100.0**	

7.1.5 Questionnaire data analysis (Aided by SPSS version 23)

The first step taken in this regard was the preparation of data. This allowed the researcher to check and edit the raw data obtained for any possible errors or omissions and inconsistencies within the data set. This was done after the responses from the questionnaire survey were downloaded from the Survey Gizmo software and then exported into an excel spread-sheet. The edited data was then exported into the Statistical Package for the Social

Sciences (SPSS version 23) for the analysis processes to commence. Using computer software for the analysis was viewed as the best way to ensure validity and reliability of the research findings because of the standardised procedures SPSS adopts for data processing and analysis (Sarantakos, 2013). The researcher was "able to explore and analyse them far more quickly and thoroughly than by hand" (Saunders et al., 2009).

With the data cleaned and entered into the SPSS software (version 23), the descriptive analysis phase commenced. Descriptively analysing quantitative data offered the present study a general overview and picture of the research findings (Naoum, 2012). This analytical approach has been adopted by a number of recent construction management studies. For instance, Ihuah (2015) and Akotia (2014) utilised this approach when analysing quantitative data. The quantitative data collected for this study was subjected to descriptive analysis to establish the mean values, standard deviation and percentage values (Pallant, 2010). Doing so also allowed the researcher to describe and compare the results both graphically and numerically.

7.1.6 Reliability of obtained data

A reliability test provides very vital information and measurement on the internal consistency of responses across questions in a questionnaire survey. Several approaches are available for assessing the reliability of questionnaire survey data. The approach commonly adopted to determine inter-item reliability and internal consistency of a questionnaire survey is the Cronbach's Alpha (Pallant, 2010). To establish whether the questionnaire survey instrument adopted was reliable in measuring what it was proposed to measure and to assess the internal reliability (Sarantakos, 2013) of the data, Cronbach's Alpha was conducted. The reliability test carried-out on the questionnaire survey data as presented in Table 7.2 indicates a Cronbach's Alpha value of 0.813, suggesting that the questionnaire has a very good internal consistency reliability. Achieving Cronbach's Alpha coefficient above 0.7 is generally considered to be of an acceptable level of internal consistency (Pallant, 2010). Thus, the value of 0.813 obtained suggests that the questionnaire is consistent and reliable. Table 7.2 presents the results of the study's reliability test.

Table 7-2: Results of the data reliability test conducted

CRONBACH'S ALPHA	NUMBER OF ITEMS
0.813	37

7.2 The specific factors that constrain firm level innovations during economic crisis (RQ1) – analysis of findings

The relevant interview data as analysed in section 6.2 reveals six factors that constrain firm level innovations during economic crisis. The six factors are:

- Unstable funding regime
- Erosion of good organizational slack
- Increased apathy to costs by clients
- Rapid and incessant changes in clients' needs and requirements.
- Dearth of creative ideas, a consequence of employee attrition and retrenchment.
- Reduced appetite for risks due to increased uncertainties.

Thus, this section aims to use the obtained questionnaire data to test the validity or otherwise of these identified factors and to possibly identify any new ones. A total of three questions were asked under this theme which basically attempts to establish from survey respondents if the identified factors are valid for their respective firms.

7.2.1 Frequency distribution of responses for questions asked under RQ1

The results of the analysed questionnaire data relevant to this theme as obtained from 83 respondents are presented in Table 7.3 below. As shown in Table 7.3, 90.4% of the respondents confirm that an ***unstable funding regime*** and a ***reduced appetite for risks*** are key factors that constrain firm level innovations during economic crisis. Furthermore, 88% of the questionnaire survey respondents accept that ***rapid and incessant changes to clients' needs and requirements*** is a key factor that inhibits firm level innovation during economic crisis. An ***increased apathy to costs by clients*** as identified from interview data is backed by 86.8% of the questionnaire survey respondents. Nearly 82% of those surveyed also support the interview finding that a ***dearth of creative ideas*** is a key factor. Lastly, 63.8% of the questionnaire survey respondents support that an ***erosion of good organisational slack*** is a

key factor that inhibit firm level innovations during economic crisis. The constraining factors are listed in their order of ranking in Table 7.3 below.

Table 7-3: Questionnaire survey results on the factors that impact firm level innovations during economic crisis

KEY INHIBITING FACTORS	MEAN SCORES	RANK	STRONGLY AGREE %	AGREE %	NEUTRAL %	DISAGREE %	STRONGLY DISAGREE %
An unstable funding regime	4.36	1	50.6%	39.8%	6%	2.4%	1.2%
Reduced appetite for risks	4.31	2	45.8%	44.6%	4.8%	4.8%	0%
Rapid and incessant changes to clients' needs and requirements.	4.30	3	49.4%	38.6%	7.2%	2.4%	2.4%
Increased apathy to costs by clients	4.25	4	44.6%	42.2%	8.4%	3.6%	1.2%
Dearth of creative ideas	4.05	5	37.3%	44.6%	8.4%	4.8%	4.8%
Erosion of good organisational slack	3.63	6	33.7%	30.1%	13.3%	10.8%	12%

The identified constraining factors are discussed according to their order of ranking in the following subsections below.

7.2.2 An unstable funding regime

The 83 respondents were asked to indicate their agreement or otherwise to the statement that an unstable regime is a constraining factor to their firms' ability to persist with innovation during economic crisis. As shown in Table 7.3 above, 50.6% (42 Nr) of the respondents strongly agree with this, while 39.8% (33 Nr) of the respondents chose to agree. This is compared to only 6% (5 Nr) of the respondents that were unsure, 2.4% (2 Nr) that disagree and 1.2% (1 Nr) that strongly disagree.

With a mean of 4.36 and over 90% of the survey respondents indicating they either strongly agree or agree, it is confirmed that an unstable funding regime is the most important

constraining factor from the survey respondents' point of view. This is consistent with the level of support for this factor by interview participants as discussed in section 6.2.1, where 100% of the participants cited this as a key constraining factor to firm level innovation during economic crisis. Furthermore, the finding on this theme is in harmony with key literature position on this as highlighted in section 4.5.1. The works of OECD (2012), Aghion et al. (2008) and Dell'Ariccia et al. (2008), O'Sullivan (2005) and Delbecq and Mills (1985) are instructive in this regard.

7.2.3 Reduced appetite for risks due to increased uncertainties

The 83 respondents were asked to indicate their agreement or otherwise to the statement that a reduced appetite for risks by organizations is a constraining factor to respective their firms' ability to persist with innovation during economic crisis. As shown in Table 7.3 above, 45.8% (38 Nr) of the respondents strongly agree that a reduced appetite for risks by organizations is a key constraining factor against firm level innovation persistence during economic crisis, while 44.6% (37 Nr) of the respondents chose to agree. This is compared to only 4.8% (4 Nr) of the respondents that were unsure and 4.8% (4 Nr) that disagree, with no respondent choosing to strongly disagree.

As can be seen from the above presented questionnaire results, over 90% of the respondents do support the validity of this factor for their organizations. It is noted that the level of support for this factor in this phase of the present study differs significantly from what was obtained in the interview phase where 60% of the participants backed the validity of this factor. The difference in the level of support is put down to the differences in the population from which both sets of data were drawn from. Whilst the interview data was obtained from management level practitioners, the questionnaire survey data was collected from largely mid-level employees. Therefore, it is logical to think management level employees will be less inclined than lower level employees to acknowledge that there is a reduced appetite on the part of the organization to persist with innovations during economic crisis.

The finding on this theme largely agrees with literature position on this as highlighted in section 4.5.4. The works of OECD 2012, Fernandes and Paunov (2011) and Grant (2003) are relevant in this regard. Indeed, OECD (2012) points out that economic uncertainty can negatively impact investors' appetite for risks. Similarly, Fernandes and Paunov (2011) find

that organizations may be less willing to face uncertainties and risks associated with introducing new products and/or processes since their survival might be compromised if demand evolves unpredictably.

7.2.4 Rapid and incessant changes in clients' needs and requirements

The 83 respondents were asked to indicate their agreement or otherwise to the statement that rapid and incessant changes in clients' needs and requirements is a constraining factor to respective their firms' ability to persist with innovation during economic crisis. As shown in Table 7.3 above, 49.4% (41 Nr) of the respondents strongly agree that rapid and incessant changes in clients' needs and requirements is a key constraining factor against firm level innovation persistence during economic crisis, while 38.6% (32 Nr) of the respondents chose to agree. This is compared to 7.2% (6 Nr) of the respondents that were unsure and 2.4% (2 Nr) that disagree, with 2.4% (2 Nr) of the respondents choosing to strongly disagree.

As can be seen from the above presented results, about 88% of the questionnaire survey respondents back the validity of this theme that emerged from the analysed interview data. This is consistent with the level of support for this factor in the interview phase with 80% of the interview participants citing this as a key constraining factor against firm level innovation persistence during economic crisis (refer to section 6.2.4). It is emphasized that this theme is novel with no explicit literature support. Nevertheless, there is a broad acceptance in the body literature that, typically, demand patterns and clients' needs alter during turbulent economic periods (OECD, 2012; Fernandes and Paunov, 2011). Thus, making it more challenging to ensure that the focus of innovation investments is in-sync with market requirements.

7.2.5 Increased apathy to costs by clients

The 83 respondents were asked to indicate their agreement or otherwise to the statement that an increased apathy to costs by clients is a key constraining factor to respective their firms' ability to persist with innovation during economic crisis. As shown in Table 7.3 above, 44.6% (37 Nr) of the respondents strongly agreed, while 42.2% (35 Nr) of the respondents agreed. This is compared to 8.4% (7 Nr) of the respondents that were unsure, 3.6% (3 Nr) that disagreed and 1.2% (1 Nr) that strongly disagreed.

From the above stated results, it is apparent that the overwhelming majority of survey respondents (nearly 87%) concur that an increased apathy to costs by clients is a key constraining factor against firm level innovation persistence during economic crisis. This results tallies with the level of support for this theme that emerged from the interview stage as discussed in section 6.3.3. The underlying reason for this as discovered from literature and discussed in section 4.5.3 is that clients often display a preference for lowest tender prices (Wong et al. 2000). With increases in the prices of goods and services as often witnessed during economic crises, construction based firms pass the consequent increases in their costs to clients in the form of increased prices for the constructed product and other services. Thus, selling innovative ideas or projects to clients becomes more challenging during economic crisis (Kim et al.1999).

7.2.6 Dearth of creative ideas, a consequence of employee attrition and retrenchment

The 83 respondents were asked to indicate their agreement or otherwise to the statement that a dearth of creative ideas is a constraining factor to respective their firms' ability to persist with innovation during economic crisis. As shown in Table 7.3 above, 37.3% (31 Nr) of the respondents strongly agree that a dearth of creative ideas is a key constraining factor against firm level innovation persistence during economic crisis, while 44.6% (37 Nr) of the respondents chose to agree. This is compared to 8.4% (7 Nr) of the respondents that were unsure and 4.8% (4 Nr) that disagree, with 4.8% (4 Nr) of the respondents choosing to strongly disagree.

The above stated result show that nearly 82% of the questionnaire survey respondents back the validity of this factor as emerged from analysed interview data (refer to 6.2.5). This finding stems from the fact that employees who survive cutbacks can become unduly risk averse and narrowly focused, and therefore less creative and open to change (Agunda 2014, Outa 2011).

7.2.7 Erosion of good organizational slack

The 83 respondents were asked to indicate their agreement or otherwise to the statement that the erosion of good organizational slack (depletion of resource reserves) is a constraining factor to their firms' ability to persist with innovation during economic crisis. As shown in Table 7.3 above, 33.7% (28 Nr) of the respondents strongly agree that the erosion of good organizational slack is a key constraining factor against firm level innovation persistence during economic crisis, while 30.1% (25 Nr) of the respondents chose to agree. This is

compared to 13.3% (11 Nr) of the respondents that were unsure, 10.8% (9 Nr) that disagree and 12% (10 Nr) that strongly disagree.

It is noted that from above presented survey results, nearly two-thirds (63.8%) of the respondents indicate that they either strongly agree or agree that the erosion of good organizational slack is a key constraining factor against firm level innovation during economic crisis. This is significantly lower than the 90% of the interview participants identified this factor as valid for their organizations. This is however, attributed to the differences in the population from which both sets of data were drawn from. Whilst the interview data was obtained from management level practitioners, the questionnaire survey data was collected from largely mid-level employees. Thus, it is reasoned that management level employees are more likely to have a positive view of the usefulness of organizational reserves than lower level employees.

This finding is in sync with the conclusion reached in a number of previous innovation management studies as discussed in section 4.5.2 that organizational slack plays a moderating role in affecting innovation performance (Voss et al. 2008, Greve 2007, Makri 2006, Nohria and Gulati 1997).

7.2.8 Summary – factors that impact firm level innovations during economic crisis

The analysed questionnaire survey data relevant to this theme confirm that the six constraining factors that emerged from the qualitative phase are valid for questionnaire survey respondents. These constraining factors are; unstable funding regime, erosion of good organizational slack, increased apathy to costs by clients, rapid and incessant changes in clients' needs and requirements, dearth of creative ideas, a consequence of employee attrition and retrenchment and reduced appetite for risks due to increased uncertainties. It is noted that the level of support for some of these themes in the questionnaire survey phase significantly differed from what it was in the interview phase. However, this was put down to the differences in the population from which both sets of data were obtained. Whilst the interview data was drawn from management level employees, the questionnaire survey data was taken from largely mid-level employees of construction based firms.

7.3 Merits of firm level innovation persistence during economic crisis (RQ2) – analysis of findings

The relevant interview data as analysed in section 6.3 reveals six merits of firm level innovation persistence during economic crisis. These are:

- Increased revenues and profits levels.
- Increased market share and brand loyalty.
- Improved clients' satisfaction and brand loyalty.
- Improved operational and resource efficiency.
- A dynamic knowledge base for organizations.
- Improved employee morale and brand loyalty.

Thus, this section aims to use the obtained questionnaire data to test the validity or otherwise of these identified merits of firm level innovation persistence and to possibly identify any new ones. Questions asked under this theme basically attempts to establish from survey respondents if the identified merits are valid for their respective firms.

7.3.1 Frequency distribution of responses for questions asked under RQ2

The results of the analysed questionnaire data relevant to this theme as obtained from 83 respondents are presented in Table 7.4 below. The emerged results indicate that 86.7% of the respondents back the ideas that ***an increased market share and brand loyalty*** is a key merit of innovation persistence, while 83.2% of questionnaire survey respondents support that ***increased revenue and profit levels'*** is a key merit of continuing with innovation implementation during economic crisis. Furthermore, an ***improved operational and resource efficiency*** is backed by 75.9% of the survey respondents, while 74.7% of the respondents support that ***a more dynamic knowledge base*** is a key merit of firm level innovation persistence during economic crisis. The emerged results also indicate that 51.8% of the respondents accept that ***improved clients' satisfaction and brand loyalty*** is one of the main benefits that can be reaped by innovation persistent firms. Lastly, 51.8% of the 83 individuals surveyed support that ***an improved employee morale and job satisfaction*** is one of the key merits of innovation persistence. The merits of firm level innovation are listed in their order of ranking in Table 7.4.

Table 7-4: Questionnaire survey results of the key benefits of innovation persistence

KEY BENEFITS OF INNOVATION PERSISTENCE	MEAN SCORES	RANK	STRONGLY AGREE %	AGREE %	NEUTRAL %	DISAGREE %	STRONGLY DISAGREE %
Increased market share and brand awareness	4.41	1	59%	27.7%	8.4%	4.8%	0%
Increased revenues and profit levels	4.11	2	39.8%	43.4%	8.4%	4.8%	3.6%
Improved operational and resource efficiency	3.84	3	30.1%	45.8%	8.4%	9.6%	6%
A dynamic knowledge base	3.84	3	32.5%	42.2%	8.4%	10.8%	6%
Improved clients' satisfaction and brand loyalty	3.46	4	26.5%	25.3%	22.9%	18.1%	7.2%
Improved employee morale	3.30	5	16.9%	34.9%	20.5%	16.9%	10.8%

The key merits of innovation persistence as highlighted above are discussed according to their order of ranking in the next sub-sections.

7.3.2 Increased market share and brand awareness

The 83 practitioners surveyed were asked to indicate their agreement or otherwise to the statement that an increased market share and brand awareness is a key merit of firm level innovation persistence during economic crisis. As shown in Table 7.4 above, 59% (49 Nr) of the respondents strongly agree that an increased market share and brand awareness is a key merit of firm level innovation persistence during economic crisis, while 27.7% (23 Nr) of the respondents indicated they merely agree. This is compared to only 8.4% (7 Nr) of the respondents that were unsure, 4.8% (4 Nr) that disagree and no respondent indicating they strongly disagree.

From the above stated results, it can be seen that nearly 77% of the survey respondents concur that this theme is valid for their organizations. This is consistent with the level of

support for this theme from interview participants (80%) as discussed in section 6.3.2. Thus, it is determined that from analysed empirical dataset, that increased market share and brand awareness is a key merit of firm level innovation persistence during economic crisis.

7.3.3 Increased revenues and profit levels

83 Practitioners were asked to specify their agreement or otherwise to the statement that increased revenues and profit levels is one of the key merits of firm level innovation persistence during economic crisis. As shown in Table 7.4 above, 39.8% (33 Nr) of the respondents indicate that they strongly agree, while 43.4% (36 Nr) of the respondents indicate they agree. This is compared to only 8.4% (7 Nr) of the respondents that chose to be neutral, 4.8% (4 Nr) reported that they disagree and 3.6% (3 Nr) of the respondents indicating they strongly disagree.

It's noted that from the above reported results of the survey questionnaire, over 82% of the survey respondents supported the validity of this theme for their respective organizations. This level of support appears consistent with that which emerged from the interview phase where 90% of the participants confirmed the validity of this theme for their organizations (refer to section 6.3.1). Therefore, the present study establishes from analysed empirical dataset that this theme is valid for construction contracting firms based in Abuja Nigeria.

7.3.4 Improved operational and resource efficiency

Practitioners were asked to specify their agreement or otherwise to the statement that increased revenues and profit levels is one of the key merits of firm level innovation persistence during economic crisis. The results are presented in Table 7.4 above. From the 83 individuals that responded to this survey, 39.8% (33 Nr), indicated that they strongly agree, while 43.4% (36 Nr) of the respondents indicated they agree. This is compared to only 8.4% (7 Nr) of the respondents that chose to be neutral, 4.8% (4 Nr) reported that they disagree and 3.6% (3 Nr) of the respondents indicating they strongly disagree.

From the above, it is noted that over 83% of the questionnaire survey respondents confirmed that this theme is valid for their respective firms. This is compared with only 50% of support that emerged from interview participants as discussed in section 6.3.4. The difference in the level of support is put down to the differences in the population from which both sets of data were drawn from. Whilst the interview data was obtained from management level

practitioners, the questionnaire survey data was collected from largely mid-level employees. Therefore, the present study argues that from analysed empirical dataset, this theme is valid for construction contracting firms based in Abuja Nigeria.

7.3.5 A dynamic knowledge base for the organization

Practitioners were asked to state their agreement or otherwise to the statement that a dynamic knowledge base is a key merits of firm level innovation persistence during economic crisis. The results are presented in Table 7.4 above. From the 83 individuals that were surveyed, 32.5% (27 Nr) indicate that they strongly agree, while 42.2% (35 Nr) agree. This is compared to 8.4% (7 Nr) of those surveyed who were unsure, 10.8% (9 Nr) who disagree, and only 6% (5 Nr) who strongly disagree.

From the emerged survey results, it can be argued therefore that nearly 75% of the respondents back the idea that a dynamic knowledge base is one of the key merits of firm level innovation persistence during economic crisis. This is compared to just 50% of the interview respondents who supported the validity of this theme for their respective organizations. Therefore, the present study argues that from analysed empirical dataset, this theme is valid for construction contracting firms based in Abuja Nigeria.

7.3.6 Improved clients' satisfaction and brand loyalty

The survey respondents were asked to indicate their agreement or otherwise to the statement that an improved clients' satisfaction and brand loyalty is a key merit of firm level innovation persistence during economic crisis. The results are presented in Table 7.4 above. From the 83 practitioners that were surveyed, 26.5% (22 Nr) indicate that they strongly agree, while 25.3% report that they agree. This is compared to 22.9% (19 Nr) that are unsure (neutral), 18.1% (15 Nr) that disagree and 7.2% (6 Nr) that strongly disagree.

Drawing on the above stated results of questionnaire survey as it relates to this theme, it is noted that nearly 52% of the survey participants accede to the fact that an improved clients' satisfaction and brand loyalty is a key merit of firm level innovation persistence during economic crisis. This is similar to the level of support for this theme that emerged from the interview phase where 50% of the participants identified improved clients' satisfaction and brand loyalty as a key merit of firm level innovation persistence during economic crisis (refer to section 6.3.3). As noted in section 6.3.3, this finding is consistent with the conclusions

reached in the works of Nemati et al. (2010), Meuter et al. (2000) and Anderson and Sullivan (1993). Therefore, the present study argues that based on the analysed empirical dataset, this theme is valid for construction contracting firms based in Abuja Nigeria

7.3.7 Improved employee morale and job satisfaction

The questionnaire survey respondents were asked to confirm if an improved employee morale and job satisfaction is a key merit of firm level innovation persistence during economic crisis. The results are presented in Table 7.4 above. From the 83 practitioners that responded to the survey, 16.9% (14 Nr) strongly agreed, 34.9% (29 Nr) agreed. Compared to 20.5% (17 Nr) of the respondents that were unsure (neutral), 16.9% (14 Nr) of the respondents that disagreed and 10.8% (9 Nr) who strongly disagreed.

It is therefore noted that from the above reported results, nearly 52% of the respondents confirmed that this identified merit of firm level innovation persistence is valid for their organizations. This is compared to only 30% of the participants who identified this factor as a key merit of firm level innovation at the interview phase. The present study attributes the difference in the level of support that emerged from both phases to the differences in the population from which both sets of data were drawn.

7.3.8 Summary – merits of firm level innovation persistence during economic crisis

The analysed questionnaire survey data relevant to this theme confirm that the six merits of firm level innovation persistence as identified in the previous phases of the present study (literature review and interviews) are valid for construction contracting firms in Abuja Nigeria. The merits of firm level innovation persistence as established in this section are; increased revenues and profits levels, increased market share and brand loyalty, improved clients' satisfaction and brand loyalty, improved operational and resource efficiency, a dynamic knowledge base for organizations and improved employee morale and brand loyalty. It is noted that the level of support for some of these themes in the questionnaire survey phase significantly differed from what it was in the interview phase. However, this was put down to the differences in the population from which both sets of data were obtained. Whilst the interview data was drawn from management level employees, the questionnaire survey data was taken from largely mid-level employees of construction based firms.

7.4 Critical success factors for firm level innovation persistence during economic crisis (RQ3) - analysis of findings

The relevant interview data as analysed in section 6.4 reveals five critical success factors for firm level innovation persistence during economic crisis. These are:

- Leadership of the innovation process by the experienced client.
- A culture of market orientation.
- The presence of a strong and effective national innovation system
- The capacity to maintain strategic flexibility.
- An organizational vision that promotes continuous innovation

Thus, this section aims to use the obtained questionnaire data to test the validity or otherwise of these identified critical success factors for firm level innovation persistence and to possibly identify any new ones. Two questions were asked under this theme which basically attempts to establish from survey respondents if the identified critical success factors are valid for their respective firms.

7.4.1 Frequency distribution of responses for questions asked under RQ3

The results of the analysed questionnaire data relevant to this theme as obtained from 83 respondents are presented in Table 7.5 below. As shown in Table 7.5, 86.7% (72 Nr) of the respondents back the idea that the ***leadership of the innovation process by the experienced client*** is a critical success factor for firm level innovation persistence during economic crisis. Furthermore, 78.3% (65 Nr) of the survey respondents accept that ***the presence of a strong and effective innovation system*** and that ***a culture of market orientation*** are critical success factors for firm level innovation persistence during economic crisis. While, 75.9% (63 Nr) of the 83 individuals surveyed corroborate the idea that ***the capacity to maintain strategic flexibility*** is central to their firms' capacity to persist with innovations during economic crisis. Lastly, 30.1% (25 Nr) of the respondents back the interview finding that ***an organizational vision that promotes continuous innovation*** is a critical success factor for firm level innovation persistence during economic crisis. The critical success factors are listed in their order of ranking in Table 7.5.

Table 7-5: Questionnaire survey results for critical success factors for firm level innovation persistence during economic crisis

CRITICAL SUCCESS FACTORS FOR FIRM LEVEL INNOVATION PERSISTENCE	MEAN SCORES	RANK	STRONGLY AGREE %	AGREE %	NEUTRAL %	DISAGREE %	STRONGLY DISAGREE %
Clients' leadership of the innovation process	4.13	1	41%	45.8%	8.4%	2.4%	2.4%
The presence of an effective innovation system	4.00	2	33.7%	44.6%	12%	7.2%	2.4%
Strategic flexibility	3.99	3	39.8%	36.1%	10.8%	9.6%	3.6%
A culture of market orientation	3.98	4	33.7%	44.6%	12%	4.8%	4.8%
An organizational vision that promotes continuous innovation	2.00	5	10.8%	19.3%	18.1%	32.5%	19.3%

The critical success factors for firm level innovation persistence during economic crisis as highlighted above are discussed according to their order of ranking in the next sub-sections.

7.4.2 Leadership of the innovation process by the experienced client.

The 83 respondents were asked to indicate their agreement or otherwise to the statement that the leadership of the innovation process by the experienced client is a critical success factor for firm level innovation persistence during economic crisis. As presented in Table 7.5 above, 41% (34 Nr) of the respondents strongly agreed and 45.8% (38 Nr) agreed. This is compared to 8.4% (7 Nr) who were neutral (unsure), 2.4% (2 Nr) who indicated they disagreed and another 2.4% (2 Nr) who strongly disagreed.

From the above results, it is noted that nearly 87% of the survey respondents backed the validity of the interview finding that the client's leadership of the innovation process is a critical success factor for firm level innovation persistence during economic crisis. It is also important to point-out that all the 10 interview participants cited this factor as critical for firms' capacity to persist with innovations during economic crisis (refer to section 6.4.1). Therefore, from the analysed interview (see section 6.4.1) and questionnaire survey results,

it is confirmed that this factor is valid for construction contracting firms operating in Abuja Nigeria. It is noted that this finding is implicit in the conclusions reached by Von-Hippel (1998; 1986) and Johnson (2007) regarding the importance of the knowledge client to the innovation process.

7.4.3 The presence of a strong and effective national innovation system

A question was posed to the 83 survey respondents to confirm or refute the idea that the presence of a strong and effective national innovation system is vital for firm level innovation persistence during economic crisis. As shown in Table 7.5 above, 33.7% (28 Nr) of the respondents strongly agreed with this, while 44.6% (37 Nr) indicated they agree. This is compared with 12% (10 Nr) who were unsure (neutral), 7.2% (6 Nr) who disagreed and 2.4% (2 Nr) who strongly disagreed.

It is noted that from the itemized results above, more than 78% of the survey participants accept that this factor is valid for their respective organizations. The level of support that emerged from the survey stage appears similar to the level of support that emerged during the interview stage (70%) as discussed in section 6.4.3. Therefore, the results that emerged from the semi-structured interviews and the questionnaire surveys as related to this theme confirm that extensive collaborations and networking as availed by the presence of a strong and effective national innovation system is critical to firm level innovation persistence during economic crisis. This finding is in harmony with the conclusion reached in the works of Filippetti and Archibugi (2011, 2010) that strong National Systems of Innovation facilitate the retention of organizations' investments in innovation during economic crisis. It is also implicit in the conclusions reached by Ansell and Gash (2008) and Chesbrough (2006, 2004).

7.4.4 The capacity to maintain strategic flexibility.

The 83 Practitioners surveyed were asked to confirm their agreement or otherwise to the statement that the capacity to maintain strategic flexibility is a critical success factor for firm level innovation persistence during economic crisis. As shown in Table 7.5 above, 34.9% (29 Nr) of the respondents strongly agreed, while 31.3% (26 Nr) agreed. This is compared to only 12% (10 Nr) of the respondents who were neutral (unsure), 15.7% (13 Nr) who disagreed and 6% (5 Nr) that strongly disagreed.

As can be seen from the above itemized results, over 66% of the survey respondents considered this factor as valid for their respective organizations. This contrasts with the level of support that emerged for this theme during the interview stage where only 40% of the respondents cited this factor as critical for their organizations' capacity to persist with innovations during economic crisis (refer to section 6.4.4). The reason for this is put down to the differences in the population from which both sets of data were drawn.

7.4.5 A culture of market orientation.

Survey participants were asked to confirm their agreement or otherwise to the statement that a culture of market orientation is critical to their firms' ability to persist with innovation during economic crisis. From the 83 individuals that responded, 26.5% (22 Nr) strongly agreed with this, while 16.9% (14 Nr) agreed. This is compared to 15.7% (13 Nr) of the respondents who were unsure, 30.1% (25 Nr) who disagreed and 10.8% (9 Nr) who strongly disagreed.

Therefore, over 43% of the survey respondents backed the validity of this factor which emerged from analysed interview data (refer to section 6.4.2). This level of support is significantly lower than that which emerged from the interview stage where 70% of the participants identified this factor as critical for their firms' capacity to persist with innovations during economic crisis.

7.4.6 A positive organizational vision that promotes continuous innovativeness

The 83 survey participants were asked to confirm their agreement or otherwise to the statement that an organizational vision that promotes continuous innovation is a critical success factor for firm level innovation persistence during economic crisis. As presented in Table 7.5 above, 10.8 (9 Nr) strongly agreed, while 19.3% (16 Nr) agreed. Compared to 18.1% (15 Nr) who were unsure, 32.5% (27 Nr) who disagreed and 19.3% (16 Nr) who strongly disagreed.

It is noted that over 30% of the survey respondents backed the validity of this factor as against only 10% of the interview participants that identified this factor as critical for their organization's capacity to persist with innovations during economic crisis (refer to section 6.4.5). It is therefore argued that this factor lacks the empirical support to be regarded as valid for construction contracting firms based in Abuja Nigeria. Nevertheless, it is envisaged that

this emergent theme will provoke further studies regarding its criticality to firm level innovation persistence during economic crisis.

7.4.7 Summary – critical success factors for firm level innovation persistence

The analysed questionnaire survey data relevant to this theme confirm that four out of the five critical success factors identified in the previous phases of the present study (literature review and interviews) are valid for the majority of the survey respondents. The critical success factors for firm level innovation persistence as determined in this chapter are; leadership of the innovation process by the experienced client, a culture of market orientation, the presence of a strong and effective national innovation system and the capacity to maintain strategic flexibility. It is noted however, that the analysed questionnaire survey data could not support the validity of the idea that a positive organizational vision that promotes continuous innovation is a critical success factor for firm level innovation persistence during economic crisis. Therefore, this theme was left out.

7.5 Summary – chapter 7

The chapter commenced with a reiteration of the questionnaire survey aim, design, process, sampling procedure, sample size as well as the data procedure followed to analyse the quantitative data obtained. The three research questions articulated for the present study were explored using data collected from the questionnaire survey of 83 mid-level employees of innovation persistent construction-based firms.

Research Question One focused on the specific factors that constrain firm level innovation during economic crisis. Six factors were identified from literature and interview data as applicable in this regard. These are; unstable funding regime, erosion of good organizational slack, increased apathy to costs by clients, rapid and incessant changes in clients' needs and requirements, dearth of creative ideas, a consequence of employee attrition and retrenchment and reduced appetite for risks due to increased uncertainties. Therefore, this chapter sought to confirm the validity of these findings. The quantitative data obtained from 83 respondents confirms the validity of these six factors that constrain firm level innovation during economic crisis.

Research Question Two centred on the merits of firm level innovation persistence during economic crisis. The results of literature review (refer to section 4.7) and semi-structured

interviews (see section 6.3) conducted to address RQ2 identified six merits of firm level innovation persistence, namely; increased revenues and profits levels, increased market share and brand loyalty, improved clients' satisfaction and brand loyalty, improved operational and resource efficiency, a more dynamic knowledge base for organizations and an improved employee morale and brand loyalty. As presented in this chapter, the quantitative data obtained from 83 respondents confirms the validity of the six merits of firm level innovation persistence as identified from literature and interviews.

Research Question Three focused on establishing the critical success factors for firm level innovation persistence during economic crisis. It is noted that the review of literature in section 4.8 identified a strong and effective national innovation system as a critical success factor for firm level innovation persistence during economic crisis. However, four additional critical success factors were identified from analysed interview data. These are; leadership of the innovation process by the experienced client, a culture of market orientation, a capacity to maintain strategic flexibility and an organizational vision that promotes continuous innovation. However, the obtained questionnaire survey data as analysed in this chapter could only support four of the five identified critical success factors. It is noted that over two-thirds of the survey respondents did not back the validity of the 5th factor - ***an organizational vision that promotes continuous innovation*** as a critical success factor for firm level innovation persistence during economic crisis.

Chapter 8 : Discussion of findings and validation of proposed critical success factors for firm level innovation persistence during economic crisis

8.0 Introduction

This chapter commences with a recap of the research aim, research objectives and research questions as presented in chapter one of this thesis. The chapter also discusses the key findings of this study according to the research objectives initially established in chapter one. The chapter concludes with a brief description of the validation process of the proposed set of critical success factors that enable firm level innovation persistence during economic crisis.

8.1 The research aim

The aim of this research is to propose and validate a set of critical success factors that enable firm level innovation persistence during economic crisis for construction contractors based in Abuja, Nigeria.

8.2 Research objectives

The research objectives as initially specified in section 1.5 are as follows:

(i) To examine and synthesize relevant literature in order to better understand the nature of innovations and the different schools of thought on why firms innovate.

(ii) To explore the nature of economic crisis and the specific factors that constrain firm level innovation persistence during economic crisis.

(iii) To determine and evaluate the key merits of firm level innovation persistence during economic crisis.

(iv) To establish and validate the critical success factors that enable firm level innovation persistence during economic crisis for construction contractors based in Abuja, Nigeria.

8.3 The research questions

Three questions were formulated for the study at the end of literature review in section 4.10. These key research questions shaped the focus of the subsequent empirical investigations in order to fully achieve research objectives 2, 3 and 4. The three research questions are:

(i) **Research Question One:** What are the specific factors that constrain firm level innovations during economic crisis?

(ii) **Research Question Two:** What are the merits of firm level innovation persistence during economic crisis?

(iii) **Research Question Three:** What are the critical success factors that enable firm level innovation persistence during economic crisis?

To achieve the study objectives and ultimately, its overall aim, a literature review was carried out. **Research Objective One** was sufficiently addressed through literature review. Therefore, at the end of literature review, three research questions were articulated with each focusing on each of the three research objectives that were not fully achieved through literature review. Addressing these three research questions will mean achieving the three unresolved research objectives, and by extension, the overall aim of the study. This was followed by in-depth semi-structured interviews conducted with 10 key management employees of five selected innovation persistent construction contracting firms based in Abuja Nigeria. Questionnaire survey was subsequently undertaken with 83 respondents, drawn from 16 innovation persistent construction contracting firms based in Abuja Nigeria. The questionnaire survey achieved a response rate of about 65%. The information from the literature review and the results obtained through the analysis of the obtained empirical datasets resulted in the identification of the critical success factors that enable firm level innovation persistence during economic crisis for construction contracting firms based in Abuja Nigeria.

8.4 Key research findings

This section presents the processes, the main findings and conclusions of the research objectives. Following a thorough review of related literature and exploration of the issues with practitioners through the semi-structured interviews and questionnaire survey, the processes undertaken to address the objectives together with their summary of conclusions are outlined.

8.4.1 Objective one: To examine and synthesize relevant literature in order to better understand the nature of innovations and the different schools of thought on why firms innovate.

The first objective of the study examines the literature on the broad area of innovation management with a view to understanding the nature of the innovation phenomenon and to further explore the different schools of thought on innovation. It is reasoned that having a good grasp of the basic characteristics of innovations, as well as the different arguments in the body literature regarding the reason why firms innovate will provide a good starting point for the present study to build on.

The research process for achieving this objective commenced and concluded with literature review in chapter three which focused on critically examining the nature of the innovation phenomenon and the different schools of thought on innovation. The key findings drawn from this objective are discussed below. An extensive review of literature in section 3.1 revealed the key characterizations of innovation as highlighted in Figure 8.1 below.

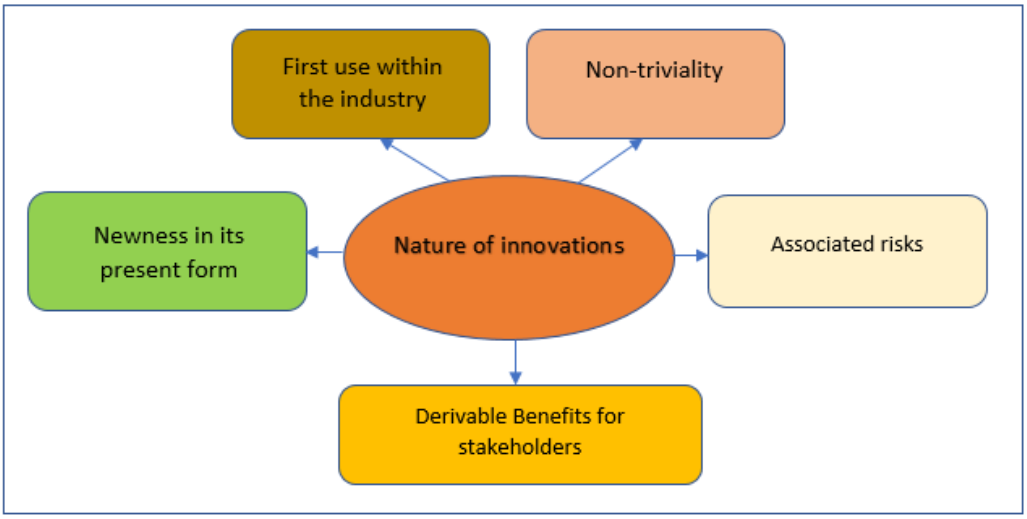


Figure 8-1: The key characterization of innovations

The descriptions of the key characterizations of innovation as revealed explored in section 3.1 are presented in Table 8.1.

Table 8-1: Key characterizations of innovation

S/N	KEY CHARACTERIZATIONS OF INNOVATION	DESCRIPTIONS
1	Newness in its present form (Murphy et al. 2011, Slappendel 1996, Roger 1995)	Innovation embodies the concept of something new, the implementation of which brings irreversible transformations. It is noted that "newness" can be expressed not only in terms of new knowledge but also in terms of first persuasion, or a decision to adopt.
2	First use within the industry (Slaughter 2000, Harkola and Greve, 1995)	Innovation entails the application of a creative idea for the first time within an industry.
3	Non-triviality (Slaughter 1998, Rothwell 1976)	Innovations must possess the capacity to effect change in standard practice.
4	Associated risks (Naldi et al., 2007, Hall and Andriani, 2003, Slaughter, 2000, Ling, 2003).	Innovation process and the innovation itself are precarious in nature. These associated risks are further exacerbated by the complex and interdependent systems inherent in construction (Slaughter 2000).
5	Derivable benefits for stakeholders (Egbu 2001b, Kimberly (1981)	Innovations are characterized by the value they generate in the form of one or more derivable benefits to all stakeholders.

Regarding the different schools of thought on why organizations innovate, the present study identified from literature review in section 3.3 that the Schumpeterian school of thought (Marceau 1995, Gilad and Levine 1986), the resource based view (Egbu 2004, Barney 1991), the psychological based view (McClelland 1961, 1987) and the social construct view (Santos 2012, Austin et al. 2006) are the main schools of thought on why organisations innovate. The identified schools of thoughts on why firms innovate are highlighted and briefly described in Figure 8.2 below.

Figure 8-2: The different schools of thought on why organizations innovate

It was however determined that the fundamental tenet that underpins this PhD research mainly draws on the views of the Schumpeterian school of thought. It does also draw on some fundamentals inherent in the resource-based view (refer to section 3.3).

8.4.2 Objective two: To explore the nature of economic crisis and the specific factors that constrain firm level innovation persistence during economic crisis.

The present study determined in section 4.1 that economic crisis encompasses periods of economic recession as characterised by negative GDP growth lasting at least two consecutive quarters (Stiglitz, 2000). It also includes periods of economic depression which are characterized by a decline in output for a prolonged period, typically, greater than 2 years, a drop in output of 10% or greater and an unemployment rate touching 20% (Romer, 1992). It was also determined in section 4.1 that economic crises are characterized by overall shift in many macroeconomic indicators, including falls in real output (determined by GDP), hyper-inflation, a high unemployment rate, negative alterations in demands for goods and service and an unstable currency (Grewal and Tansuhaj, 2001). Furthermore, it was identified from literature review in section 4.5 that the effects of economic crisis do constrain firm level innovations (Archibugi et al., 2013, Paunov, 2011). This finding was further validated by obtained empirical data (refer to section 6.2 and 7.2). Four distinctive factors that constrain firm level innovations were identified from literature and discussed in section 4.5. These include:

- An unstable funding regime
- Increased apathy to cost by clients
- Erosion of good organisational slack
- Reduced appetite for risks due to increased uncertainties

The analysed interview data confirmed the validity of all four factors that constrain innovation during economic crisis as identified from literature (refer to section 6.2). Furthermore, two novel factors that constrain innovation were discovered from analysed interview data. These emerged novel factors are:

- Rapid and incessant changes to clients' needs and requirements
- Dearth of creative ideas, a consequence of employee attrition and retrenchment.

Furthermore, the validity of the identified six constraining factors were further established by the obtained questionnaire survey data (refer to section 7.2). The key findings obtained in relation to this objective are illustrated in Figure 8.3 below.

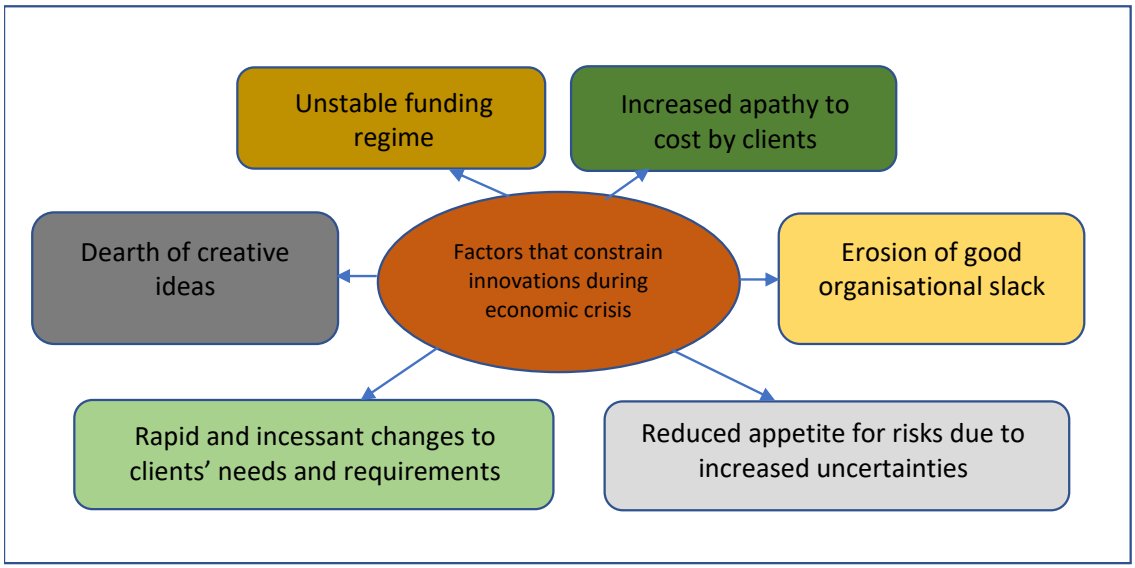


Figure 8-3: The factors that constrain firm level innovations during economic crisis

The six factors that constrain firm level innovation persistence during economic crisis are briefly explained in Table 8.2.

Table 8-2: The identified factors that constrain firm level innovation during economic crisis

S/N	FACTORS THAT CONSTRAIN INNOVATION	BRIEF EXPLANATIONS
1	An unstable funding regime - see section 4.5.1 (OECD 2012, Aghion et al. 2008).	As found in section 4.3, economic crisis causes; declining revenues and profits level (Gilchrist et al. 2017, Donald et al. 2014), increased delays in payments for jobs (Odeh and Battaineh 2002, Mansfield et al. 1994), increased difficulties in accessing credits (Maiherbe 2014, Cornett et al. 2011), increased operating costs (Gilchrist et al. 2017, Wang et al. 2014). These elements converge to cause an unstable funding regime within firms and this constrains innovation. It is noted that innovation is often an expensive endeavour often requiring consistent and adequate funding.
2	Increased apathy to cost by clients – see section 4.5.3. (Wong et al. 2000, Kim et al. 1999).	As found in section 4.3.4, economic crisis causes increases in operating costs for firms (Gilchrist et al. 2017, Wang et al. 2014), and these are often passed unto the clients in the form of increases in products prices. In addition, innovation is often an expensive process, with the extra cost passed to the client. Clients are often conscious of these price increases and this

		influences firms' innovation options during economic crisis. This often constrains firms' capacity to persist with innovations.
3	Erosion of good organisational slack – see section 4.5.2 (Nohria and Gulati 1997, Bourgeois 1981).	As found in section 4.3, economic crisis causes; declining revenues and profits level (Gilchrist et al. 2017, Donald et al. 2014), increased delays in payments for jobs (Odeh and Battaineh 2002, Mansfield et al. 1994), increased difficulties in accessing credits (Maiherbe 2014, Cornett et al. 2011), increased operating costs (Gilchrist et al. 2017, Wang et al. 2014). These elements converge to cause the depletion of firms' resource reserves. It was determined that resource-reserves cushion the effects of resource turbulence especially during economic crisis. Therefore, a depletion of these reserves often constrains firms' capacity to innovate.
4	Reduced appetite for risks due to increased uncertainties – section 4.5.4. (OECD 2012, Paunov 2011).	Organizations may be less willing to face uncertainties and risks associated with introducing new products and/or processes since their survival might be compromised if demand evolves unpredictably (Paunov 2011). Therefore, firms prefer to wait until demand and financial markets have recovered before recommencing innovations efforts (OECD 2012).
5	Rapid and incessant changes to clients' needs and requirements – section 6.2.4 (identified from interview data).	The frequency and scale of the changes in clients' needs and requirement during economic crisis are such that firms find it difficult to maintain alignment between clients' needs and innovation investments. It was established from analysed interview data that this constrains firm level innovation.
6	Dearth of creative ideas, a consequence of employee attrition and retrenchment – see section 6.2.5 (identified from interview data).	It was found that most construction-based firms in Abuja have had to cut back on their workforce during economic crisis. This is often unsettling to surviving employees and therefore impacts employees' sense of job security and job satisfaction. Furthermore, survivors of downsizing can become unduly risk averse and narrowly focused, and therefore less creative and open to change (Agunda, 2014, Outa, 2011). Indeed, when employees are disconnected or in some way distant from their organization, alienated by mistrust, resentment or dispiritedness, the impact on performance and creativity can be significantly negative.

8.4.3 Objective three: To determine and evaluate the key merits of firm level innovation persistence during economic crisis

To further justify the call for firm level innovation persistence during economic crisis, thus, the need to adopt the proposed set of CSFs that enable firm level innovation persistence, the present study recognized the need to determine the key merits of firm level innovation persistence during economic crisis. Accordingly, Objective three focuses on uncovering and appraising the key merits of firm level innovation persistence during economic crisis.

A review of literature in section 4.7 enabled the discovery of four key merits of firm level innovation persistence during economic crisis. These are:

- Increased revenue and profit levels
- Improved operational and resource efficiency
- Improved clients' satisfaction and brand loyalty
- A more dynamic knowledge base for the organization

The analysed interview data confirmed the validity of all four merits of innovation persistence during economic crisis as identified from literature (refer to section 6.3). In addition, two new merits of firm level innovation persistence were identified from analysed interview data. These novel merits of firm level innovation persistence are:

- Increased market share and brand awareness
- Improved employee morale and job satisfaction

Furthermore, the obtained questionnaire survey data (see section 7.3) confirms the validity of all six merits of firm level innovation persistence during economic crisis. The identified six merits of firm level innovation persistence during economic crisis are illustrated in Figure 8.4 below.

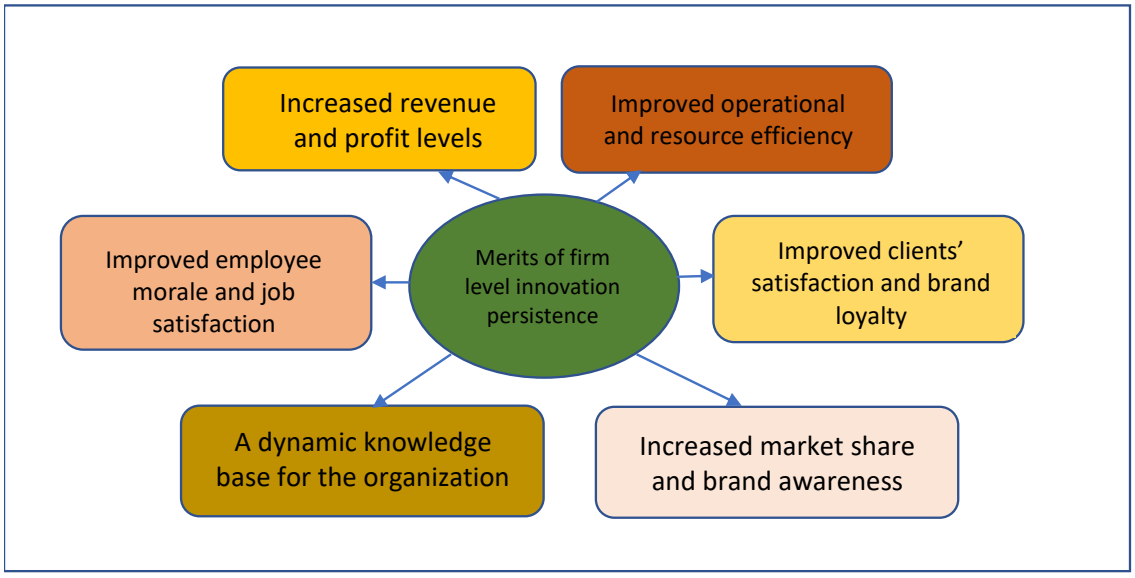


Figure 8-4: Merits of firm level innovation persistence during economic crisis

The six merits of firm level innovation persistence are further explained in Table 8.3 below.

Table 8-3: The merits of firm level innovation persistence during economic crisis

S/N	MERITS OF FIRM LEVEL INNOVATION PERSISTENCE	BRIEF EXPLANATIONS
1	Increased revenue and profit levels – refer to section 4.7.4 (OECD 2012, Antonelli et al. 2012, Anthony and Feinzaig 2008)	It was established that firm level innovation persistence often has a positive effect on organizational revenues and profitability.
2	Improved operational and resource efficiency – see section 4.7.3 (Rennings and Rammer 2009, Polimeni 2008)	It was determined that innovation persistence during economic crisis can increase the efficiency with which organizational resources are utilized. Thus, leading to lower operating costs in the long term.
3	Improved clients' satisfaction and brand loyalty – refer to section 4.7.1 (Nemati et al. 2010, Anthony and Feinzaig 2008)	It was found that as firms continue to meet their clients' needs and requirements during economic crisis by continuing to innovate, their clients tend to be more satisfied and often choose to stick with these kinds of firms.
4	A more dynamic knowledge base for the organization – see section 4.7.2 (Leonard-Barton 1995, 1992).	It was determined that halting innovations during economic crisis can undermine the development or renewal of organizational competencies. Conversely, persisting with innovations during economic crisis

		enables firms to continue to renew their knowledge base and competencies.
5	Increased market share and brand awareness - see section 6.3.2 (novel finding)	It was argued that since economic crisis generates turbulence and gaps in the market, firms that persistently innovate often view these emerged gaps as opportunities and therefore make conscious efforts to meet the demands of this emerged markets. It was therefore established that by so doing, firms can increase their market share and brand awareness.
6	Improved employee morale and job satisfaction - see section 6.3.6 (novel finding)	It was found that keeping employees creatively engaged during economic crisis keeps the workplace adequately stimulated and this often impacts positively on employees' morale and job satisfaction.

8.4.4 Objective four: To establish and validate the critical success factors that enable firm level innovation persistence during economic crisis for construction contractors based in Abuja, Nigeria.

Objective four focuses on identifying and exploring the elements necessary for enabling firm level innovation persistence during economic crisis. This builds on the identified conditions necessary for innovations to thrive within firms (see section 3.9). Therefore, before focusing on the elements necessary for enabling firm level innovation persistence during economic crisis, the present study assumes that the conditions conducive for innovations to thrive within organizations have been put in place.

A review of literature in section 4.8.1 identified only one critical success factor for firm level innovation persistence during economic crisis as follows:

- The presence of a strong and effective innovation system

The analysed interview data as presented in section 6.4 confirmed the validity of the above listed critical success factor for firm level innovation during economic crisis. In addition, four new critical success factors for firm level innovation persistence were identified from analysed interview data. These novel CSFs for firm level innovation persistence are:

- The leadership of the innovation process by the experienced client
- A culture of market orientation
- The capacity to maintain strategic flexibility.
- An organizational vision that promotes continuous innovation

Furthermore, the obtained questionnaire survey data (see section 7.4) confirms the validity of the critical success factor as identified from literature in section 4.8.1, in addition to 3 of the 4 CSFs for firm level innovation persistence during economic crisis as identified from analysed interview data in section 6.4. It is noted that the analysed questionnaire data could not support the validity of the 5th CSF - *an organizational vision that promotes continuous innovation* - as identified from interview data. The four CSF for firm level innovation persistence as identified in the present study are illustrated in Figure 8.5 below.

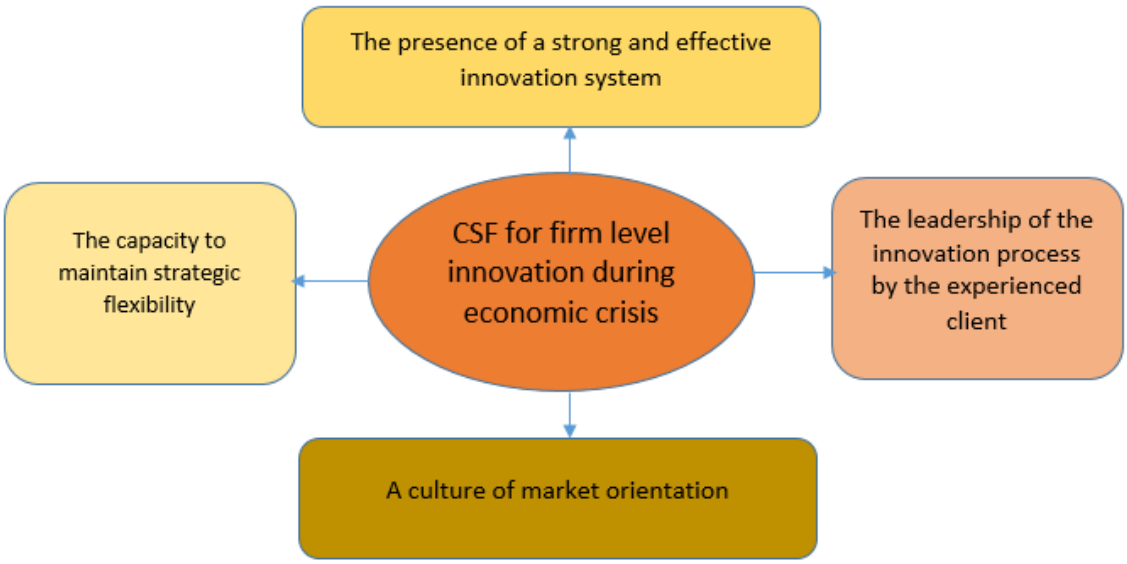


Figure 8-5: Proposed critical success factors for firm level innovation persistence during economic crisis

The four critical success factors for firm level innovation persistence during economic crisis are listed below and further explained in Table 8.4.

- The leadership of the innovation process by the experienced client
- The presence of a strong and effective innovation system
- A culture of market orientation
- The capacity to maintain strategic flexibility.

Table 8-4: Brief description of the proposed set of CSFs that enable firm level innovation persistence during economic crisis

S/N	PROPOSED CSF FOR FIRM LEVEL INNOVATION PERSISTENCE DURING ECONOMIC CRISIS	BRIEF EXPLANATIONS
1	The presence of a strong and effective innovation system – refer to section 4.8.1 (Filippetti and Archibugi, 2010, North, 2006)	Innovation persistent firms will often have to leverage on established links with other firms and institutions to drive innovations during economic crisis. This enables the pooling of resources to drive innovations in a time when resources are scant and prioritized. The key benefits of incorporating this critical element into a firm's innovation strategy during economic crisis were outlined. For instance, to resolve the problem of unstable funding regime (refer to section 6.2.1), to mitigate against the problem of the erosion of good organizational slack (refer to section 6.2.2), to enable the generation and flow of creative ideas (refer to 6.2.5) and to cushion the effect of a reduced appetite for risks due to increased uncertainties (refer to section 6.2.6).
2	The leadership of the innovation process by the experienced client – refer to section 6.4.1 (novel finding)	Information obtained from the clients is pivotal in shaping the trajectory of the innovation process during economic crisis. The key benefits of incorporating this element into a firm's innovation strategy during economic crisis were outlined. For instance, to resolve the problem of increased apathy to cost by clients as identified in section 6.2.3, as a solution to the issue of rapid and incessant changes in clients' requirements as identified in section 6.2.4, and as a panacea to the problem of a dearth of creative ideas (see section 6.2.5).

3	A culture of market orientation – refer to section 6.4.2 (novel finding)	With an increased uncertainty in not only the clients' requirements but also the extensive market conditions, there is need for the firm to keep in constant touch with alterations in the wider market. The key benefits of incorporating this element into a firm's innovation strategy during economic crisis were outlined. For instance, to mitigate against several factors that constrain firm level innovations during economic crisis i.e. an increased apathy to costs by clients (refer to section 6.2.3), the rapid and incessant changes to clients' needs and requirements (refer to section 6.2.4) and a reduced appetite for risks due to increased uncertainties (refer to section 6.2.6). Indeed, the need to constantly monitor the clients, their needs and requirements, market conditions and wider environmental dynamics and adapting innovation efforts to align with perceived changes cannot be overemphasized.
4	The capacity to maintain strategic flexibility – refer to section 6.4.4 (novel finding).	Maintaining strategic flexibility ensures that resources are more easily switched from an innovation project that has failed to a more viable one, thus, minimizing wastages and keeps the firm agile and responsive to changes in the market. The key benefits of incorporating this element into a firm's innovation strategy during economic crisis were outlined. For instance, as a solution to; the unsteady funding regime (refer to section 6.2.1); the erosion of good organizational slack (refer to section 6.2.2) and; the rapid and incessant changes in clients' needs and requirements (refer to section 6.2.4).

Furthermore, a positive organizational vision that promotes continuous innovation was identified from analysed interview data (see section 6.4.5) as a critical success factor for firm level innovation during economic crisis. It is however, noted that the analysed questionnaire data relevant to this theme could not support the validity of this emerged theme. Consequently, the present study could not advance this theme as one of the research findings.

However, the present study suggests the need for future studies to conduct a more detailed investigation of the relevance of this theme to firm level innovation persistence during economic crisis.

8.4.5 Summary of key research findings

This section converges the key findings that emerged from the different phases of the present study (Literature, interview and questionnaire survey). These findings were presented and discussed under the research objective they address. Research Objective One was fully achieved through data obtained from literature, while Research Objectives Two, Three and Four were achieved through a triangulation of literature, interview and questionnaire survey data. All literature findings under Research Objectives Two, Three and Four were confirmed by obtained empirical dataset. In addition, novel themes under Research Objectives Two, Three and Four emerged at the interview stage and validated by the subsequently obtained questionnaire survey data. Nevertheless, one novel theme that emerged under Research Objective four was not adequately supported by the questionnaire survey data and therefore could not be advanced in the present study. However, the present study recommends that that this could become the focus of future studies.

8.5 Theoretical examination of the proposed set of critical success factors that enable firm level innovation persistence during economic crisis.

This section examines the proposed critical success factors as established from literature and empirical data. The proposed set of CSFs for firm level innovation persistence during economic crisis are as follows:

- The leadership of the innovation process by the experienced client.
- The presence of a strong and effective innovation system.
- A culture of market orientation.
- The capacity to maintain strategic flexibility.

Each of these identified enablers of firm level innovation persistence are explored below.

8.5.1 The leadership of the innovation process by the experienced client.

The emergence of a knowledgeable and demanding client continues to receive a growing attention (Eisenhardt and Martin, 2000) . The successful incorporation of the client in marketing strategies of several successful firms appear to be the key reason for this growing attention accorded the client as a valued resource of the firm (Foss et al., 2011). Other reasons adduced for this increasing awareness include the growth in internet connectivity, with the world becoming more networked (Sawhney et al., 2005). Firms now recognize the power of the Internet as a platform for co-creating value with customers. Rowley (2002) contends that customer/client knowledge is the source of most improvements in customer value. Thus, there is an emerging market for the tools and utilities whose objective is to offer intelligence for knowledge sharing between the businesses and their clients (Zanjani et al., 2008) . The work of Mills and Morris (1986) conceptualizes the experienced client as a "partial employee" of the firm. Foss et al. (2011) find that "firms that attempt to leverage user and customer knowledge in the context of innovation must design an internal organization appropriate to support it". This can be achieved in particular through the use of new organizational practices, notably, intensive vertical and lateral communication, recognizing and rewarding clients for sharing and acquiring knowledge. Sawhney et al. (2005) focus on the impact of the internet on the process of collaborative innovation - a key process in value co-creation. They argue that the unique capabilities of the internet as a platform for client engagement, including interactivity, enhanced reach, persistence, speed, and flexibility, and suggest that firms can

use these capabilities to engage clients in collaborative product innovation through a variety of Internet-based mechanisms.

8.5.1.1 Towards an innovation process led by the experienced client

There are indeed many strategies that can stimulate the client's appetite to drive innovation. The starting point of course has to be the project procurement strategy of the client. Kamara (2008) remarks that with the realization that practices preferred by clients (for instance competitive lowest cost tendering) "stifle innovation by encouraging adversarial culture in the construction industry, it is now generally agreed that clients can work to promote and even drive innovation in the construction industry". An important aspect that clients can add value to the project experience is in creating an enabling environment for innovation in construction projects through having in place appropriate procurement strategies. A shift away from traditional procurement practices has been advised by researchers. The work of Best and De Valence (2002) suggests that a move away from traditional procurement systems will have significant impact on innovation, because the traditional design-bid-build method does not allow for capture of intellectual property by construction contractors in their tenders. Innovative contract procurement methods will often make provisions that ensure enabling environment for innovative endeavours. This enabling environment according to Kamara (2008) concerns the management of project risks to permit a relative measure of freedom by construction professionals to be innovative. It (enabling environment) does also involve having in place, performance measurement and benchmarking systems and the improved use of information technology between the stages in project delivery and use (Manley, 2006). Kamara (2008) argues that "performance measurement, and by implication, performance specifications, can, in particular, contribute to design creativity by removing the relative constraints that prescriptive requirements can impose".

Regarding how best to enable the client to drive the innovation process, Kamara (2008) prescribes a requirements oriented project process (ROPP) as an ideal framework for adequately engaging with the client and for suitably absorbing the client's ideas into the innovation mix. He views ROPP as an approach most effective in enhancing client-driven innovations. As the construction industry has been consistently lambasted for neglecting clients' concerns, ensuring that the project process is more transparent and explicit through a ROPP according to Kamara (2008) is a significant factor in enhancing the client's confidence

and a good starting point for the construction industry in attempting to fully exploit the inherent benefits of working with an experienced client. Kamara and Anumba (2006) refer to the "project process" as a vision for realising the requirements of the client into a completed facility. Indeed, the overarching aim of the ROPP is to "make more visible the requirements of the client within a construction project" (Kamara, 2008). Kamara and Anumba (2006) attempt to explain ROPP as a "process where there is explicit traceability to the requirements of the client, where every action can be traced back to the original wishes of the client". In a requirements-driven process according to Kamara (2008), each activity is driven by the requirements for its execution. It is a client-driven approach where recipients of information and/or resources are the "clients" of those providing that information or resource. All the different parties commonly involved in a project therefore become a network of customers and supplier (Kamara and Anumba, 2006). The establishment of a ROPP therefore, starts with client requirement – definition, capture, representation and management throughout the project's lifecycle. An overview of ROPP protocol as adapted from Kamara (2008) is presented in Table 8.5 below. The development of a ROPP therefore starts with a clear definition, capture, representation and management of the clients' requirements. Kamara (2008) argues that the "development and implementation of design metrics is central to the mapping and traceability of client requirements in the project requirement document". The work of Kamara et al. (2002) proposes the use of the first stage of the quality function deployment correlation matrix to map client requirements to design attributes. An expansion of this over the life cycle of the project is illustrated in Figure 8.6 below. The different levels and flow of the "systematic mapping" of client's requirements (see Figure 8.6) as advanced by kamara (2008) are as follows:

- From client's business need to strategic requirements;
- Strategic requirements to design specifications (or design metrics);
- Design specifications' to 'construction specifications (or metrics); and,
- Construction specifications to operation and use specifications.

Process phases (0–9)			
9	PC[a]	Operation and maintenance	
8	Construction	Construction	
7		Production information	
6	Pre-construction	Coordinated design/procurement/full FA	
5		Full conceptual design	
4		Outline conceptual design	
3	Pre-project	Substantive feasibility/outline financial authority (FA)	
2		Outline feasibility	
1		Conception of need	
0		Demonstrating the need	
Activity zones		Development management	Project management	Resource management	Design management	Production management	Facilities management	Health/safety management	Process management	Change management

Table 8-5: Overview of the innovation protocol (Adopted from Kamara, 2008)

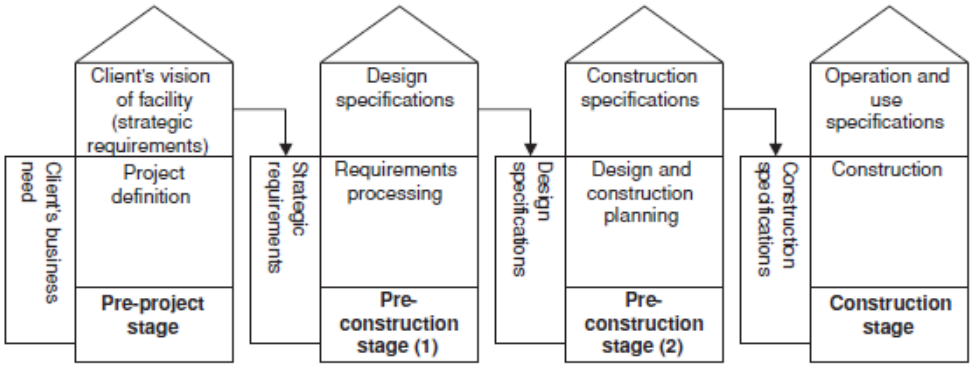


Figure 8-6: The engagement of the client and absorption of the client's ideas in the innovation process (Adopted from Kamara, 2008).

Key: Stage 1 corresponds to PP phases 4 and 5; Pre-construction stage 2 corresponds to PP phases 6 and 7; and Construction stage corresponds to PP phase 9, in Table 8.5).

8.5.2 The presence of a strong and effective innovation system.

Systems thinking in innovation studies has become widespread (Klerkx and Leeuwis, 2009), encouraged by studies focusing on approaches such as national, regional and sectoral systems of innovation (Malerba, 2002, Lundvall, 2010, Lundvall, 1992). Implementing innovation according to Smith (2002) demands an effective combination of hardware, software and orgware. Hardware according to Klerkx and Leeuwis, (2009), concerns equipment required; software relates to the knowledge in terms of manuals, digital content, and tacit knowledge involved in the innovation (Klerkx and Leeuwis, 2009); orgware on the other hand refers to organisational and institutional conditions that engender innovations (Klerkx and Leeuwis, 2009). Woolthuis et al. (2005) argue that policies, legislations, infrastructures, funding and market developments are critical to continuous innovation implementation. An effective innovation system ensures a positive interaction and integration of the factors as identified by Smith, (2002) and Woolthius et al. (2005).

During economic crises, the operating environment for firms is characterized by increased resource scarcity and competitive rivalry. In this regard, science and technology appear an essential source of competitive and sustainable advantage at national, regional levels and sectoral levels (Carayannis and Campbell, 2012). Carayannis and Campbell (2012) add that the "key determinant of their efficacy is the quality and quantity of entrepreneurship-enabled innovation that unlocks and captures the benefits of the science enterprise in the form of private, public, or hybrid goods". Connecting basic and applied research activities with market

dynamics, through technology transfer and commercialization mechanisms, including government–university–industry partnerships and capital investments, constitute the critical trigger mechanism and driving force of sustainable competitive advantage and prosperity. A system of innovation denotes elements and relationships which interact in the production, diffusion and use of new and economically useful knowledge (Lundvall, 2010). The central argument is that the innovation and economic performance of countries (regions) are shaped by the systemic interaction of organizations including market (price) and other (non-price) mechanisms, differences across nations and regions are likely to persist across time and space in a path-dependent way (Asheim et al., 2011). Thus, the rate of technological change and innovation is determined by the interaction between a set of private and public sector organizations – including, firms, universities, research organizations, government, educational bodies and finance providers – that combine to create, develop and diffuse new technology and innovations (Lundvall et al., 1988), with a key role played by national, regional and local governments. Of crucial importance is the fact that the system cannot be understood by focusing on the activities of any of its components in isolation. Rather, a complete sense of it can be made with broad emphasis on networking, social and institutional interactions and associated collective learning that is captured and analysed within a defined environment.

8.5.2.1 Innovation systems in Nigeria

A good number of today's advanced countries began the development of an integrated National Innovation Systems in the 1980s, focusing on the integration of science, industrial and technology policies. The Nigerian state however, appear to have failed to key-into what was then becoming a mainstream way of thinking. Obrenovic and Jalilov (2014) find that not all countries have been able to recognize the significance of an innovation strategy and knowledge sharing as a way of achieving competitiveness and in turn economic growth. Although, currently 8th in the world in terms of population, Nigeria ranks 21st in terms of GDP (nominal) and 161st in terms of GDP per capita. She is a powerhouse on the African continent by virtue of her size and vast oil wealth. Nigeria has a bold vision of becoming one of the top twenty economies in the world by the year 2020. However, there has been no clear-cut strategy as to how to achieve this lofty dream. A closer scrutiny of the blueprint for Nigeria's vision 2020 Economic Transformation Agenda reveals what would look

like two colossal omissions; no recognition of innovation as a critical tool for real economic transformations and no stated interest in the construction industry. In fact, there is no mention of 'innovation' in the 24-page Vision 2020 Economic Transformation Agenda blueprint document. This simply suggests two things; first, Nigeria's policy makers have not yet recognised innovation as an essential tool for economic renewal and transformation; second, construction is not seen as a key sector of Nigeria's economy. A number of critics have argued that the goal of becoming a top-twenty economy can only be achieved if Nigeria makes the transition to a new economy based on knowledge, productivity and innovation in order to be competitive in a twenty-first century context. Indeed, Knowledge - a springboard for most innovations (Egbu, 2004) - has always been central to economic development (Gertler, 2003, Kogut and Zander, 1992) and nowadays has become truly global, accessible and democratic, through new technologies and means of communication.

Organisations in Nigeria are largely left on their own to devise and project their individual innovation generation and promotion mechanism. This usually involves trying to source from what is a fragmented knowledge base and to make sense of disjointed bits of knowledge (Tödtling et al., 2013, Wang and Wang, 2012), sourcing for an appropriate funding regime (Camarero et al., 2011) and searching and obtaining an appropriately skilled human resource (Gupta and Singhal, 1993). Besides, as most construction orders are public sector related – over 60% - local construction firms relate with each other as competitors and are engaged in what can be better described as a ceaseless competitive manoeuvring. Gjerding (1998) describes this scenario as "mainstream confinement" of firms competing against each other based on inherent behavioural predispositions. This subsisting lack of collaboration and interaction among construction contractors in Nigeria means that most local construction firms often lack the required resource (funding, knowledge and management) to drive an innovation process to a meaningful conclusion and this becomes even more manifest during economic crisis.

Over the years, the Global Innovation Index (GII) has measured the innovation capacity of nations across the world and presented a comparative analysis to help us in achieving a fuller grasp of the constant variation in national competencies (GII, 2015). The findings of the last five years of GII rankings in its innovation input and output pillars establish that certain countries are consistently doing better than their peers in the same income and region

categories. Nigeria ranks 128 out of 141 countries surveyed. Although, numerous factors are involved in countries' innovation performance, however, Banerji (2015) argues that policy presents a major differentiating factor in most cases. The GII, (2015) confirms the continued existence of global innovation divides. The gap between the innovation performance of high-income top performers and poorer economies is substantial. However, in the case of a few countries, this gap is beginning to erode. More specifically, they are closing the gap in areas associated with credit, investment, and economic competition (Market sophistication); those linked to the acquisition and transfer of knowledge (Business sophistication); those associated with education and with R&D (Human capital and research); and those associated with the creation, impact, and diffusion of innovation. Uganda's experience offers important lessons that can be priceless for other low-income countries (e.g. Nigeria) seeking to improve their innovativeness. Uganda was classed as an 'innovation achiever' for the second time by the GII in 2014. This means that Uganda's GII score relative to its GDP is significantly higher than that of other economies in the low-income bracket. Uganda was ranked 106th in 2011, 117th in 2012, 89th in 2013, and 91st in 2014, consistently outperforming a number of low-income countries. Although, its GII performance might appear to be an outlier, long-term observers of the country's stable economic policies and performance will not find Ugandan's GII scores surprising. The most important lesson however, is that policy formulation and institutional capacity development around science and technology initiative (STI) must be addressed concurrently. Strong leadership can also provide an essential component of successful progress in bridging the gap between research and innovation centres and industry.

8.5.2.2 Towards building an effective sectoral, regional and national innovation system

One question seems pertinent: How can the prevailing innovation policy approaches of high-income countries be adapted to work for developing countries, if at all? To find an answer, the first step is to look at the innovation policy mixes that high-income economies have perfected over the last decades (GII, 2015). Policy makers in these countries follow an innovation system approach in which innovation. Understood broadly, an innovation system is the result of complex interactions among all innovation actors, policies, and institutions (Padilla-Pérez and Gaudin, 2014). GII, (2015) finds that "they also draw on the understanding, borne of experience, that converting a scientific breakthrough or an idea into a successfully

commercialized innovation often involves a long journey with no guaranteed outcomes". In addition to incentivizing research, complementary measures are needed to bring product, process, marketing, and organizational innovation to fruition. GII (2015) concludes that "two main policy strands form the core of present innovation policy". First, it is essential that the framework conditions for innovation is improved upon; these according to GII (2015) include the business environment, access to finance, competition, and trade openness. Second, dedicated innovation policies of countries should target both innovation actors and the linkages among them. These include collaborative research projects, public-private partnerships, and clusters (OECD, 2010). OECD, (2014) observes that "high-income countries follow a set of dedicated supply-side and demand-side innovation policies". Jacobsson and Johnson (2000) identify mechanisms that may impel or impede the development of effective national innovation systems. They find that government policy (e.g. R&D funding, investment subsidies, tax incentives), ease of firm entry and feedback from market formation can be enabling mechanisms for an effective innovation system. The inhibiting mechanisms according to Johnson and Jacobsson (2000) are uncertainties (can be political and economic), lack of political support, poor connectivity of networks, opposing behaviour of established firms and disincentives generated by other government policies. An analysis by Bergek and Jacobsson (2003) of how these inducements and inhibiting mechanisms interacted in practice, pin-points four key dynamics. They include; the creation of variety in an early phase, establishment of social legitimacy, the employment of advanced market creation policies in a later phase and the use of industrial policy to favour the domestic industry.

Drawing on Uganda's experience, the following specific factors are identified as critical to achieving an effective national innovation system in Nigeria:

(i) Strong political will

It is widely accepted that Nigeria has never had a problem with churning out good intentioned policies but what has always been the bane of both technological and economic progress in Nigeria has always been the will to follow through with a complete implementation of policies. Therefore, in establishing an effective NIS, there must be a strong political will aimed at ensuring that the right environment and structures (tax, funding etc.) are put in place.

(ii) Enhancing the competitiveness of firms

The private sector must be recognised as engine for economic growth and development. However, it must be competitive domestically and internationally. A good place to start for Nigeria is putting in place mechanisms and structures to improve on what is currently a difficult operating environment for businesses. For instance, The World Bank's Doing Business Report for 2017 ranks Nigeria at 169th out of 190 countries in its Ease of Doing Business Index. There is also the issue of Abuja being the 20th costliest city in the world to reside according to Mercer's Cost of Living Ranking for 2016. To improve on the competitiveness of construction contractors in Abuja, Nigeria, policy makers start by finding creative ways to reduce not only the high cost of doing business and living in Abuja but also, the ease of doing business in Abuja, Nigeria.

(iii) Learning and competence building

There is no surprise that enrolment into education institutes is growing at the same time as Uganda's improvement in the GII ranking. The focus has largely been on the acquisition of science and technology-based knowledge. Ugandan public universities, which constitute 28% of tertiary institutions in the country, are mainly science and technology-oriented. At the same time, entrepreneurial activities are gaining prominence within Ugandan university system (GII, 2015). GII, (2015) concludes that this shows an increasing recognition of the value of university-industry-government link. Similarly, India currently leverages on a stable and solid foundation for scientific, technological and business education through the setting up of centres of excellence. These centres provide the needed linkages between various actors within the national, regional and sectoral innovation systems.

While Nigeria currently has over 130 Universities – federal, state and private (NUC, 2017) and about 110 Polytechnics – federal, state and private (NBTE, 2017). There is however, an absence of any substantial formal coordination between any of these tertiary institutions and industries. Indeed, there is no research collaboration between any of these universities, neither are there any collaborations between Nigerian universities and other actors within a national or regional systems of innovation (NSI) framework (Adebowale and Oyelaran-Oyeyinka, 2012b). It is important to note that substantial scholarly submissions (Adebowale and Oyelaran-Oyeyinka, 2012a, Fagerberg et al., 2005, Rosenberg and Nelson, 1994, Lundvall, 1992) underscore the importance of industry-universities collaboration as an important

organizational form for knowledge creation within the national, regional or sectoral systems of innovation (NSI), especially in stimulating new technologies. Consequently, ensuring that there is coordination between universities, polytechnics and research centres; and collaborations between universities and the construction industry will offer not only cost benefits for continuous implementation of innovation during economic crisis but could mitigate against increased risks of pursuing innovations during economic crisis. Considering that a key reason for halting innovation implementations during economic crisis is the heightened uncertainties characteristic of economic crisis situations (Anthony and Feinzaig, 2008), the significance of extensive collaboration among innovation system actors cannot be over-emphasised.

(iv) Innovation promotion

GII, (2015) notes that "anecdotal evidence shows that the Ugandan government's emphasis on wealth creation within communities is inspiring creativity and innovative thinking among youth". Innovation promotion by policy makers, especially by inspiring young people to be creative and demonstrating this support at the highest political office - the presidency - builds a culture of innovation that pays off in the long term. GII (2015) suggests that a country's Innovation policy should focus on maximizing innovation in all industries and should support all types and phases of innovation. It is often pointed out that over 60% of the population of Nigeria are under 40 years old and could be referred to as youths. Enabling science, technology and entrepreneurial based learnings earlier in the education system could be helpful in re-energising the drive towards technological and economic growth.

8.5.3 A culture of market orientation

It is generally accepted that through the continual monitoring of customers, their needs, their requirements, market conditions and wider environmental conditions, firms adapt to develop and deliver the products and services that are valued by customers (Wei and Atuahene-Gima, 2009, Narver and Slater, 1990, Day, 1994). McNamara (1972) submits that market orientation is "a philosophy of business management, based upon a company-wide acceptance of the need for customer orientation, profit orientation and recognition of the important role of marketing in communicating the needs of the market to all major corporate departments". Kohli and Jaworski (1990) offer a broader definition of the market orientation concept. They submit that "market orientation is an organization-wide generation of market intelligence

that pertains to current and future customer needs, dissemination of intelligence across departments, and organization-wide responsiveness". Kohli and Jaworski (1990) add that "a market-oriented organization is one whose actions are consistent with the marketing concept". Three core themes or "pillars" underpin the definitions submitted above. These are: (1) customer focus, (2) coordinated marketing, and (3) profitability. Slater and Narver (1995) submit that market orientation is an "overall organizational value system…". To buttress the importance and relationship between this concept and innovation, it is imperative to refer to the observation of Hurley and Hult (1998) that "it is nearly impossible to find an industry that is not engaged in continuous or periodic innovation and reorientation due to the dynamic nature of most markets". Marketing scholars have viewed market orientation from several perspectives. For instance, Kohli and Jaworski (1990) contend that it is a set of specific behaviours and activities; Hunt and Morgan (1995) argue that market orientation is "a resource"; (Shapiro, 1988) concludes that market orientation is "a basis for decision making", while quite a few studies have observed that it is an aspect of organizational culture (Slater and Narver 1995; Day 1994). Because market orientation basically involves doing something new or different in response to environmental conditions, it may be viewed as a form of innovative behaviour (Jaworski and Kohli, 1993). Jaworski and Kohli (1996) suggest that market orientation is an antecedent to innovation. While Jaworski and Kohli (1996) regard innovation as an outcome of market orientation, they however, do not recognize that innovativeness can be a feature of a group's culture, just as a market orientation can be evident in culture. Furthermore, to be an effective platform for a learning organization and provide opportunities for generative learning, Slater and Narver (1995) advise that "the scope of market orientation must include all stakeholders and constituencies that (i) possess or are developing knowledge that has the potential to contribute to the creation of superior customer value, or (ii) are threats to competitive advantage".

Drawing on Slater and Narver's (1995) account of the relationship between market orientation and business performance, the work of Hurley and Hult (1998) offers an explicit theoretical framework linking market orientation, business performance and innovation. According to Slater and Narver (1995), market orientation only improves business performance when it is coupled with a learning orientation. The study by Lado and Maydeu-Olivares (2001) finds that all market orientation components as identified in the work of

Lambin (1996) - i.e. customer analysis, competitor analysis and environmental analysis - are significantly related to the firms' degree of innovation and their innovation performance. Lado and Maydeu-Olivares (2001) conclude that marketing activities, especially the customers, and an analysis of the competitors are predominant sources of ideas for new products in the financial service sector. Similarly, in their investigation of over 600 new product launches in the financial service industry, Cooper and Edgett (1996) find that a critical success factor that distinguished the top performers in new products/ services was putting in place a market-oriented new product process. Therefore, "the magnitude and the effectiveness of the innovation activities of a firm can be enhanced through the adoption of market orientation principles" (Lado and Maydeu-Olivares 2001). More so, as the focus of market orientation is on understanding latent customer needs, it is viewed as "inherently entrepreneurial" (Slater and Narver 1995). Thus, an organization that values entrepreneurship and innovation must provide a culture and an environment in which learning from exploration and experimentation is likely to take place (Hamel and Prahalad, 1991). Nevertheless, Hillebrand et al. (2011) caution against getting too fixated with the customer. They argue that firms that are too focused on being customer oriented can create an environment where there is no room for more radical innovations. The point being that strong customer orientation could breed inertia. Thus, innovations – especially competence-destroying ones – may lack initial legitimacy because they use up resources otherwise allocated to the current customers' cause (Hillebrand et al., 2011). In this sense, customers/clients can be a distraction, drain resources on piecemeal solutions, and ultimately hinder firms focusing on the overall changes necessary to innovate (Tveito 2015).

8.5.3.1 Towards a market orientated innovation process

Whilst it's been established that a strong market orientation is critical to a new idea achieving a successful exploitation in the market place (Lado and Maydeu-Olivares 2001; Slater and Narver, 1995), unfortunately, a strong market orientation, is mostly lacking in construction innovation process. Veryzer (1998b) conceptualizes that for an innovation effort to achieve success, a strong market orientation must be built into every stage of the innovation process. Veryzer (1998b) provides a stage-gated guide on how to build a strong market orientation into the innovation process. The present study adopts Veryzer's suggestions having adapted

them to fit in with the construction environment. These suggestions are presented in Table 8.5 below.

Table 8-6: Building market orientation into stages of the innovation process (Adapted from Veryzer, 1998b)

S/N	STAGES OF INNOVATION PROCESS	SUGGESTION ON HOW TO BUILD IN MARKET ORIENTATION INTO THE INNOVATION PROCESS
1	Idea generation	Focus should be on the client, and exploiting the client's capacity to be a source of creative ideas.
2	Product design	Employ market research as an input to product design, not just an after-the-fact check
3	During development	Constant client contacts and feedback (e.g. continuous user testing of facets of the product).
4	After development	Carry out client trials, preference tests and market testing to verify market acceptance and launch plan.
5	Launch	Employ a well-designed, carefully targeted, properly resourced, marketing plan, based on solid market information.

8.5.4 The capacity to maintain strategic flexibility.

Aaker and Mascarenhas (1984) remark that in an increasingly uncertain operating environment, firms can only cope by "opening up avenues of strategic flexibility". In fact, Aaker (1984) views strategic flexibility as "surprise management". Research focusing on the evaluation of the significance of strategic flexibility and market orientation both of which are seen as essential organizational capabilities and critical for competing effectively in the marketplace (D'Aveni and MacMillan, 1990) reveals that surviving organizations, in contrast with failing companies, focus on both their external and internal environments (critical feature of market orientation – see Kohli and Jaworski, 1990), and continue to achieve a balance between the two environments - an important feature of strategic flexibility – (Shimizu and Hitt, 2004; Grewal and Tansuhaj, 2001). Combe and Greenley (2004) argue that "different forms of strategic flexibility allow for reactively adapting to different changing environments and proactively driving change". It is therefore, increasingly important for

decision makers to not only possess marketing capabilities, but also the capabilities for strategic flexibility in its various forms. In a highly uncertain and changing environment, firms are required to possess the strategic flexibility to respond to problems speedily (Shimizu and Hitt, 2004). Shimizu and Hitt (2004) define strategic flexibility as an "organization's capability to identify major changes in the external environment, quickly commit resources to new courses of action in response to those changes and recognise and act promptly when it is time to halt or reverse existing resource commitments". The idea of strategic flexibility is implicit in Leonard-Barton's (1995; 1992) dynamic capability theory, which highlights the down side of an exclusive focus on the core competencies of a firm. It is argued that strategic flexibility entails firms finding the right balance between committing the resources necessary to persist with an innovation during economic crisis and avoiding the investment of good money in bad projects (Shimizu and Hitt, 2004). The point here is that merely being cautious and realistic is essential but insufficient if managers are to recognize when resource commitments should be halted or reversed and act quickly (Shimizu and Hitt, 2004). Leonard-Barton (1992) explores the nature and strategic significance of firms' distinctive capabilities with special focus on their 'core competencies' (Prahalad and Hamel, 1990) and the interaction of such capabilities with a critical strategic activity: the development of new products and processes. She argues that "in responding to environmental and market changes, development projects become the focal point for tension between innovation and status quo". She describes this as "microcosms of the paradoxical organizational struggle to maintain, yet renew or replace core capabilities". Indeed, the traditional core capabilities have a down side that inhibits innovation. Leonard-Barton (1992) refers to this down side as "core rigidities". Thus, managers of the innovation projects are faced with a paradox: how to successfully exploit core capabilities without being hampered by their dysfunctional flip side (Leonard-Barton, 1992).

8.5.4.1 Towards building the capacity to maintain strategic flexibility

Shimizu and Hitt (2004) argue that it is challenging to maintain strategic flexibility especially when the outcomes of previous decisions are undesirable. They conclude that this is because managers are subject to various psychological and organizational biases when evaluating previous strategic decisions. As noted in section 7.2.2.6, economic crisis is characterised by increased uncertainty in the operating environment. This increased uncertainty further

aggravates the difficulties in making decisions about whether to remain committed to previous strategic decisions or to change them (Shimizu and Hitt, 2004). Nevertheless, there are steps that firms can implement to reduce these problems and sidestep these difficulties in making decisions. In their study which investigated 18 cases where changes where needed and 140 acquisitions, Shimizu and Hitt (2004) propose six fundamentals required in building and maintaining organizational preparedness that enable managers and firms to "effectively maintain attention to negative signs, evaluate and analyse outcomes objectively, and initiate actions that reverse, where necessary, previous strategic decisions". These six principles for building and maintaining strategic flexibility as advanced by Shimizu and Hitt (2004) are discussed below.

(i) Objectively measure and monitor decision outcomes

When managers are oblivious of the outcomes of a decision taken, they are highly likely not to attend to it or change the decision if need be (Shimizu and Hitt, 2004). Thus, Shimizu and Hitt (2004) suggests that managers "ensure that decision outcomes are measured and monitored".

(ii) Stimulate Decision-Making Processes

Shimizu and Hitt (2004) find that evaluating and absorbing new ideas often help firms to alter their initial decisions flexibly. Team-based decision-making according to Shimizu and Hitt (2004), enhances the opportunity to incorporate diverse perspectives into decisions. Thompson (2003) finds that the value of a team-based approach can be best obtained from the team members' diverse and varied perspectives and experiences.

(iii) Put in place structures to attract new ideas and perspectives from outside of the firm's boundaries

Shimizu and Hitt (2004) argue that there is need for managers and organizations to be proactive in their approach especially when operating in turbulent and highly uncertain environment. Thus, the need to establish an organizational system that frequently attracts news ideas and perspectives from outside of the firm. This according to Shimizu and Hitt (2004) will provide a "wake-up call" to managers. As noted in section 3.18, the creative destruction effect of economic crisis often erodes the validity of the path dependency concept. To avoid being trapped by path dependence, Shimizu and Hitt (2004) advise that

managers pay attention to and encourage the flow of external ideas. They note that "by exposing themselves to external ideas, managers can evaluate the firm's past strategic actions, its current strategy, and the outcomes achieved through the lens of external standards". This principle is implicit in Chesbrough's (2006; 2003) open innovation theory. Some of the ways in which a firm can achieve this fundamental required for building strategic flexibility according to Shimizu and Hitt (2004) are (i) limiting the tenure of top executives (ii) routinely new directors from outside of the firm's boundary (ii) routinely rotating manager's in key positions, and (iv) expand and exploit the breadth of collaboration with other firms to facilitate the seamless and continuous inflow of ideas from external sources.

(iv) Recognize the limitations of static governance systems

It is argued that strong corporate governance ensures that executives scrutinize appropriate alternatives and opportunities when they exist (Shimizu and Hitt, 2004). Thus, Shimizu and Hitt (2004) recommend that processes be established to "ensure that a devil's advocacy approach be used in board decision processes similar to the processes used by the top-management team to make strategic decisions". They suggest that "there should be some processes to ensure regular turnover on the board and, importantly, actions should then be taken to ensure that new members infuse the board with new ideas and different perspectives".

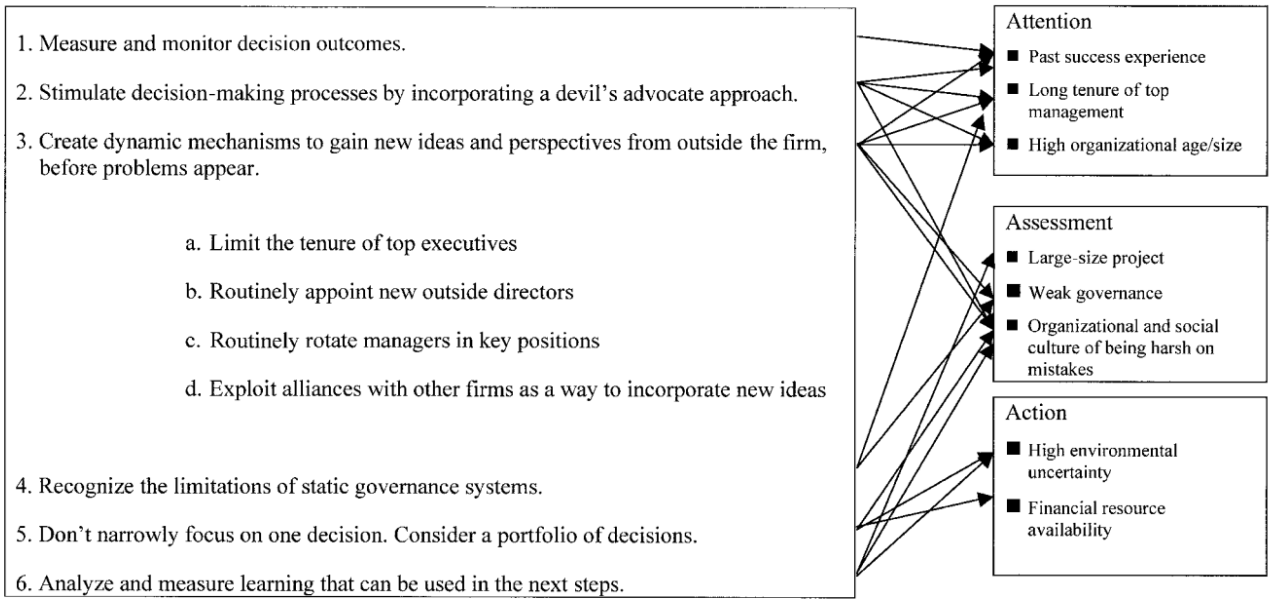
(v) Consider diverse decision portfolios

Although maintaining a broader view may be difficult for middle managers because they are often dedicated to one project, Shimizu and Hitt (2004) recommend that "top management should maintain a portfolio view of multiple decisions to effectively assess decision outcomes and allocate resources accordingly".

(vi) Analyse and measure learning

It is often difficult to predict the trajectory of a firm's future potentials and risks and make major decisions under conditions of increased uncertainty. However, learnings from past experienced helps an organization to understand and initiate strategic changes (Shimizu and Hitt, 2004). This is especially important in the construction industry where products are usually one-offs and thus, offer a wider scope for learning. It is noted that learning in the construction industry are mostly tacit and often unrecorded. This presents enormous challenge to managers attempting to analyse and measure elements of learning on the

project or from external sources. Nevertheless, this principle remains a key fundamental for building the capability to maintain strategic flexibility in organizations. Shimizu and Hitt's six steps for creating the capability to maintain strategic flexibility is depicted in Figure 8.7 below.



* Specific causal connections discussed in the text are shown with arrows. Other connections are possible.

Figure 8-7: Creating the capability to build and maintain Strategic Flexibility (Adapted from Shimizu and Hitt, 2004).

8.6 Validation of the proposed set of critical success factors for firm level innovation persistence during economic crisis

The validation process sets-out to establish whether the proposed set of CSFs meets particular routine needs (Rao et al. 1998). Simply put, this process seeks to ascertain the effectiveness or usefulness of the proposed CSFs for firm level innovation persistence during economic crisis. This suggests that the proposed CSF is purpose specific and its validation should only be within the context of the research purpose and frame (Balci and Sargent, 1981 cited in Rao, et al., 1998). It is reasoned that the validation process would assist in verifying the **comprehensiveness, relevance and perceived value** of the proposed set of CSFs for firm level innovation persistence during economic crisis within the Abuja context and in other regions of Nigeria. It is important to reiterate that the set of CSFs for firm level innovation persistence during economic crisis as proposed in the present study is intended for construction contractors based in Abuja Nigeria. It is also envisaged that it could be useful for other construction-based firms in Abuja and other parts of Nigeria. It is noted that the

conceptual set of CSFs for firm level innovation persistence during economic crisis was developed through findings from literature (refer to section 4.8), semi-structured interviews (refer to section 6.4) and questionnaire survey (refer to section 7.4).

8.6.1 Validation process

The proposed set of CSFs that enable firm level innovation persistence during economic crisis was validated using expert validation method. A total of 11 expert participants were selected using purposive sampling technique. The questionnaire survey approach was preferred to enable responses to be collected as quickly as possible from selected practitioners who were located in 11 different construction contracting firms across Abuja Nigeria.

As noted in section 5.12.2, the present study found 16 Abuja-based construction contracting firms that persisted with innovation implementation during the 2015-2017 economic crisis in Nigeria. As discussed in section 5.12.3, 5 out of these 16 firms were the focus of the case study/interview phase of the present study. However, for the validation phase of the present study, 1 identified management level employee was drawn from each of the remaining 11 Abuja based construction contractors that persisted with innovations during the last economic crisis. These 11 individuals were considered experts in the area of implementing innovations during economic crisis because they were deemed to be significantly involved with implementing innovations during economic crisis. This is consistent with the contention of Chan et al. (2001) that an expert is a practitioner who possesses an extensive working experience and are currently or directly involved in a study's area of interest. Therefore, a total number of 11 experts drawn from 11 innovation persistent construction contracting firms were emailed a questionnaire to confirm the **comprehensiveness, relevance and perceived value** of the proposed set of CSFs that enable firm level innovation persistence during economic crisis.

The validation survey comprises of a total number of 4 questions. The first 3 questions were based on a 5-point Likert scale. The first question sought to determine the comprehensiveness or otherwise of the proposed set of CSFs. The second question on the other hand was concerned with establishing the relevance or otherwise of the proposed set of CSFs. While the third question focused on ascertaining the perceived value of the proposed set of CSFs. Finally, the 4th question sought to obtain qualitative data from the experts

regarding any additional comment they may have. A copy of the validation questionnaire can be found in Appendix D.

8.6.2 Experts survey findings

From the total of 11 questionnaires distributed, 7 were completed and returned. The results obtained from the validation questionnaire survey are shown in Table 8.7 below.

Table 8-7: Results of the validation survey of the proposed set of CSFs

Validation questions	To a very high/high extent	To some/limited extent	To no extent at all
The comprehensiveness of the proposed set of CSFs	5	2	-
The relevance of the proposed set of CSFs	5	2	-
The perceived value of the proposed set of CSFs	6	1	-

From the above result as presented in Table 8.7 above, 5 of the 7 practitioners that responded to the validation questionnaire were of the view that the set of CSFs as proposed was comprehensive to a very large high/high extent, while 2 of the 7 practitioners believed that the proposed set of CSFs was comprehensive to some/limited extent. Regarding the relevance of the proposed set of CSFs to practical realities, 5 of the 7 practitioners deemed it relevant to a very high/high extent, while 2 of the 7 practitioners considered it to be of some/limited relevance. In terms of the perceived value of the proposed set of CSFs, 6 of the 7 practitioners indicated that the proposed set of CSFs, to a very high/high extent would add value to firms intending to persist with innovations during economic crisis. However, 1 of the 7 practitioners reported that if implemented, the proposed set of CSFs will to some/limited extent add value to any construction contracting firm intending to persist with innovation during economic crisis.

From the validation survey results as discussed above, it is therefore confirmed that the proposed set of CSFs that enable firm level innovation persistence during economic crisis could be identified as such. Nevertheless, several suggestions were offered by the validation survey participants toward the improvement of the proposed set of CSFs. The key suggestions offered are as follows:

- Three experts are of the view that to establish a strong and effective innovation system (National and Sectoral), Policy makers must show a strong political will towards ensuring that the right environment and structures (tax, funding etc.) are put in place. Tax concessions and facilitating easy access to credits and grants are some of the programmes that policy makers at state and federal levels can implement towards promoting innovations and building an effective innovation system.

- Two of the validation survey participants remark that adequate funding is a key element of a firm's capacity to continue implementing innovations during economic crisis. They argue that although this point was highlighted in the proposed set of CSFs but should be made more conspicuous.

- Two of the validation participants are of the view that for firms considering their innovation options during economic crisis, a good starting point should be to reflect on the additional constraints that emerge during economic crisis.

Based on the findings of the validation exercise, the recommendations were revised, with the key feedbacks from the validation exercise processed into the final recommendations.

Chapter 9 : Research conclusions, contributions, limitations and recommendations

9.0 Introduction

The chapter presents the research conclusions as drawn from the entire study. In addition, the research contributions and limitations are discussed. The chapter then concludes with recommendations made for possible improvements in terms of practice, policy and study.

9.1 Research conclusions

The aim of this study was to establish and validate the critical success factors for firm level innovation persistence during economic crisis. It was however, deemed necessary to commence with an exploration of the innovation subject with a view to achieving a comprehensive understanding of its basic characteristics. Several theoretical contentions were explored in this regard before arriving at a number of common characteristics that define every innovation. Newness in its present form, first use within the industry, non-triviality, associated risks and derivable benefits for stakeholders were found as the defining characteristics of every innovation. Following this, the study explored the concept of economic crisis from literature and found that economic crises generally constrain firm level innovations. The factors responsible for constraining firm level innovations were subsequently identified from literature and obtained empirical dataset. These constraining factors are; unstable funding regime, increased apathy to cost by clients, erosion of good organisational slack, reduced appetite for risks due to increased uncertainties, rapid and incessant changes to clients' needs and requirements and dearth of creative ideas, a consequence of employee attrition and retrenchment. Furthermore, to support the call for firm level innovation persistence during economic crisis, the present study identified and evaluated the key merits of innovation persistence from literature and obtained empirical dataset. The merits of firm level innovation persistence as determined in the present study are; increased revenue and profit levels, improved operational and resource efficiency, improved clients' satisfaction and brand loyalty, a dynamic knowledge base for the organization, increased market share and brand awareness, improved employee morale and job satisfaction. Lastly, a set of CSFs that enable firm level innovation persistence was

identified from literature and obtained empirical dataset. The CSFs that enable firm level innovation as proposed in the present study are; the leadership of the innovation process by the experienced client, the presence of a strong and effective innovation system, a culture of market orientation and the capacity to maintain strategic flexibility. The set of CSFs as proposed in the present study was further validated using the expert validation method.

It is envisaged that the merits of firm level innovation persistence during economic crisis as identified in this study will provide the much-needed spur for construction-based firms in Nigeria to persist with innovations irrespective of the wider economic conditions. In addition, the set of critical success factors as proposed in the present study should provide the key essential elements for whatever innovation management strategy a firm may want to adopt towards safely persisting with innovations through and beyond economic crises.

9.2 Research contributions

The envisaged research contributions are divided into two categories, namely, the research contribution to knowledge and the research contribution to practice.

9.2.1 Research contribution to the body of knowledge

(i) The present study lends weight to the argument in support of innovation persistence during economic crisis by identifying and evaluating the key merits of firm level innovation persistence during economic crisis in Nigeria. Thus, providing researchers with an important platform and reference document for future studies in the broader area of innovation persistence.

(ii) It is envisaged that the key factors that constrain firm level innovations during economic crisis as identified and explored in the present study will provide researchers with a valuable insight into the limitations of the existing innovation management submissions during economic crisis

(iii) The proposed set of critical success factors that enable firm level innovation persistence during economic crisis will provide researchers with a veritable platform upon which to build on towards further exploring the necessary elements required to enable firms to persist with innovations during other forms of crisis in Nigeria for example political crisis, security crisis etc.

9.2.2 Research contribution to practice

(i) The proposed set of critical success factors that enable firm level innovation persistence during economic crisis will provide construction practitioners in Abuja Nigeria with an essential guideline on how best to approach innovations during economic crisis with a view to persisting with innovations during economic crises.

(ii) It is envisaged that the key merits of firm level innovation persistence as identified and evaluated in the present study will spur construction-based firms in Abuja and indeed in other parts of Nigeria towards a culture of continuous innovation.

(iii) It is expected that the factors that constrain firm level innovations during economic crisis as identified and explored in the present study will offer a useful insight to construction practitioners in Nigeria as to the limitations of their extant innovation management approaches in times of economic crisis. Thus, nudging firms towards redesigning their approach to innovations during economic crises.

9.3 Research limitations

The constraints and scope of the present study are highlighted below.

(i) The present study confines itself to the management of innovation persistence from the construction-based firm's viewpoint. As such, a creative process can only be termed an "innovation" if it culminates in an outcome that adds value to the firm (market exploitation). Hence, what could be viewed as an innovation by other stakeholders or actors may in fact, not meet the criteria for innovation in the present study.

(ii) The present study focuses on firm level innovation persistence during economic crisis. Therefore, before establishing what the critical success factors for firm level innovations during economic crisis are, the present study presupposes the

presence of the basic conditions necessary for innovations to thrive in organizations irrespective of the economic situations. The present study essentially builds on this.

(iii) Nigeria is a large country with over 250 ethnic nationalities and with distinct cultural, social and religious beliefs. There are also substantial differences in laws and value systems amongst the federating states and the Federal Capital Territory, Abuja. The social, political, cultural and economic peculiarities of Abuja could limit the applicability of the research findings to other contexts.

(iv) The five construction contracting firms studied are all fairly large sized. Therefore, the replicability of the research findings may be limited to large sized construction-based firms.

9.4 Research recommendations

The recommendations advanced in the present study are divided into three categories, namely; recommendations for managers of construction-based firms, recommendations for policy makers and recommendations for future studies.

9.4.1 Recommendations for managers of construction-based firms in Abuja, Nigeria

(i) Managers of construction-based firms in Abuja and indeed in other parts of Nigeria should reflect on the merits of firm level innovation persistence during economic crisis as identified in the present study with a view to stimulating the innovation dispositions of their firm especially during economic crisis.

(ii) Firms considering their innovation options during economic crisis must first appreciate the risks and uncertainties inherent in economic crisis situations. Therefore, for firms considering their innovation options during economic crisis, a good starting point should be to reflect on the factors that constrain firm level innovation during economic crisis as established in the present study.

9.4.2 Recommendations for policy makers in Nigeria

(iii) It was found in the present study that a strong and effective innovation system is critical for enabling firm level innovation persistence during economic crisis. However, to put in place a strong and effective innovation system (National and Sectoral), Policy makers must show a strong political will towards ensuring that the right environment and structures (tax, funding etc.) are put in place. Tax concessions and facilitating easy access to credits and grants are some of the programmes that policy makers at state and federal levels can implement towards promoting innovations and building an effective innovation system.

(iv) As established in the present study, a strong and effective national innovation system is key to a firm's capacity to persist with innovations during economic crisis. As such, policy makers should ensure that there is an excellent coordination amongst universities, polytechnics and research centres; and collaborations between academic institutions and the construction industry. Not only will this offer substantial cost benefits to innovative firms, it will also help in resolving the problems of unstable funding regime and dearth of creative ideas that constrain firm level innovations during economic crisis.

9.4.3 Recommendations for future studies

(i) The present study focused on innovation persistence by construction contractors during economic crisis. Future studies could attempt to look at innovation persistence during other forms of environmental turbulence e.g. aftermath of wars, refugee crisis or periods of political instability.

(ii) The present study looked at innovation as a central theme without delving into the specifics of what innovation form or type is most appropriate for turbulent economic environments. Therefore, it could be beneficial if further studies attempt to establish if there is any type or form of innovation that is most appropriate for economic crisis periods.

(iii) Because the empirical investigation conducted in the present study focused entirely on firms within the construction industry, the applicability of the research

findings to other industries, for instance, the manufacturing industry, could be substantially limited. Therefore, additional investigations may be required in this regard.

(iv) Further investigation is required before the findings of the present research can be effectively generalized to other regions of Nigeria and to the other developing and developed countries. This is because Nigeria is a large country with many cultural, social and religious settings and beliefs with substantial differences in laws and value systems amongst the federating states. Likewise, the socio-economic, political, legal and regulatory environments in other developed and developing countries may differ significantly from what obtains in Abuja, Nigeria.

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Appendices

Appendix A: Sample of the initial questionnaire survey

PhD research student room
School of Built Environment
4th Floor, Maxwell Building,
The Crescent, University of
Salford, United Kingdom,
M5 4WT

26th Oct. 2015

Tel: +44(0) 161 295 7305; 07720848184
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Initial questionnaire survey

Research Title: Innovation persistence during economic crisis by Nigeria's construction contracting firms: An investigation of the critical success factors

This questionnaire is based on an ongoing PhD which aims to develop a management framework that seeks to resolve the often-deleterious effects of economic crisis on construction contractors' capacity to persist with innovation during economic crisis. Thus, ensuring the improved implementation and exploitation of innovations and their impacts during turbulent economic periods. As such, this initial questionnaire survey seeks to determine the suitability of your organization as a context for this study. This survey is a short one containing five (5) straight-forward questions. You are not obliged to answer these questions but accurately responding to them will be of great value to this ongoing research.

In order to protect your confidentiality, privacy, dignity and anonymity, your answers will be attached with a unique code that will only be understood and accessed by the researcher. This will be stored in password-protected files in a password-protected computer that only the researcher has access to. Finally, any data provided by you will be destroyed once the degree is achieved. The project has ethical approval for the study protocol from the University of Salford, which provides further assurance.

If you require further clarifications, do not hesitate to contact me or my supervisor using the details below.

Section A: Key Respondent Information

Q.1 Please kindly specify your level of experience in implementing innovations?

0-5 Years ☐ 6-10 Years ☐ 11-15 Years ☐ 16-20 Years ☐ 21-25 Years Over ☐

Q.2 Please state your level of agreement with the statement that you are directly involved in the implementation of innovations for your organization during economic crisis?

Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree ☐

Section B: Firm's suitability for case study

Q.3 Your firm was innovative before the current economic crisis?

Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree ☐

Q.4 Your firm has continued to implement innovations during the current economic crisis?

Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree ☐

Q.5 This is a case study research, is your firm happy to be involved in subsequent investigations of this case?

Yes ☐

No ☐

Thank you.

Name of the researcher: Azubuike Anthony Ugwuoke
Mobile: 07720848184

Name of the Supervisor: Prof. Carl Abbott
Tel: (0)161 295 3172

Appendix B: Sample of semi-structured interview questions

University of Salford MANCHESTER

PhD research student room
School of Built Environment
4th Floor, Maxwell Building,
The Crescent, University of Salford,
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Email : a.a.ugwuoke1@edu.salford.ac.uk

8th Feb. 2016

Draft Interview Guide

Research Title: Innovation persistence during economic crisis by Nigeria's construction contracting firms: An investigation of the critical success factors

Name of the researcher: Azubuike Anthony Ugwuoke

Name of the Supervisor: Prof. Carl Abbott

Section A: Demographic Information.

1. What is your current profession?
2. Approximately, how long have you been in this profession?
3. How long have you been employed by your current organization?
4. What areas of construction are your organization experienced in?
5. How many on-going construction projects are your organization currently implementing?
6. What is the level of your involvement with key decisions regarding innovative inputs in the construction project process?

Section B: Main interview questions

1. Would you describe your organization as innovative?
   - Yes
   - No
2. How would you describe the economic environment you have had to operate in for the past 12 months?
3. How have economic conditions impacted your organization?

4. In your opinion, does the effects of economic crisis impact innovations in your organization?

   Yes

   No

5. If yes, what are the specific factors that constrain innovation in your firm during economic crisis?

6. In your opinion, does your organization persist with innovation during unstable economic periods?

   Yes

   No

7. If yes, please explain what you consider the merits of innovation persistence during economic crisis?

8. What are the peculiarities of innovating during economic crisis period?

9. Do you consider closer collaboration, networking and interaction with other organizations and institutions as a critical success factor for enabling firm level innovation persistence during economic crisis?

   Yes

   No

   If yes, please explain.

10. In your opinion, explain other factors you consider as necessary for facilitating firm level innovation persistence during economic crisis?

11. Do you have any suggestions in terms of how best to manage innovation during turbulent economic periods?

Appendix C: Sample of self-delivery and collection questionnaire

PhD research student room
School of Built Environment
4th Floor, Maxwell Building,
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12th September 2016

Tel: +44(0) 161 295 7305
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QUESTIONNAIRE

Research Title: Innovation persistence during economic crisis by Nigeria's construction contracting firms: An investigation of the critical success factors.

This questionnaire is based on an ongoing PhD research which aims to develop a management framework that seeks to resolve the often-deleterious effects of economic crisis on construction contractors' capacity to persist with innovations during economic crisis. Thus, ensuring the improved implementation and exploitation of innovations and their impacts during turbulent economic periods. As such, this questionnaire is divided into five sub-themes of the research topic. These are:

Section 1: General information about the respondents.

Section 2: Questions focusing on the factors that constrain firm's ability to persist with innovations during economic crisis.

Section 3: Questions concerning the merits of innovation persistence.

Section 4: Questions regarding the critical success factors that enable firm level innovation persistence during economic crisis.

Confidentiality: The information collected will be used for the sole purpose of this study and for academic publications. The findings of the study will not be attributed to any specific personnel.

PhD Researcher
Azubuike Ugwuoke
School of the Built Environment
University of Salford
Salford M5 4WT, UK
Email: a.a.ugwuoke1@edu.salford.ac.uk
Mobile: 07720848184

Supervisor
Professor Carl Abbott
Email: C.abbott@salford.ac.uk
Tel: (0)161 295 3172

Section A: General information

1. Your present job title_____
2. Size of your organization _____
3. Nature of Business for your organization _____
4. Years of experience_____

Section B: Questions focusing on the factors that constrain your firm's ability to persist with innovations during economic crisis

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
(5) Your firm was innovative prior to the current economic crisis					
(6) The effects of economic crisis do inhibit your firm's ability to continue implementing innovations?					
(7) The factors that constrain innovations during economic crisis for your firm are?					
(i) An unstable funding regime					
(ii) Dearth of creative ideas, a consequence of employee attrition and					
(iii) Erosion of organizational slack					
(iv) Increased apathy to cost by clients					
(v) Rapid and incessant changes in clients' requirements					
(vi) Reduced appetite for risks due to increased uncertainty in the market					
Others (specify)					

Section C: Questions concerning the merits of innovation persistence for your firm

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
(8) Your organization continues to innovate successfully during economic crisis?					
(9) The merits of innovation persistence outweigh the risks?					
(10) The key merits of innovation persistence for your organization are:					
(i) Improved clients' satisfaction and brand loyalty.					
(ii) A dynamic knowledge base for organizations					
(iii) Improved operational and resource efficiency					
(iv) Increased revenues and profits levels.					
(v) Increased market share and brand awareness					
(vi) Improved employee morale					
Others (specify):					

Section D: Questions regarding the critical success factors that enable your firm to persist with innovations during economic crisis

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
(11) Your organization adopts a management approach to enable innovation persistence during economic crises?					
(12) Which of the following do you consider as critical elements to your firm's capacity to persist with innovations during economic crisis?					
A culture of market orientation					
An organizational vision that promotes continuous innovation					
Client leadership of the innovation process					
A strong and effective collaboration and networking					
Ability to maintain strategic flexibility					
Others (specify)					

Appendix D: Sample of the validation questionnaire

PhD research student room
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Email : a.a.ugwuoke1@edu.salford.ac.uk

18th July 2018

Dear Sir/Madam

Research Title: Innovation persistence during economic crisis by Nigeria's construction contracting firms: An investigation of the critical success factors.

I am a PhD student at the University of Salford, Greater Manchester, UK and I am currently interested in validating a set of critical success factors for firm level innovation persistence as identified in this PhD research titled as above.

Your company has been selected for this study because your firm persisted with innovations during the 2015-2017 economic crisis. To this end, it will be appreciated if your firm can be used for this validation. A brief description of the research aim and the proposed set of CSFs is provided below. The survey is expected to take between 10-15 minutes to complete.

In order to protect your confidentiality, privacy, dignity and anonymity, information gathered will be attached with a unique code that will only be understood and accessed by the researcher. This will be stored in password-protected files in a password-protected computer that only the researcher has access to. Finally, any data provided by you will be destroyed once the validation is concluded. The project has ethical approval for the study protocol from the University of Salford, which provides further assurance.

If you require further clarifications, do not hesitate to contact me or my supervisor using the details below.

Mr. Azubuike Anthony Ugwuoke
(Researcher)
Contact email: a.a.ugwuoke1@edu.salford.ac.uk
Telephone: +447720848184

Dr. Pathirage Chaminda
(Supervisor)
Contact email: P.Pathirage@salford.ac.uk
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Research aim

This research seeks to propose and validate a set of critical success factors that enable firm level innovation persistence during economic crisis for construction contractors based in Abuja, Nigeria.

The proposed set of CSFs

The study identified four CSFs that enable firm level innovation persistence during economic crisis. These are illustrated in Figure 1 below.

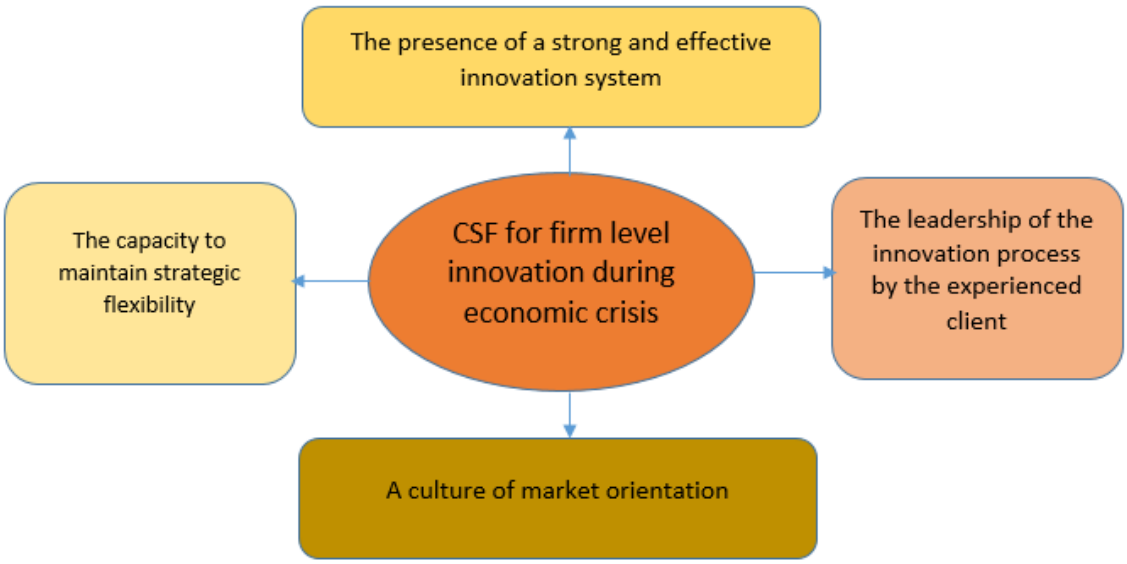


Figure 1: Proposed critical success factors for firm level innovation persistence during economic crisis

The four critical success factors that enable firm level innovation persistence during economic crisis are listed below and further explained in Table 1.

- The leadership of the innovation process by the experienced client
- The presence of a strong and effective innovation system
- A culture of market orientation
- The capacity to maintain strategic flexibility.

Table 1: Brief description of proposed set of CSFs that enable firm level innovation persistence during economic crisis

S/N	PROPOSED CSF FOR FIRM LEVEL INNOVATION PERSISTENCE DURING ECONOMIC CRISIS	BRIEF EXPLANATIONS
1	The presence of a strong and effective innovation system.	This PhD study finds that innovation persistent firms will often have to leverage on established links with other firms and institutions to drive innovations during economic crisis. This enables the pooling of resources to drive innovations in a time when resources are scant and prioritized. The key benefits of incorporating this element into a firm's innovation strategy during economic crisis were outlined. For instance, for access to resources which otherwise would have been unavailable to the firm, access to creative ideas and a cushion to increased uncertainties inherent during economic crisis.
2	The leadership of the innovation process by the experienced client.	This study finds that information obtained from the clients is pivotal in shaping the trajectory of the innovation process during economic crisis. The key benefits of incorporating this element into a firm's innovation strategy during economic crisis were outlined. For instance, to resolve the problem of increased apathy to cost by clients, as a solution to the issue of rapid and incessant changes in clients' requirements and as a panacea to the problem of a dearth of creative ideas.

3	A culture of market orientation.	This PhD study finds that with an increased uncertainty in not only the clients' requirements but also the extensive market conditions, there is need for the firm to keep in constant touch with alterations in the wider market. Thus, the need for putting in place a culture of market orientation. Indeed, the need to constantly monitor the clients, their needs and requirements, market conditions and wider environmental dynamics and adapting innovation efforts to align with perceived changes cannot be overemphasized. The key benefits of incorporating this element into a firm's innovation strategy during economic crisis were outlined as follows; to mitigate against an increased apathy to costs by clients; to lessen the impact of the rapid and incessant changes to clients' needs and requirements and a reduced appetite for risks due to increased uncertainties.
4	The capacity to maintain strategic flexibility.	This study finds that maintaining strategic flexibility ensures that resources are more easily switched from an innovation project that has failed to a more viable one, thus, minimizing wastages and keeps the firm agile and responsive to changes in the market. Thus, it is argued that the ability to maintain strategic flexibility is a critical success factor that enables firm level innovation persistence during economic crisis. The key benefits of incorporating this element into a firm's innovation strategy during economic crisis were outlined. For instance, as a solution to; the unsteady funding regime, the erosion of good organizational slack and the rapid and incessant changes in clients' needs and requirements.

VALIDATION QUESTIONS

- How would you rate the **comprehensiveness** of the proposed set of CSFs? Please tick box that best represents your views below.

Very comprehensive	*Comprehensive*	*Fairly comprehensive*	*Slightly comprehensive*	*Not comprehensive*

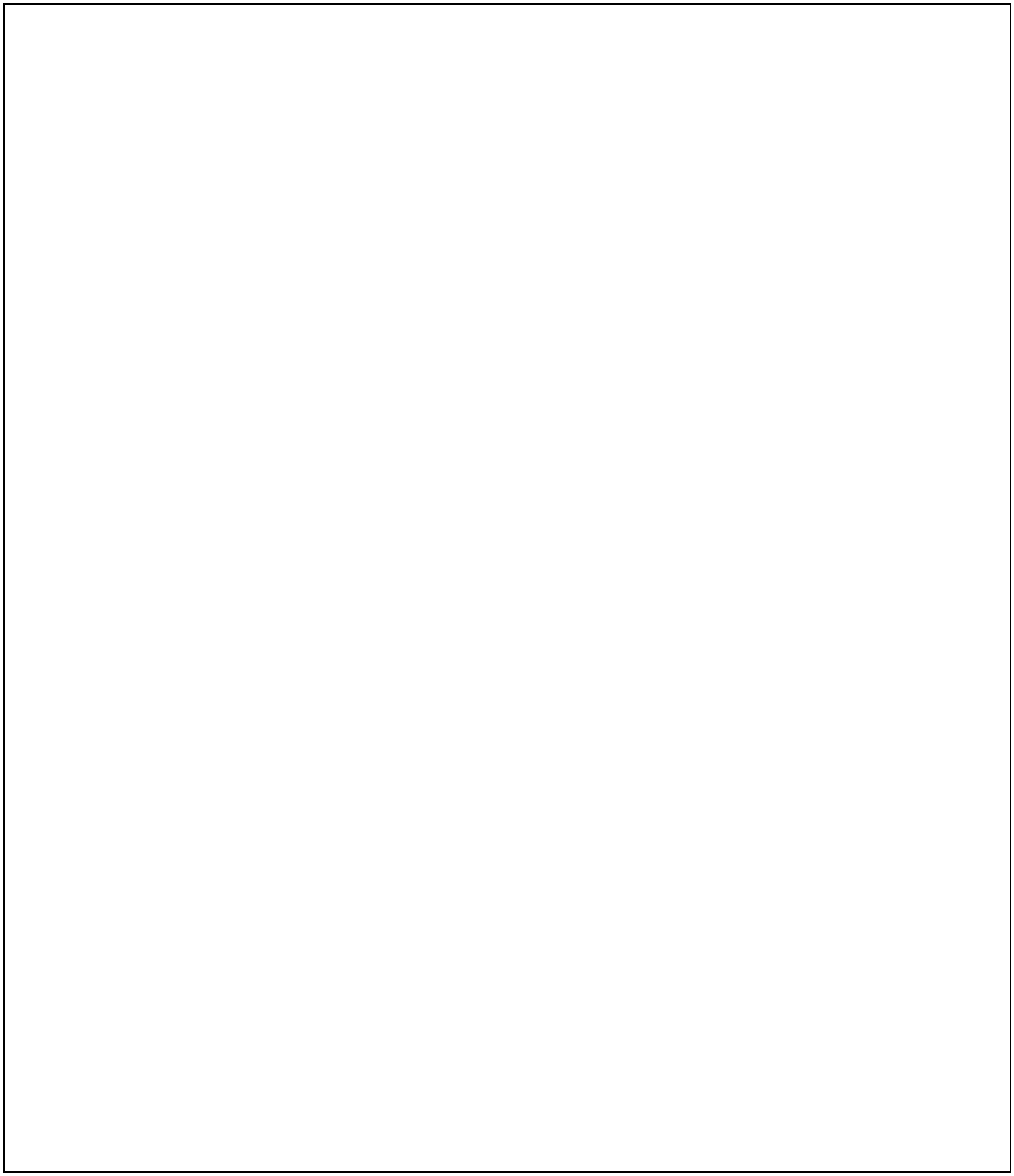
- To what extent would you rate the **relevance** of the proposed set of CSFs to practical realities? Please tick box that best represents your views below.

Very relevant	*Relevant*	*Fairly relevant*	*Slightly relevant*	*Not relevant*

- In your opinion, to what extent would the proposed set of CSFs **add value** to your day-to-day practice in enabling innovations during economic crisis? Please tick box that best represents your views below.

Would add value to a very high extent	*Would add value to a high extent*	*Would add value to some extent*	*Would add value to a low extent*	*Not value adding*

- Please feel free to provide any additional comments on the above questions, or any general comments you may have on the subject matter that might help to further improve the proposed set of CSFs.



Appendix E: Sample of the study ethical approval letter

Research, Innovation and Academic Engagement Ethical Approval Panel

Research Centres Support Team
G0.3 Joule House
University of Salford
M5 4WT

T +44(0)161 295 5278

www.salford.ac.uk/

4 February 2016

Dear Ugwuoke,

RE: ETHICS APPLICATION ST15/79 – Towards a model for client-firm relationship that enables continuous implementation of construction innovation during turbulent economic periods. A case study of selected PBOs in Abuja, Nigeria.

Based on the information you provided, I am pleased to inform you that your application ST 15/79 has been approved.

If there are any changes to the project and/ or its methodology, please inform the Panel as soon as possible by contacting S&T-ResearchEthics@salford.ac.uk

Yours sincerely,

Prof Mohammed Arif
Chair of the Science & Technology Research Ethics Panel
Professor of Sustainability and Process Management,
School of Built Environment
University of Salford
Maxwell Building, The Crescent
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