AN ASSESSMENT OF THE INFLUENCE OF ABSORPTIVE CAPACITY ON AMBIDEXTERITY IN CONSTRUCTION PROJECT ORGANISATIONS

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BEING A DISSERTATION SUBMITTED TO THE DEPARTMENT OF QUANTITY SURVEYING, AHMADU BELLO UNIVERSITY, ZARIA, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE MASTERS OF SCIENCE DEGREE IN PROJECT MANAGEMENT.

DEPARTMENT OF QUANTITY SURVEYING,

FACULTY OF ENVIRONMENTAL DESIGN,

AHMADU BELLO UNIVERSITY.

NOVEMBER, 2021.

Declaration

I declare that the work in this project dissertation entitled "AN ASSESSMENT OF THE INFLUENCE OF ABSORPTIVE CAPACITY ON AMBIDEXTERITY IN CONSTRUCTION PROJECT ORGANISATIONS" has been performed by me in the Department of Quantity Surveying. The information derived from literature has been duly acknowledged in the text and a list of references provided. No part of this dissertation was previously presented for another degree or diploma at this or any other Institution.

 Stanley Majiyebo MUSA

     Name of Student   Signature   Date

Certification

This dissertation entitled "AN ASSESSMENT OF THE INFLUENCE OF ABSORPTIVE CAPACITY ON AMBIDEXTERITY IN CONSTRUCTION PROJECT ORGANISATIONS" meets the regulations governing the award of the degree of Masters of Science Degree in Project Management of the Ahmadu Bello University, and is approved for its contribution to knowledge and literary presentation.

Dr. Baba Adama KOLO

Chairman, Supervisory Committee   Signature   Date

Prof. Kulomri Jipato ADOGBO

Member, Supervisory Committee   Signature   Date

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Dean, School of Postgraduate Studies   Signature   Date

Dedication

I dedicate this dissertation to God Almighty, my family, friends and future Project Management and Quantity Surveying students.

Abstract

Organisations have always aimed towards improved performance and efficient project delivery. Research has shown that both Absorptive Capacity and Ambidexterity help achieve these goals and there is some relationship between them which has an impact on overall organisational performance. While this relationship has been explored in organisations like manufacturing and technology, unique organisations like construction project organisations have been sparsely looked into despite possessing their potential to utilise external knowledge as well as use current processes while seeking new routines. Thus, the effect of Absorptive Capacity on Ambidexterity in these temporary organisations and its impact on their performance is not known. This research aimed at investigating Absorptive Capacity and Ambidexterity within construction project organisations with a view to determine the effect the latter has on the former and this was achieved by identifying the measures of Absorptive Capacity and Ambidexterity from literature; appraising their incidences in the construction project organisations respectively; and finally, determining the effect of Absorptive Capacity had on Ambidexterity in the organisations. For the purpose of the dissertation, the aspects of Absorptive Capacity, Acquisition, Assimilation, Transformation, Exploitation and Implementation; and the dimensions of Ambidexterity, Exploitation activities and Exploration activities, were investigated. The research comprised the use of literature and a structured questionnaire to gather information from construction project organisation participants using the convenience sampling technique. Questionnaires were distributed electronically via emails of the respondents and 89 responses were retrieved and analysed, using the IBM Statistical Product and Service Solutions (SPSS) statistical package and Partial Least Squares Structural Equation Modeling (PLS-SEM) software, to fulfill the objectives of the research. Analysis from the SPSS package comprised descriptive and inferential statistics which involved the use of mean and percentage distributions as well as analysis of variance using the One-Way ANOVA. It was found that majority of construction project organisations do have the potential to utilise external knowledge towards achieving project goals as well as balancing current processes with seeking new routines to efficiently deliver projects. However, there was little significance of a relationship between Absorptive Capacity and Ambidexterity in these project organisations, thus, the effect therefore was limited though significant in some aspects. This showed that Absorptive Capacity has little effect on Ambidexterity in construction project organisations despite their individual contributions to organisation performance. The study concludes that construction project organisations possess the potential and need for absorptive capacity as well as the enhancing their routines with newer processes given the increasing complexity of construction projects and client demands. While these concepts improve these organisations' ability to effectively delivery projects in their dynamic industry, however, Absorptive Capacity does not a significant effect on Ambidexterity in construction project organisations. It is recommended emphasis should be given to the transformation of external knowledge to internal capabilities; and the implementation of these improved capabilities as construction project organisations balance the use of their current routines with acquiring new processes. Furthermore, as construction project organisations do possess potential for both absorptive capacity and ambidexterity, knowledge and awareness on the concepts are also recommended.

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Chapter 1

Introduction

1.1 Background to the Study

Organisations have always aimed to enhance project delivery and performance especially with knowledge, processes and technologies ever advancing. External knowledge sources often provide advantages in effective organisational innovation and the utilisation of such knowledge, Absorptive Capacity, has been found to improve organisational performance in meeting client demands as well as providing competitive advantage over rival organisations (Garcia-Granero, Fernandez-Mesa, Jansen, and Vega-Jurado, 2017; Cappellari, Welter, Hermes, and Sausen, 2019; Kurniawana, Hartatia, Qodriaha, and Badawia, 2020; Venugopala, Krishnanb, Upadhyayulac, and Manish, 2020). While the major focus has been on organisations such as manufacturing and technology due to their Research and Development units, research has also addressed unique organisations including construction.

Furthermore, a balance between achieving present organisational tasks and future goals, Ambidexterity, has been observed to sustain performance, innovation and delivery (Petro, Ojiako, Williams, and Marshall, 2019; Sailer, 2019). Organisations with features of absorptive capacity and ambidexterity present, have been noted to stand a better competitive chance in their respective markets and there is some form of relationship, direct or indirect, between these concepts that influences just how well these organisations will perform (Solis-Molina, Hernandez-Espallardob and Rodriguez-Orejuela, 2018; Diaz-Molina, 2019). Though prior research has focused on the relationship and effect of absorptive capacity on ambidexterity in permanent organisations such as manufacturing, power supply and technology, it has also shown

that both concepts are present in unique organisations which comprise organisations in construction (Diaz-Molina, 2019). However, the findings cannot be applied to construction project organisations as such organisations do not possess research and development facilities nor engage in long term, continuous activities.

Studies on absorptive capacity and organisational ambidexterity focused mainly on effects and implementation. Studies by Solis-Molina *et al.* (2018), Diaz-Molina (2019) and Kurniawan *et al.* (2020) highlights how components of absorptive capacity relate with the activities of organisational ambidexterity such as exploratory and exploitative activities; if these relations were direct, partial, positive or negative; and how they affected other aspects such the dimensions of ambidexterity. Studies on implementation by Kamal and Flanagan (2014); and Muller, Buliga and Voight (2020) observed how absorptive capacity is being used across diverse organisations such as small and medium enterprises and large organisations as well as the levels within organisations could affect overall performance in regards to the use of exploration and exploitation activities by such organisations.

While the effects of absorptive capacity on certain aspects of ambidextrous organisations have been explored, a main focus has been on the dimensions of ambidexterity (Popadiuk and Nunes, 2018; Diaz-Molina, 2019). As such, effects on the types, levels and mechanisms are available gaps that could offer more on the extent to which absorptive capacity impacts ambidexterity and possibly, vice-versa (Rothaermel and Alexandre, 2009; Diaz-Molina, 2019). Another gap is how such relationships affect specific organisations like the construction industry and their performance output as technologies, demands, and problem solving methods are becoming more sophisticated (Ali, Kan and Sarstedt, 2016; Kurniawan *et al.*, 2020).

1.2   Statement of the Problem

With the ever growing increase in knowledge, technology and expertise, it has been observed that Absorptive capacity and Ambidexterity both have an impact on organisational performance and innovation; facilitating effective product delivery; (Kamal and Flanagan, 2014; Awojide, Hodginson, and Ravishankar, 2018; Petro *et al.*, 2019; Sailer, 2019; Muller *et al.*, 2020). Given the increasing demands and complexity of projects in the construction industry, construction project organisations are no exception as they have been observed to have the need and potential for the absorptive capacity - utilisation of external knowledge, as well as ambidexterity - using current routines and seeking new processes in project delivery improvement.

Prior research has shown that absorptive capacity has an effect on ambidexterity in manufacturing and technology organisation (Solis-Molina *et al.*, 2018; Kurniawan *et al.*, 2020) which has been found to be positive, enhancing performance, innovation and project delivery; though this has been limited to such permanent organisations due their use of research and development activities as well as continuous operations, not construction project organisations. Eriksson (2013), Kamal and Flanagan (2014) and Diaz-Molina (2019) have observed the potential for absorptive capacity and ambidexterity in construction, however, not specifically construction project organisations which are short term, and more exploitative than explorative in nature. Thus, the usability of absorptive capacity and ambidexterity and possible effects of absorptive capacity on ambidexterity within these organisations remains unknown. As such, this gap forms the basis for this research.

1.3   Justification for the Study

Construction project organisations are groups of construction professionals assembled to deliver a specific project on behalf of a client and subsequently disassembled when the project is completed. These organisations, being temporary in nature, are different from the permanent organisations, therefore the established effects of absorptive capacity on ambidexterity within permanent organisations cannot be generalised to construction project organisations. This necessitates this study as construction project organisations have been suggested to have the potential for both concepts, thus, this research would aid the construction professionals in the usability of absorptive capacity and ambidexterity; and how the effects of absorptive capacity on ambidexterity in such organisations enhance project delivery in the construction industry

1.4   Aim and Objectives

The aim of this study is to investigate the effect of Absorptive Capacity on Ambidexterity within construction project organisations with a view to enhancing the usability of both concepts in project delivery. This was achieved by the following objectives:

1. To identify the measures of absorptive capacity and ambidexterity in construction project organisations.
2. To appraise the incidence of absorptive capacity in construction project organisation.
3. To appraise the incidence of ambidexterity in construction project organisation.
4. To determine the effect of absorptive capacity on ambidexterity in construction project organisations.

1.5   Scope of the Study

This research focused on construction project organisations across Nigeria which comprised of project participants. The sample frame and unit composed of Architects, Quantity Surveyors, Structural Engineers, Civil Engineers, Mechanical and Electrical (M&E) Engineers and Project Managers. Further emphasis was on the five major aspects of Absorptive Capacity which included acquisition, assimilation, transformation, exploitation and implementation as well as the exploration and exploitation activities of Ambidexterity.

1.6   Limitations

Limitations to this study include:

1. Convenient sampling was used which would affect the distribution of the results, thus, affecting the mean distribution of the results by making them abnormal.
2. The sampling method and distribution of questionnaires increased the risk of response bias.

Chapter 2

Literature Review

Project delivery, innovation and organisation performance are the goals that sustain organisation in their respective markets and construction project organisations are no exception. An organisation's ability to recognise a need for external knowledge, seek it and utilise it gives such an organisation an edge in competition and efficient project delivery. The use of such knowledge often results in changes in internal routines and processes which can be of a varying degree. Furthermore, in maintaining their performance and delivery, organisations seek to optimise their current processes with their available resources as well as seek new technologies to integrate into their systems.

2.1   Projects and Construction Project Organisations

A project is a temporary undertaking done to produce a certain service or product within a specific time and at an established cost by an assembly of professionals and teams (Project Management Institute, 2017). Projects are referred to as temporary not in regard to their lifespan but rather to the disassembly of the project participants involved after the project is completed or achieved. Though projects can be and have been repeated in various cases and places, projects are unique as no two are ever the same. This is due to differences in the following factors: design; location; stakeholders; circumstances; and time (PMI, 2017). Projects are also unique to their industries and such industries include transport, medical, food, and construction.

The construction industry is one of the biggest segments of any country's economy (Designing Building, 2021) and like with other industries, has projects particular to it. Construction projects constitute raw materials and expertise assembled together to produce a unique, finished structure.

These undertakings can be classified into Building construction; the most common type of construction projects and Industrial construction; specific projects for particular needs usually factory productions. Building projects form the majority of construction projects in any country. They can be either commercial such as hotels, markets or banks; or residential such as homes, and apartments. Industrial projects include factories, refineries, and power plants.

A construction project organisation is a system which comprises a number of specialist professional firms, contractors and subcontractors assembled by a client or on behalf of the client to design and construct a construction project and led by a project manager (Walker, 2015). Construction organisations, unlike other organisations, are project-driven which means that they involve a wide variety of project participants assembled for the delivery of the projects and are disassembled after the projects are completed (Kamal and Flanagan, 2014). In other words, they are temporary in nature compared to other organisations such as manufacturing and technology. Construction project organisations also comprise structural and procedural routines and regulations which are used to deliver the project at hand (t2informatik, 2020). As projects are unique and diverse, the project organisations often comprise members best suited to handle such projects. As such, there are three types of project organisations which are Internal Company Project Organisation in which employees from one or more units in an organisation work on a project; Cross-company Project Organisations which comprises professionals from different organisations come together to deliver a project; and Project Company which is a unique type that comprises organisational and legal capacities as it deals with companies who work projects in which they have shares.

Irrespective of the type of project organisation, the definition of human resources, roles and responsibilities in order to facilitate the successful delivery of projects requires a good degree of

innovation, learning, strategy, leadership and structure (The Project Definition, 2020). These determine how well project organisations plan and achieve efficient delivery as well as how to improve on shortcoming in routines and processes for future and subsequent activities.

2.2   Absorptive Capacity

Absorptive capacity can be defined as an organisation's capability to utilise external knowledge for the purpose of enhancing project delivery. Originating from macro-economics as an economy's ability to utilise its resources as addressed by Adler (1965); it was Kedia and Bhagat (1988) that coined the concept using the context of technology transfer between nations. Cohen and Levinthal (1990), often referred to as the originators of the concept, defined it as the "ability to recognize the value of new information, assimilate it, and apply it to commercial ends" while recent researchers such as Diaz-Molina (2019) described it as the "ability to seek and acquire critical resources and capabilities from outside the organisation". Studies over the years have shown that absorptive capacity provides a competitive advantage to organisations as well as serves a basic necessity for organisational innovation and performance (Darwish, Zeng Zadeh, and Haak-Saleem, 2018). This is dependent on an organisation's experience; the source of external knowledge; and how well these are related with each other.

Absorptive Capacity is often observed in the context of permanent organisations such manufacturing and technology industries. The dynamics of their markets makes the utilisation of external knowledge a major source of competitive advantage, innovation and overall performance. Research by Cohen and Levinthal (1990) focused such industries with emphasis on their Research and Development department which were a source of knowledge acquisition and processing and majority of research afterwards followed suite despite the possibility of other

sources of external knowledge collection and utilisation (Kamal and Flanagan, 2014; Vasconcelos, Martins, Ellis and Fontainha, 2018).

Absorptive Capacity has been found to comprise four primary aspects. These are *acquisition*, *assimilation*, *transformation*, and *exploitation* (Zahra and George, 2002). Acquisition is defined as the capability of an organisation to identity and obtain potentially useful knowledge from external sources for operational and project purposes. It depends on the existing knowledge of the organisation as well as current and future demands the organisation has to meet. Assimilation is the ability to analyse and process the recently acquired knowledge in order to find its potential suitability for the demands of the organisation. As these two aspects address potentially useful external knowledge, they are collectively known as Potential Absorptive Capacity (Zahra and George, 2002; Lawrence, Chan and James, 2016). Transformation involves the combination of the assimilated knowledge with the organisation's existing knowledge in order to develop new processes and routines for present and future demands in terms of project delivery. And Exploitation is the capability of an organisation to apply the transformed information by making it part of its operations. Research has classified these further aspects as Realised Absorptive Capacity. Potential absorptive capacity and realised absorptive capacity are also referred to as dimensions of absorptive capacity. While research has identified these aspects: *acquisition*, *assimilation*, *transformation*, *exploitation*, it has been suggested that there are five aspects with the inclusion of *implementation* which, despite being thought to be part of exploitation, has been seen to stand separately being a broad component on its own (Kamal & Flanagan, 2014).

In construction, with projects are becoming more and more sophisticated and the technology changing, construction project organisations have needed to seek new processes to handle the growing complexity and demands thereof (Kamal, 2013). Project organisations therefore need to

find ways to utilise external knowledge rather primarily on internal information and routines. As construction project organisations differ from those in manufacturing and technology as well as comprise different professionals of varying capabilities, research has shown that absorptive capacity is more complex for such organisations though possible. It has been suggested that technology transfer can offer absorptive prospects (Barrett, Sexton, and Lee, 2008; Kamal and Flanagan, 2014); and public research and academic institutions serve as possible research and development variants for construction projects organisations (Spithoven, Clarysse, and Knockaert, 2011). Given the nature of construction project organisations, Kamal and Flanagan (2014) suggests exploring the potential for Absorptive Capacity with the use of its aspects *acquisition*, *assimilation*, *transformation*, *exploitation* as well as *implementation*.

2.3   Ambidexterity

Ambidexterity is often seen as the ability to handle two or more tasks simultaneously. While this is accurate, there is more to ambidexterity in regards to organisations. March (1991) described the concept as a balance between the use of current resources in achieving present goals and pursing new knowledge to achieve future goals. The activities involved in the present goals and future actions were coined as exploitation and exploration respectively. It was noted that organisations that had this balance proved to be adaptive and more progressive as specialisation in either exploitation or exploration helped organisations in the short run or long run respectively but not in both (March, 1991; Eriksson, 2013). As a concept, ambidexterity or organisational ambidexterity can be seen in various ways. O'Reilly III and Tushman (2004) described it as a combination and balance of exploitation and exploration processes to enable organisations to be creative and adaptive while maintaining traditional methods and procedures.

Exploitation and exploration activities are two major components of ambidexterity. Exploitation comprises the current routines, processes, knowledge and resources which are used for short term goals. These activities focus on internal consistency and control (Pedro *et al*, 2019). Exploration, on the other hand, involves new knowledge, technologies and demands for long term profits; addressing risk taking and flexibility. Research has shown that specialisation in exploitation produces reduces organisational learning, leaving the organisation outdated capabilities that will hinder long-term performance (Hoang and Rothaermel, 2010). This has been called a "success trap". Likewise, specialisation in exploration leads to scarce resources and getting unsatisfactory payback often referred to a cycle of failures (Levinthal and March 1993; Brix, 2019). Given these limitations from the respective specialisations, a balance between these two activities is encouraged for efficient organisational performance, sustenance and innovation.

Ambidexterity, also referred to as Organisational Ambidexterity, has been found to balance its exploitation routines and exploration activities in three distinct ways (Sailer, 2019; Pedro *et al*, 2019). These include structural ambidexterity, sequential ambidexterity and contextual ambidexterity. Structural ambidexterity involves having distinct units within an organisation for exploitation and exploration activities respectively or having units that pursue both activities alternatively (Liu and Leitner, 2012). Sequential ambidexterity is the pursuit of exploitation and exploration activities successively, that is, one after the other over a course of time. Contextual ambidexterity balances exploration and exploitation through the use of individual adaptablity (Birkinshaw and Gibson, 2004), that is, the discretion of individuals to perform exploitative or explorative activities based on the situation or project at hand. These have also been referred to as approaches to organisational ambidexterity.

Ambidexterity has been found to contribute to project success in construction project organisation (Sailer, 2019) though these organisations have been found to be more exploitative than explorative given their temporary nature, that is, being assembled for the purpose of efficient project delivery and disassembled afterwards (Eriksson, 2014) and it was suggested they be managed differently at project and business levels to facilitate ambidexterity. Studies by Pellegrinelli, Murray-Webster, and Turner (2015), however, suggested that the flexible but complementary use of projects and programmes would provide a better solution. In terms of approach, research has shown that ambidexterity in project organisations can be either structural or contextual due to the nature of projects they are working on or the participants within the organisations respectively.

2.4   Absorptive Capacity and Ambidexterity in Construction Project Organisations

Absorptive capacity and ambidexterity has been found to sustain competitive advantage and improve project delivery (Kamal and Flanagan, 2014; Awojide *et al*., 2018; Muller *et al*., 2020). In organisations, both concepts have been explored separately and in conjunction to one another. Some researchers have observed a relationship between these two with the presence of certain moderators such as organisational learning and strategic agile. Others have observed a relationship with positive effects between absorptive capacity and ambidexterity (Popadiuk and Nunes, 2018; Diaz-Molina, 2019) especially between realised absorptive capacity and the exploitation activities of ambidexterity.

The temporary nature of project organisations has been found to offer low levels of absorptive capacity as well as made these organisations more involved with exploitative activities than explorative activities (Eriksson, 2013; Kamal and Flanagan, 2014). Despite this, with the

growing complexities of projects and demands, the need for external knowledge and exploration of new technologies has increased. And while the aspects of absorptive capacity, based on Zahra and George (2002) research as well as Kamal and Flanagan (2014) have proffered that implementation be added to the aspects especially for organisations like construction project organisations. To properly research the absorptive capacity and ambidexterity in these organisations, the following measures were compiled:

Table 3.1   Measures of Absorptive Capacity in Construction Project Organisations

Aspects	Measures
Acquisition*	Giving prevalence to new knowledge and technologies
	Acquiring new knowledge critical to the organisation's activities
	Focusing on prototype development, novel techniques and processes
	Relying on feedback to develop efficient product delivery
Assimilation*	Establishing efficient means of communication amongst stakeholders
	Using relevant technologies to handle knowledge sharing between consultants
	Providing allowance for proper processing and utilisation of new technologies
	Adapting existing structure of communication as per the task at hand
Transformation*	Integrating new processes into the organisation's existing system
	Revamping routines to facilitate paradigm shifts
	Acquiring technologies that accommodate newer processes and techniques
	Changing existing approach in handling the project in its entirety
Exploitation*	Adopting new processes into the organisation's current projects
	Assessing organisational performance with new technologies
	Acquainting current parties with new techniques and processes
	Improving project delivery as demands for services increase
Implementation*	Interacting newly developed techniques and processes with new projects
	Expanding services offered based on the organisation's new system
	Matching new services with market dynamics
	Refining new technologies to keep up with client demands

*Aspects are based on Model of Absorptive Capacity by Kamal and Flanagan (2014)

Table 3.2 Measures of Ambidexterity in Construction Project Organisations

Aspect	Measures
Exploitation (Eriksson, 2013)	Improving current processes and techniques to satisfy clients
	Improving reliability of projects delivered
	Seeking ways to partner with existing clients
	Exploring diverse means of using internal resources to reduce production costs
	Mitigating conflicts within the organisation during project delivery
	Using interim feedbacks to ensure clients' satisfaction
Exploration (Eriksson, 2013)	Seeking out new and efficient processes for project delivery
	Achieving project delivery based on its ability to explore new technologies
	Engaging in projects that novel to the organisation
	Seeking new and creative ways to satisfy clients' demands

In exploring the relationship between absorptive capacity and ambidexterity using these five aspects (acquisition, assimilation, transformation, exploitation and implementation) and the exploitation and exploration activities of ambidexterity, the following were observed from past literature and hypotheses were drawn:

2.5.1 Acquisition

Acquisition is an organisation's ability to identify and acquire external knowledge from its market environment (Fosfuri and Tribo, 2008; Kale, Aknar, and Basar, 2018). This involves finding and acquiring information most useful to the organisation's operations. This aspect of absorptive capacity depends heavily on research and development of organisations that focus on large projects and operations. As most construction project organisations deal with small to medium scale projects and constitute many participants of varying information backgrounds, they do not possess an R&D division (Kamal and Flanagan, 2014) though construction project organisations can also deal with large projects and can have access to information from sources such as an academic institution to counter the individual sources of external knowledge (Eriksson, 2014; Kamal and Flanagan, 2014). Acquisition of external knowledge is based on a need for new and valuable information and this is explorative in nature, thus, does not relate with

the exploitation activities of these organisations which deal with current routines and internal information already in use. Therefore, the following hypothesis can be drawn:

H1.   Acquisition has no significant effect on Exploitation activities in construction project organisations.

Furthermore, acquisition being a process that identifies a need for external knowledge in order to improve performance and process; and exploration addresses the need for new skills, resources to meet the demands of improvement and continuity (Popadiuk and Nunes, 2018); there is a possibility for the following hypothesis despite the temporary nature of project organisations.

H2.   Acquisition has a significant effect on Exploration activities in construction project organisations.

2.4.2   Assimilation

An organisation's ability to analyse, interpret and understand the knowledge acquired from its external environment and covert it to useful information is referred to assimilation (Pop, 2016; Kale, Aknar, and Basar, 2018). External knowledge acquired has to be converted to information for use by any organisation otherwise such knowledge and time spent to get it would be a waste. Similarly with acquisition, processing new knowledge into possible useful information requires an R&D unit; a feature particular to permanent organisations not temporary organisations. Though temporary in nature, how construction project organisations coordinate themselves and knowledge sharing for the success of the projects plays a vital role in using the external knowledge from the individual participants or academic sources. Therefore, it is hypothesised that:

H3. Assimilation has a significant effect on Exploitation activities in construction project organisations.

Assimilation deals with processing the acquired external knowledge in order to determine its potential use by the organisation which works in line the exploration of new capabilities to ensure organisational performance. Despite their differences with permanent organisation, construction project organisations still acquire new capabilities through the individuals involved within them and other sources which allows for a degree of assimilation and exploration (Kamal, 2013; Popadiuk, 2018). Therefore, we can hypothesis that:

H4. Assimilation has a significant effect on Exploration activities in construction project organisations.

2.4.3 Transformation

Transformation means developing and refining these routines so that it is easier to combine existing knowledge with acquired and assimilated knowledge for future use (Zahra and George, 2002). This also involves the ability to change, adapt, and combine external information from external sources with existing and internally-generated information (Fosfuri and Tribo, 2008). Project organisation combines professionals of different disciplines in a bid to effectively deliver projects. These professionals bring diverse information and expertise which forms the organisation's sum of information in dealing with the projects at hand and construction project organisations are no exception in this regard. Thus, it can be given that:

H5. Transformation has a significant effect on Exploitation activities in construction project organisations.

The temporary nature of project organisations also reflects an emphasis on current goals than future ambitions. The transformation process tends to give indicators to areas that require changes as a result of the newly acquired and assimilated knowledge and with the construction being more dynamic and sophisticated; there is a need for project organisations to explore capabilities to accommodate these changes. As transformation is part of realised absorptive capacity which is for more current use than future goals, this may have little impact on the exploration activities of the project organisations (Diaz-Molina, 2018). Therefore, it can be hypothesised that:

H6.   Transformation has no significant effect on Exploration activities in construction project organisations.

2.4.4 Exploitation

Exploitation refers to the capacity of a firm to develop, expand, and use existing routines, competencies, and technologies to create something new based on "transformed" knowledge (Haro-Dominguez *et al*., 2007). Exploitation uses the recently transformed information into organisational operations which have a direct impact on project delivery similarly with exploitation activities in ambidexterity and there is evidence of a relationship between these two in permanent organisations. As these diverse exploitations are focused on delivery of current goals, there is a possibility of a relationship between in construction project organisations (Diaz-Molina, 2018). Thus, it can be hypothesised that:

H7.   Exploitation has a significant effect on Exploitation activities in construction project organisations.

While permanent organisations have continuous flow of operations leading to short term tasks and long term goals, project organisations focus primarily on short term goals making them more exploitative than explorative. Through the advent of technology, knowledge, expertise and forms of partnership with diverse clients, project organisations have also ventured into long term tasks therefore requiring them to seek a balance in achieving these goals and current goals with the organisational resources available. However, exploitation in Absorptive Capacity addresses the current tasks at hand of these organisations more so than future prospects. Therefore, it can be hypothesised that:

H8.   Exploitation has no significant effect on Exploration activities in construction project organisations.

2.4.5   Implementation

Implementation involves the process after exploitation, which is to put the newly acquired knowledge and technology into practical effect (Kamal, 2013). It involves new sets of people and new sets of skills to make it happen. It deals with people at the production stage that produces the final output. The main issue in implementation is not only new knowledge and technology, but also how to get people to accept new knowledge and technology and what needs to be done to make it work. Successful exploitation of transformed external knowledge can lead to a paradigm shift in order for newly developed routines and processes to have a positive effect on organisational performance. Implementation also reveals the extent to which these routines and process will be exploited and this forms the basis for the hypothesis below:

H9.   Implementation has a significant effect on Exploitation activities in construction project organisations.

If the new and current routines of the organisations do not meet the market demand or significantly improve overall performance and project delivery, the process will have to begin at acquiring new knowledge to utilise (Kamal, 2013). This is also where exploration activities are considered in order to move beyond the lapse of current processes and newly developed methods. There is a possibility that the failings from implementation of newly acquired capabilities can serve a form of feedback leading to the exploration of new capabilities, however, this does not infer a direct impact on exploration activities. Therefore, it can be theorised that:

H10.   Implementation has no significant effect on Exploration activities in construction project organisations.

These ten (10) hypotheses would be confirmed by the analysis of the data retrieved from the questionnaires distributed using the Partial Least Squares Structure Equation Modeling (PLS-SEM) statistical tool.
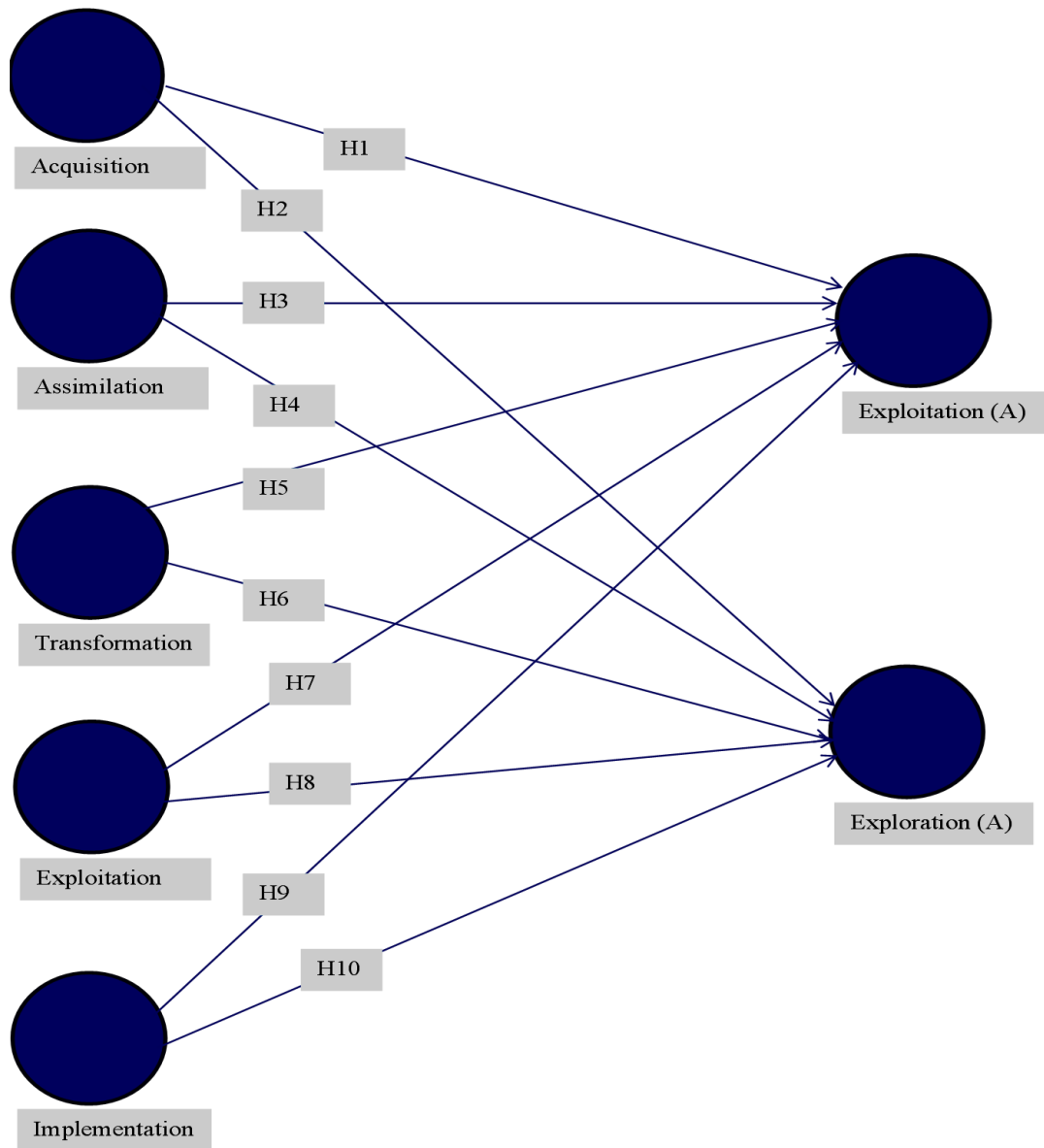
Figure 2.1   Proposed Structural Model depicting the Hypotheses

Chapter 3

Research Methodology

A research methodology is a set of principles, processes and procedures by a researcher conducts the research. It is a systematic way to solve the research gap present (Kothari, 2004). This involves the use of past literature review, specific research questions and available information sources in line with the research topic, aim and objectives. The aim of this research was to determine the effect of Absorptive Capacity on Ambidexterity in construction project organisations. The primary reason for this was to observe if the significance of such effect had an impact on the organisations' performance as it did in other industries such as manufacturing and technology where the effect benefited these industries with improved productivity, competitive advantage and project delivery.

3.2   Research Design

This involves the step by step approach to fulfilling the objectives of the research and achieving its overall aim. To this effect, this research comprised the use of knowledge and information sourcing from literature pertinent to Absorptive Capacity and Ambidexterity in general and specific to the construction industry as well as a review of the literature for information to be used in data collection. Such information comprised the measures of Absorptive Capacity and Ambidexterity as showed in the Table 2.1 and 2.2 in Chapter 2 of this research, respectively.

The research also involved a survey of construction project organisations via their participants which included Architects, Quantity Surveyors, Engineers, and Project Managers. These respondents were selected as they make up the project organisations which handle project delivery; thus, they were best suited to provide information necessary for this research.

3.2.1 Population

A research's population or target population is the total number of individuals, items or units that is used to establish the scope of the research (Neuman, 2014). The population of this research comprises the construction project organisations. Construction project organisations are systems which comprise a number of specialist professional firms, contractors and subcontractors assembled by a client or on behalf of the client to design and construct a construction project and led by a project manager. These are temporary organisations as they are disassembled after the project is completed. This were selected as they are pertinent to the research, however, their population was not readily available as they have a regulatory body contain a list of construction project organisation. This does not extend to their participants who served as representatives for the organisations.

3.2.2 Sampling Method

Sampling involves the technique by which a sample of a population is selected for the research study. This involves the use of probability and non-probability sampling techniques. Probability sampling provides a sample based on statistics and any member of a population can be featured in it (Fink, 2003; Ajayi, 2013). Non-probability gives a sample based on the researcher's judgment with regards to the research's needs and characteristics of the target population (Fink, 2003; Ajayi, 2013). For the purpose of this research, convenience sampling and snowballing

sampling techniques were used to determine the sample. These are non-probability techniques which aid selecting respondents that are most available and accessible to represent the sample population as well as those are more difficult to reach.

3.2.3 Sample

A sample is a part of a target population/sample frame selected using a statistical method to represent the entire population body and meet the scope of the research in order to acquire relevant data (Neuman, 2014). The unit of analysis for the research was the construction project organisation. However, data was collected from the organisation participants who comprised Quantity Surveyors, Architects, Engineers and Project Managers as they served as representatives of the organisations and they were sourced from the Nigerian Institute of Quantity Surveying and Architectural Registration Council of Nigeria. As the research involved the subsequent use of the Partial Least Square Structural Equation Modeling software, an estimated sample size range was needed and this was derived using the recommendation by Kline (2015) which is a ratio of participants (N) to the estimated parameters (q) suggests a range of 10 to 20 participants to each variable. In this case, that would be:

10 x 7 = 70 units; 20 x 7 units= 140 units

This implies needs a minimum of 70-140 units for the analysis and at the point of data collection and analysis, the sample for this research comprised 89 units.

3.3 Data Collection

Data collection was done using closed-ended, structured questionnaires that were shared electronically to the respondents, that is, the construction project participants across Nigeria. The

questionnaire comprised a request letter to potential respondents and two section which included section 1 (Information about Respondents and Projects) and Section 2 which was divided into parts; Information about Absorptive Capacity in construction project organisations and Information about Ambidexterity in construction project organisations. A detailed representation of questionnaire in contained in the Appendix Section of this research, Appendix A. The questionnaires were electronically shared using the convenient sampling technique in order to get information from respondents that were easily and readily accessible at the time of the research.

3.4   Data Analysis

This is the means by which data is collected from available resources in relation to the research for the purpose of analysing and interpreting the data finding according to the aim and objectives. Data for the dissertation were collected using structured questionnaires distributed amongst the construction project organisations participant sample size and were analysed using tools in the IBM Statistical Product and Service Solutions (SPSS) Statistics software and Partial Least Squares Structure Equation Modeling (PLS-SEM) programme for the purpose of processing the data received from the questionnaires to the fulfill the objectives of the research.

3.4.1   IBM Statistical Product and Service Solutions (SPSS) Statistics Software

IBM SPSS software is a programme used for statistical analysis, data management and documentation. For the purpose of this research, IBM SPSS 23 was used to conduct descriptive and inferential analyses. The descriptive analysis, which depicts a quantitative summery of the data collected, was conducted using the measure of central tendency, Mean, which provides a value that best represents the set data for which it is used. However, with the possibility of the mean values derived being skewed, frequency tools such as percentages were also conducted and

used for a more concise description of the information received from the respondents. The inferential statistics produced showed how the information provided by the respondents varied in regards to the measures of Absorptive Capacity and Ambidexterity and in which aspects specifically. This was conducted using the One-Way ANOVA (Analysis of Variance) test which analyses the differences between two or more groups of data. This was done for the measures of Absorptive Capacity which comprises Acquisition, Assimilation, Transformation, Exploitation, and Implementation; and the measures of Ambidexterity, Exploitation activities and Exploration activities, using the information of the respondent and respondents to determine the differences between the respective measures as well as within the measures. A Post-Hoc test was further conducted to specify the points of variance in the measures of Absorptive Capacity and Ambidexterity.

3.4.2   Partial Least Squares Structural Equation Modeling (PLS-SEM)

PLS-SEM is a statistical tool that used for multiple variable analysis or multivariate analysis that establishes complex cause-effect relationship models with the use of latent variables (Hair Jr, Hult, Ringle, and Sarstedt, 2014). This was used to determine the effect of absorptive capacity on ambidexterity using their latent variable or constructs which were the five aspects of Absorptive Capacity (Acquisition, Assimilation, Transformation, Exploitation and Implementation); and the Exploitation and Exploration activities of Ambidexterity. As the research comprises hypotheses in regards to the effect of Absorptive Capacity on Ambidexterity in construction project organisations, the evaluation of the model generated by using PLS-SEM required a test of reliability and validity of the Measurement model before assessing the Structural Model the PLS-SEM analysis comprised a series of the tests which included the PLS Algorithm, Bootstrapping and their subsequent Path Models representing the effectual relationship between Absorptive

Capacity and Ambidexterity in construction project organisations. The PLS algorithm was used to determine the validity and reliability of the indicators reflecting the independent and dependent variables through a series of tests which included Internal Reliability which tested reliability of the individual indicators of the variables and indicators with values less than 0.708 are deemed unreliable; Composite Reliability which used the Internal Consistency with an Indicator Reliability test to measure reliability using the different indicators assigned to a variable rather one at a time with values at 0.60 to 0.70 being considered as acceptable; and Convergent Validity test which measured the extent to which an indicator of a construct or variable positively correlates with other indicators of the same construct, using the Average Variance Extracted (AVE) which measures how closely the indicators correlate with each other in reflecting their variable and are acceptable at values of 0.50 and greater. All these were done to produce an acceptable Structural Model, depicting the significant relationship of the Absorptive Capacity variables on the Ambidexterity variables based on proposed hypotheses given in Chapter 2. This was further verified by the Bootstrapping test to close up any assumptions and produce the most suitable information supporting or opposing the hypotheses.

Chapter 4

Data Presentation and Analysis

This research was aimed at establishing the effect of Absorptive Capacity on Ambidexterity in construction project organisations across Nigeria. The data for this research was collected using a structured questionnaire which was distributed electronically via recipient emails and contacts of the participants in these organisations. This chapter covers the data presentation and the outcome of its analysis in response to the structure questionnaire distributed as well as the objectives of this research which include identifying the measures of absorptive capacity and ambidexterity in construction project organisations; appraising the level of absorptive capacity and ambidexterity in construction project organisation; establishing a relationship between absorptive capacity and ambidexterity in construction project organisations; and establishing the effect of absorptive capacity on ambidexterity in construction project organisations.

4.1   General Information about Respondents and Projects Investigated

One aspect of data collected for this research involved asking the respondents their profession to give specific information about themselves and their most recent activities. The information comprised profession and time on project whose results are shown in Table 4.1.

Table 4.1   Frequency Distribution of Information about the Respondents

		Number (Nr)	Percentage (%)
Profession	Architecture	19	21
	Quantity Surveying	56	63
	Civil Engineering	5	6
	Project Management	9	10
Time on Project	Less than 6 months	20	23
	6-12 months	28	31
	Greater than 12 months	41	46

The information about the respondents showed that 63% of the responses indicated they practiced Quantity Surveying, 21% practiced Architecture, 10% practiced Civil Engineering and 6% practiced Project Management. Out of the time periods on project given, 46% of the respondents had spent greater than 12 months on recent projects, 31% spent 6-12 months and 23% had spent less than 6 months. This meant that data about Absorptive Capacity and Ambidexterity will be predisposed towards Quantity Surveyors and projects on which greater than 12 months was spend.

Another aspect of data collected for the purpose of this research was requesting respondents to provide information specific to a project in which they had recently worked on. These information include project type, project complexity, project status and project value. The outcome of analysis performed on these data is shown in the Table 4.2.

Table 4.2   Percentage of Information about Project Particulars

Description	Percentage[1]	Description	Percentage[1]
Type		**Status**	
Building Works	86	Ongoing	61
Civil Engineering Works	7	Completed	39
Others	7		
Complexity		**Value**	
Not Complex	9	Less than ₦500m	47
Slightly Complex	44	₦500m - ₦1bn	19
Complexity	35	₦2bn - ₦5bn	18
Very Complex	8	₦6bn - ₦10bn	8
Extremely Complex	4	Greater than ₦10bn	8

[1] **Total number of responses = 89**

Out of the three types of projects investigated, 86% of respondents provided information about projects that are Building Works in nature, 7 % about Civil Engineering Works and 7% provided information about other types of project. This means that information about absorptive capacity and ambidexterity would predominately come from project organisations involved in the construction of building works. The responses for the five levels of project complexity revealed information that 44% of the projects were slightly complex, 35% of the projects were complex, 9% of the projects were not complex, 8% were very complex and the last 4% were extremely complex. This showed that the information about Absorptive Capacity will be predominant in projects classified as slightly complex.

In regards to status of the projects, 61% of the responses gave information about ongoing projects and 39% gave information about completed projects thus, implying that subsequent responses about Absorptive Capacity and Ambidexterity will be heavily inclined towards ongoing projects. And information about the estimated value of the projects, 47% of the respondents addressed projects valued at less than ₦500 million, 19% of responses addressed projects valued from ₦500 million to ₦1 billion, 18% gave information about projects valued

from ₦2 billion to ₦5 billion, 8% responded to projects valued from ₦6 billion to ₦10 billion and the last 8% responded to projects valued at greater than ₦10 billion. This inferred that responses to the measures of absorptive capacity and ambidexterity in construction projects organisations will highly consider projects valued at less than ₦500 million.

4.2   Appraising the Incidence of Absorptive Capacity in Construction Project Organisations

While Absorptive Capacity has mostly been researched in manufacturing and technological organisations detailing its response to the need to new information and enhancement of organisational processes and performance, studies have suggested that unique organisations such as construction project organisation do in fact seek to utilise external knowledge in improving project delivery. Given the temporary nature of construction project organisations, their potential for Absorptive Capacity was investigated using the measures identified from literature and the sections 4.2.1 and 4.2.2 contain the descriptive and inferential analysis of this investigation.

4.2.1   Descriptive Analysis of Absorptive Capacity in Construction Project Organisations

One of the main elements of the data collection inquired the extent to which the respondents were allowed to undertake certain knowledge seeking and utilisation activities by their respective project organisations. The information provided by the respondents in regards to the degree to which they disagreed or agreed with the outlined measures of Absorptive Capacity were scaled using a Likert scale of   1-5 which comprise 1 – *Strongly Disagree*, 2 – *Disagree*, 3 – *Neutral*, 4 – *Agree*, and 5 – *Strongly Agree* and the mean distribution was derived. Table 4.3 contains the average mean of the responses.

Table 4.3   Mean Distribution of the Measures of Absorptive Capacity in Construction Project Organisations

Activities	Mean*	Standard Deviation	Skewness	Standard Error
Giving prevalence to new knowledge and technologies	3.83	0.94	-0.98	.255
Acquiring new knowledge critical to the organisation's activities	4.00	0.78	-1.16	.255
Focusing on prototype development, novel techniques and processes	3.55	0.99	-0.50	.255
Relying on feedback to develop efficient product delivery	3.96	0.89	-1.10	.255
Establishing efficient means of communication amongst stakeholders	4.16	0.82	-1.17	.255
Using relevant technologies to handle knowledge sharing between consultants	4.08	0.63	-0.06	.255
Providing allowance for proper processing and utilisation of new technologies	3.70	0.92	-0.51	.255
Adapting existing structure of communication as per the task at hand	3.93	0.52	-0.10	.255
Integrating new processes into the organisation's existing system	3.80	0.84	-0.53	.255
Revamping routines to facilitate paradigm shifts	3.63	0.83	-0.91	.255
Acquiring technologies that accommodate newer processes and techniques	3.80	0.86	-0.49	.255
Changing existing approach in handling the project in its entirety	3.26	0.96	-0.39	.255
Adopting new processes into the organisation's current projects	3.69	0.68	-1.25	.255
Assessing organisational performance with new technologies	3.66	0.94	-0.44	.255
Acquainting current parties with new techniques and processes	3.52	0.85	-0.45	.255
Improving project delivery as demands for services increase	3.93	0.86	-0.84	.255
Interacting newly developed techniques and processes with new projects	3.79	0.90	-1.01	.255
Expanding services offered based on the organisation's new system	3.76	0.92	-1.23	.255
Matching new services with market dynamics	3.85	0.83	-0.80	.255
Refining new technologies to keep up with client demands	4.00	0.77	-1.08	.255

Likert scale of 1-5: 1 – Strongly Disagree, 2 – Disagree, 3 – Neutral, 4 – Agree, and 5 – Strongly Agree

The activities above are sub-themed into the aspects of Absorptive Capacity comprising

Acquisition, Assimilation, Transformation, Exploitation and Implementation with each set of

four activities to an aspect respectively. The mean distribution showed that the construction project organisations allowed for activities pertaining to external knowledge seeking and utilisation with most measures outlined in Table 4.3 having mean values greater than 3.50 which indicate responses agree with outlined measures. However, one of activities involved in the transformation of external knowledge has a mean value of 3.26. This implies that overall implies that while construction project organisations do possess the potential for absorptive capacity given the undertaking of the measure in Table 4.3, not all activities are undertaken. This could perhaps be due to the nature of the projects or likely their duration.

Table 4.3 presents the mean value which represented the responses to each measure; the standard deviation which showed how diverse the responses were in their mean value provided the standard deviation value was greater than 0.50; the skewness detailing how normal or abnormal the distribution was; and the significant error confirmed how normal or abnormal the distribution was given how different the skewness was from its standard error. If the skewness value is more than double the standard error value, then the distribution is an abnormal one, thus, its mean cannot adequately represent the measure. The standard error for the measures of Absorptive Capacity is 0.255 and double its value is 0.510. Given the skewness of the distributions, the mean distribution could not serve as a satisfactory descriptive analysis. As such, the percentage distribution was undertaken to properly describe the sample responses received. This is shown in Table 4.4.

Table 4.4   Percentage Distribution of the Measures of Absorptive Capacity in Construction Project Organisations

Activities	SD	DA	NT	AG	SA
Giving prevalence to new knowledge and technologies	2	9	14	54	21
Acquiring new knowledge critical to the organisation's activities	1	4	10	62	23
Focusing on prototype development, novel techniques and processes	4	10	30	40	16
Relying on feedback to develop efficient product delivery	2	4	15	53	26
Establishing efficient means of communication amongst stakeholders	1	3	11	49	36
Using relevant technologies to handle knowledge sharing between consultants	-	-	15	61	24
Providing allowance for proper processing and utilisation of new technologies	-	14	18	51	17
Adapting existing structure of communication as per the task at hand	-	-	17	73	10
Integrating new processes into the organisation's existing system	-	9	20	53	18
Revamping routines to facilitate paradigm shifts	2	7	26	56	9
Acquiring technologies that accommodate newer processes and techniques	1	5	28	46	20
Changing existing approach in handling the project in its entirety	4	16	36	37	7
Adopting new processes into the organisation's current projects	1	5	23	66	5
Assessing organisational performance with new technologies	-	16	19	48	17
Acquainting current parties with new techniques and processes	-	15	25	52	8
Improving project delivery as demands for services increase	1	5	17	52	25
Interacting newly developed techniques and processes with new projects	2	8	16	57	17
Expanding services offered based on the organisation's new system	3	8	12	62	15
Matching new services with market dynamics	2	1	26	51	20
Refining new technologies to keep up with client demands	1	3	12	61	23

*SD – Strongly Disagree *DA – Disagree *NT – Neutral *AG – Agree *SA – Strongly Agree

The inquiry produced information which was sub-themed into the aspects of Absorptive Capacity which were Acquisition, Assimilation, Transformation, Exploitation, and Implementation. The results in Table 4.4 showed 43% - 85% of construction project organisations do allow for activities that facilitate the acquisition and use of external knowledge in enhancing project delivery with majority of the responses indicating agree or strongly agree. This confirms the results from the mean distribution in Table 4.3 despite the skewness of the

distribution imply that the constriction project organisations possess the potential for Absorptive Capacity and its usability in their performance towards efficient construction project delivery.

4.2.2   Inferential Analysis of Absorptive Capacity in Construction Project Organisations

The information received from the respondents comprises 3 parts. Section 1 which contains information on respondents and projects which comprises respondent's profession, duration spent on last project, nature of the project, complexity of the project, current status of the project and the project's estimated value. Section 2 covered information on the measures of Absorptive Capacity using five aspects which were Acquisition, Assimilation, Transformation, Exploitation, and Implementation. A One-Way ANOVA test was conducted to expose such differences in the responses of the participants in regards to the measures of Absorptive Capacity in their respective project organisations using information from section 1 as criteria as shown in Table 4.5.

Table 4.5   Differences in Responses to the Measures of Absorptive Capacity in Construction Project Organisations

Variable	Sig.					
	Profession	**Time spent on Project**	**Project Type**	**Complexity**	**Project Status**	**Project Value**
Acquisition	0.046	0.035	0.726	0.076	0.546	0.731
Assimilation	0.039	0.000	0.860	0.416	0.989	0.435
Transformation	0.310	0.156	0.699	0.738	0.967	0.301
Exploitation	0.202	0.095	0.562	0.604	0.785	0.604
Implementation	0.392	0.016	0.927	0.151	0.181	0.508

* The mean difference is significant at the 0.05 level.

The analysis shows that there were significant differences in the responses to the aspects, Acquisition and Assimilation, in terms of profession and time spent on the projects. Using profession as a criterion, responses to the Acquisition aspect had a significant mean difference value of 0.046 and responses to the Assimilation aspect had a value of 0.039. A similar result was derived using the duration spent the project as a criterion. Responses to Acquisition had a significant mean difference value of 0.035 and Assimilation had a value of 0.000. The values, being below 0.050, indicate significant differences in the responses provided to these aspects and a Post Hoc test was conducted to uncover the specific areas in which those differences lay. Tables 4.6 and 4.7 contain such specific areas.

Table 4.6   Differences in Information on Absorptive Capacity using Professions as a Criterion

Dependent Variable	(I) Respondent's Profession	(J) Respondent's Profession	Sig.
Acquisition	Architecture	Quantity Surveying	0.048
		Structural Engineering	0.254
		Project Management	0.187
	Quantity Surveying	Architecture	0.048
		Structural Engineering	0.958
		Project Management	0.987
Assimilation	Architecture	Quantity Surveying	0.027
		Structural Engineering	0.317
		Project Management	0.314
	Quantity Surveying	Architecture	0.027
		Structural Engineering	0.996
		Project Management	0.998

* The mean difference is significant at the 0.05 level.

Based on profession, the results revealed that the differences were between respondents that informed "Architecture" and those that informed "Quantity Surveying" which had significant mean difference values of 0.048 for Acquisition and 0.027 for Assimilation respectively. These values fell below the 0.050 significance level inferring that their differences. This means that

given the responses, Architects and Quantity Surveyors have different views or opinions of Absorptive Capacity in these regards.

Table 4.7   Differences in Information on Absorptive Capacity using Duration Spent on Project as a Criterion

Dependent Variable	(I) Time on Last Project	(J) Time on Last Project	Sig.
Acquisition	Less than 6 months	6-12 months	0.051
		Greater than 12 months	0.825
	6-12 months	Less than 6 months	0.051
		Greater than 12 months	0.080
	Greater than 12 months	Less than 6 months	0.825
		6-12 months	0.080
Assimilation	Less than 6 months	6-12 months	0.004
		Greater than 12 months	0.652
	6-12 months	Less than 6 months	0.004
		Greater than 12 months	0.000
	Greater than 12 months	Less than 6 months	0.652
		6-12 months	0.000

* The mean difference is significant at the 0.05 level.

With the duration spent on their recent projects serving as bases, the results showed differences with values of 0.051 for Acquisition between projects of Less than 6 months and project of 6 – 12 months; 0.004 for projects of Less than 6 months and project of 6 – 12 months for Assimilation; and 0.00 for projects of 6 -12 months and projects of Greater than 12 months for Assimilation as well. This could also mean that for Acquisition, projects less than 6 months and those of 6 – 12 months perceived Absorptive Capacity different as did projects of less than 6 months and those of 6 – 12; and projects of 6 -12 months and projects of Greater than 12 months respectively for Assimilation.

This could possibly mean that these project organisations seek out new knowledge and analyse it different in regards to the professions of Architecture and Quantity Surveying which could affect the level and nature of external knowledge coming into the project organisation. Furthermore, there are differences in how the construction project organisations seek external knowledge for

effective project delivery given the duration spent on the project at hand. While literature has revealed the utilisation of external knowledge in project organisations, how professions specifically perceived Absorptive Capacity and its use in projects of varying duration has been sparsely looked into.

4.3   Appraising the Incidence of Ambidexterity in Construction Project Organisations

Construction project organisations have been found to engage more in exploitative activities than explorative activities as given their temporary nature. However, as research as shown that despite their exploitive nature, construction project organisations seek out new processes and routines with regards to the project for which they are assembled, thus having a potential for explorative activities. As such, the potential for Ambidexterity in these project organisations was researched and the sections 4.3.1 and 4.3.2 contain the descriptive and inferential analysis, respectively, of the investigation.

4.3.1   Descriptive Analysis of Ambidexterity in Construction Project Organisations

The final information retrieved comprised asking the respondents the extent to which they disagreed or agreed with outlined activities their respective project organisations engaged in while working on the projects. These activities were sub-themed into Exploitation activities and Exploration activities, and served as the measures for Ambidexterity in the construction project organisations in order to investigate their potential for Ambidexterity in enhancing performance and project delivery. Table 4.8 shows the results from the mean distribution of the data collected based on a Likert scale of 1-5 which comprises 1 – *Strongly Disagree*, 2 – *Disagree*, 3 – *Neutral*, 4 – *Agree*, and 5 – *Strongly Agree*.

Table 4.8   Mean Distribution of the Measures of Ambidexterity in Construction Project Organisations

Activities	Mean	Standard Deviation	Skewness	Standard Error
Improving current processes and techniques to satisfy clients	4.08	0.71	-0.31	.255
Improving reliability of projects delivered	4.02	0.84	-0.99	.255
Seeking ways to partner with existing clients	4.03	0.73	-0.41	.255
Exploring diverse means of using internal resources to reduce production costs	4.10	0.77	-0.79	.255
Mitigating conflicts within the organisation during project delivery	4.17	0.73	-0.27	.255
Using interim feedbacks to ensure clients' satisfaction	4.09	0.78	-1.05	.255
Seeking out new and efficient processes for project delivery	3.94	0.79	-0.90	.255
Achieving project delivery based on its ability to explore new technologies	3.88	0.90	-0.80	.255
Engaging in projects that novel to the organisation	3.67	0.81	-0.39	.255
Seeking new and creative ways to satisfy clients' demands	4.12	0.75	-0.54	.255

Table 4.8 shows that the construction project organisations engage in exploitative and explorative activities; the balance of these activities constituting ambidexterity. The responses have mean values greater than 3.60 which indicate responses agree with outlined activities above which imply that despite being temporary in nature and predominately exploitative, majority of construction project organisation do possess the potential for ambidexterity thereby, combining the use of their current processes with seeking new and efficient ways to enhance project delivery.

Table 4.8 contains the average mean value which represented the responses to each measure; the standard deviation which showed how diverse the responses were in their mean value provided the standard deviation value was greater than 0.50; the skewness detailing how normal or abnormal the distribution was; and the significant error confirmed how normal or abnormal the distribution was given how different the skewness was from its standard error. If the skewness value is more than double the standard error value, then the distribution is an abnormal one, thus,

its mean cannot adequately represent the measure. The standard error for the measures of Ambidexterity is 0.255 and double its value is 0.510. As the results show, majority of the mean distribution was skewed, thus, most of the mean values cannot adequately represent the measures from which they were derived. Thus, the percentage distribution was analysed to have an adequate representation of the sample responses retrieved.

Table 4.9   Percentage Distribution of the Measures of Ambidexterity in Construction Project Organisations

	SD	DA	NT	AG	SA
Seeking out new and efficient processes for project delivery	1	3	17	57	22
Achieving project delivery based on its ability to explore new technologies	1	8	17	51	23
Engaging in projects that novel to the organisation	-	9	27	52	12
Seeking new and creative ways to satisfy clients' demands	-	2	16	49	33
Improving current processes and techniques to satisfy clients	-	1	18	53	28
Improving reliability of projects delivered	1	5	13	53	28
Seeking ways to partner with existing clients	-	2	18	54	26
Exploring diverse means of using internal resources to reduce production costs	-	5	11	54	30
Mitigating conflicts within the organisation during project delivery	-	-	19	45	36
Using interim feedbacks to ensure clients' satisfaction	1	3	12	55	29

*SD – Strongly Disagree *DA – Disagree *NT – Neutral *AG – Agree *SA – Strongly Agree

Table 4.9 depicts the percentage distribution of the measures of ambidexterity and these percentages were derived from the overall 89 responses; producing the proportions shown in the table. The dimensions of Ambidexterity investigated in this research were Exploitation and Exploration as observed in prior literature and the responses to the measures showed that, on an average, 15% - 36% of the respondents indicated that their respective project organisations do not possess the potential for Ambidexterity and 64% - 84% indicate that their construction project organisations do possess potential for Ambidexterity in efficient project delivery. This infers that construction project organisations are capable of using their current process and routines while seeking new capabilities to effectively deliver projects.

4.3.2   Inferential Analysis of Ambidexterity in Construction Project Organisations

Another One-Way ANOVA test was conducted to measure differences in responses to the measures of Ambidexterity using the information in section 1 as criteria. The table below highlights the areas with significant differences as shown.

Table 4.10   Differences in Responses to the Measures of Ambidexterity in Construction Project Organisations

Variable	Sig.					
	Profession	**Time Spent on Project**	**Project Type**	**Complexity**	**Project Status**	**Project Value**
Exploitation (A)	0.141	0.037	0.444	0.809	0.651	0.653
Exploration (A)	0.026	0.002	0.753	0.450	0.569	0.819

* The mean difference is significant at the 0.05 level.

The results in Table 4.10 showed that information provided for the measures of Ambidexterity in construction project organisations had significant differences using Section 1 as criteria specifically in regards to profession of the respondents and the duration spent on the project. Using professions as a basis, responses to the exploration component of Ambidexterity had a significant mean difference value of 0.026. Using the duration spent on project, responses to the Exploitation component had a significant mean difference value of 0.037 and responses to the Exploration component had a value of 0.002. These values fell below the 0.050 significance level signifying their differences. A Post Hoc test was conducted to determine precisely where the differences were in the responses.

Table 4.11   Differences in Information on Ambidexterity using Professions as a Criterion

Dependent Variable	(I) Respondent's Profession	(J) Respondent's Profession	Sig.
Exploitation (A)	Architecture	Quantity Surveying	0.181
		Civil Engineering	0.453
		Project Management	0.996
	Quantity Surveying	Architecture	0.181
		Civil Engineering	0.972
		Project Management	0.597
	Civil Engineering	Architecture	0.453
		Quantity Surveying	0.972
		Project Management	0.649
	Project Management	Architecture	0.996
		Quantity Surveying	0.597
		Civil Engineering	0.649
Exploration (A)	Architecture	Quantity Surveying	0.058
		Civil Engineering	0.089
		Project Management	0.959
	Quantity Surveying	Architecture	0.058
		Civil Engineering	0.686
		Project Management	0.545
	Civil Engineering	Architecture	0.089
		Quantity Surveying	0.686
		Project Management	0.288
	Project Management	Architecture	0.959
		Quantity Surveying	0.545
		Civil Engineering	0.288

* The mean difference is significant at the 0.05 level.

Table 4.11 above contains the results of the Post Hoc test which revealed that differences in responses to Exploration were between the information provided by Architects and information provided by Quantity Surveyors. The significant mean difference was 0.058 and this could mean that exploration varies across profession particularly Architecture and Quantity Surveying which could affect how the project organisation seek out new technologies and processes to improve performance. Likewise, Table 4.12 below contains the results of Post Hoc test done using duration spent on project as a criterion.

Table 4.12   Differences in Information on Ambidexterity using Duration Spent on Project as a Criterion

Dependent Variable	(I) Time on Last Project	(J) Time on Last Project	Sig.
Exploitation (A)	Less than 6 months	6-12 months	0.764
		Greater than 12 months	0.284
	6-12 months	Less than 6 months	0.764
		Greater than 12 months	0.035
	Greater than 12 months	Less than 6 months	0.284
		6-12 months	0.035
Exploration (A)	Less than 6 months	6-12 months	0.244
		Greater than 12 months	0.251
	6-12 months	Less than 6 months	0.244
		Greater than 12 months	0.001
	Greater than 12 months	Less than 6 months	0.251
		6-12 months	0.001

* The mean difference is significant at the 0.05 level.

Using the duration spent on project as a basis, responses to the exploitation activities contained differences between projects on which 6 -12 months were spent and those on which greater than 12 months were spent. This had significant mean difference value of 0.035. This could mean that exploitation activities could vary between projects of 6-12 months and those greater than 12 months. Responses to exploration activities, similarly, contained differences between projects of 6-12 months and greater than 12 months which has a significant mean difference value of 0.001 also implying a variance on exploration activities between projects of 6-12 months and greater than 12 months. These results can infer that level of ambidexterity in construction project organisations can possibly be affected by the professions involved and the duration spent on a project can affect the extent to which the project organisations use current processes or seek out new routines.

4.4 Effect of Absorptive Capacity on Ambidexterity in Construction Project Organisations

A fundamental part of the research involved using the information from data collected to establish the relationship between the Absorptive Capacity and Ambidexterity in project organisations. To the end, the Partial Least Squares Structural Equation Model statistical tool was used to relate the two concepts using the aspects of absorptive capacity which included acquisition, assimilation, transformation, exploitation and implementation; as well as the exploitation and exploration activities of ambidexterity. This comprised using the PLS-SEM software to derive a Path Model depicting a relationship between Absorptive Capacity and Ambidexterity using their latent variables, that is, their aspects.
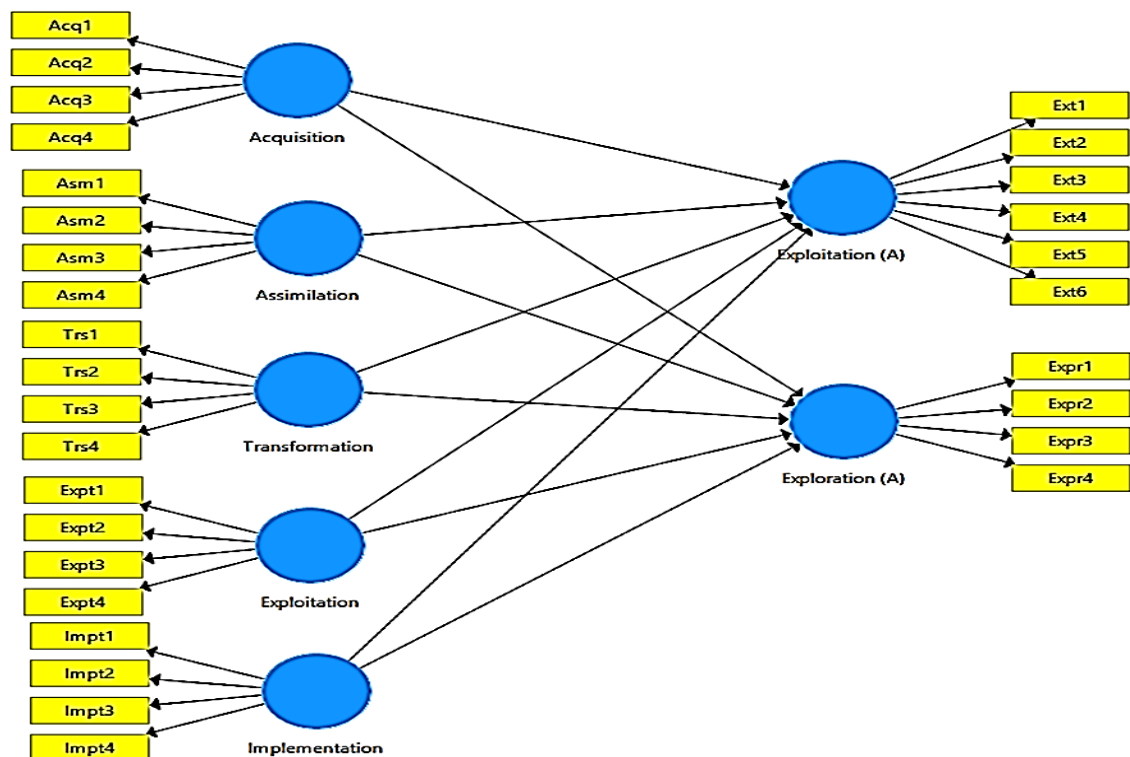

Figure 4.1   The Relationship between Absorptive Capacity and Ambidexterity in Construction Project Organisations

The Path Model generated, as shown in Figure 4.1, comprised the variables, represented by blue circles, having their measures or indicators represented in yellow rectangles. The relationship between the variables and measures are called the Outer Model. The latent variables of Absorptive Capacity were to the left and Ambidexterity to the right in blue circles with their respective indicators in yellow boxes. For absorptive capacity, the variables are the aspects Acquisition, Assimilation, Transformation, Exploitation and Implementation. For ambidexterity, the variables are the components Exploitation activities and Exploration activities. Their indicators include Asq1 to Acq4 (Acquisition); Asm1 to Asm4 (Assimilation); Trs1 to Trs4 (Transformation); Expt1 to Expt4 (Exploitation); and Impt1 to Impt4 (Implementation) for Absorptive Capacity as well as Ext1 to Ext6 (Exploitation activities) and Expr1 to Expr4 (Exploration) for Ambidexterity. These are the measures which contain data about the variables and with arrows extending from the variables to their measures, these outer models are reflective.

The data was analysed using the PLS-SEM statistical tool to determine the relationship between Absorptive Capacity and Ambidexterity as well as the effect of such relationship in construction project organisations across Nigeria. This was done to achieve objective four of the research. A PLS Algorithm analysis was conducted to determine the reliability and validity of the relationship between the indicators and variables in order to determine whether to or not to proceed to the relationship between variables, that is, the independent and dependent constructs. This was done using three tests which included Internal Consistency Reliability, Composite Reliability, and Convergence validity. The Internal Consistency Reliability test measures the estimated reliability of the indicators of the variables and indicators with values less than 0.708 are deemed unreliable. The Composite Reliability combines the Internal Consistency with the Indicator Reliability test which measures reliability using the different indicators assigned to a

variable rather one at a time. This test uses 0.60 to 0.70 as its acceptable levels and values less than these are considered unreliable. The Convergent Validity test measures the extent to which an indicator of a construct or variable positively correlates with other indicators of the same construct. This lays emphasis on the Average Variance Extracted (AVE) which measures the communality of the indicators, that is, how closely they correlate with each other in reflecting their variable. For an indicator to be acceptable, it is required to have a value of 0.50 or greater which means that the indicator can represent the variable it is assigned to.

4.4.1 Validity and Reliability of Outer Model

This first run was done to establish the reliability and validity of the indicators assigned to the Absorptive Capacity and Ambidexterity latent variables in order to determine if these indicators can be used to establish a relationship depicting the effect of the independent and dependent variables on each other. A path model generated from the initial PLS Algorithm analysis and shown in Figure 4.2.
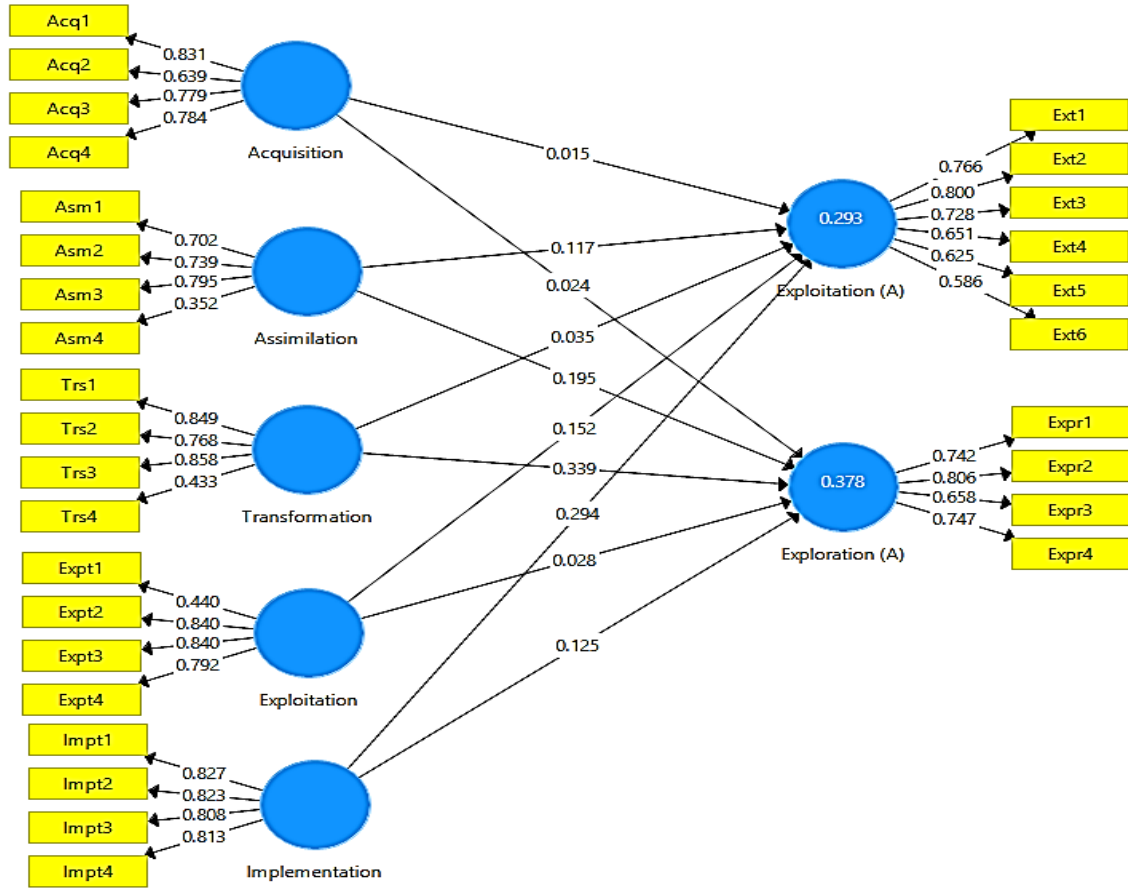
Figure 4.2   Initial Model showing both the Measurement and Structural models

Figure 4.2 displays the results of the first PLS-SEM algorithm test which was used to determine how reliable and valid the indicators, of Absorptive Capacity and Ambidexterity latent variables, are. For Absorptive Capacity, the indicators of Acquisition, Acq1 to Acq4, had values of 0.831, 0.639, 0.779, and 0.784 respectively. Indicators of Assimilation, Asm1 to Asm4, had values of 0.702, 0.739, 0.795, and 0.352 respectively. Trs1 to Trs4, for Transformation, had values of 0.849, 0.768, 0.858, and 0.433. For Exploitation, Expt1 to Expt4 had the values 0.440, 0.840, 0.840, and 0.792 respectively. And lastly for implementation, Impt1 to Impt4 had the values 0.827, 0.823, 0.808, and 0.813 respectively. For Ambidexterity, Exploitation activities had values of 0.766, 0.800, 0.728, 0.651, 0.625, and 0.586 for its indicators, Ext1 to Ext6

respectively. And for Exploration activities, Expr1 to Expr4 had the values 0.742, 0.806, 0.658, and 0.747 respectively. From this initial test, the indicator reliability showed that following indicators were highlighted for removal: Acq2 (0.639); Asm4 (0.352); Expr3 (0.658); Expt1 (0.440); Ext4 (0.651); Ext5 (0.625); Ext6 (0.586); and Trs 4 (0.433). These indicators had values of less than 0.708 which meant they are unsuitable to measure their respectively variables, thus, unreliable for the processing of the Structural Model. However, the Convergent test revealed the following as shown in Table 4.13.

Table 4.13   Results for Outer Model (1st Run)

Latent Variable	Indicators	Indicator Reliability	Composite Reliability	Average Variance Extracted (AVE)
Acquisition	Acq1	0.831	0.846	0.580
	Acq2	0.639		
	Acq3	0.779		
	Acq4	0.784		
Assimilation	Asm1	0.702	0.752	0.449
	Asm2	0.739		
	Asm3	0.795		
	Asm4	0.352		
Transformation	Trs1	0.849	0.827	0.559
	Trs2	0.768		
	Trs3	0.858		
	Trs4	0.433		
Exploitation	Expt1	0.440	0.828	0.558
	Expt2	0.840		
	Expt3	0.840		
	Expt4	0.792		
Implementation	Impt1	0.827	0.890	0.669
	Impt2	0.823		
	Impt3	0.808		
	Impt4	0.813		
Exploitation (A)	Ext1	0.766	0.848	0.486
	Ext2	0.800		
	Ext3	0.728		
	Ext4	0.651		
	Ext5	0.625		
	Ext6	0.586		
Exploration (A)	Expr1	0.742	0.828	0.548
	Expr2	0.806		
	Expr3	0.658		
	Expr4	0.747		

Table 4.13 showed results of the Composite Reliability and Convergent Validity tests in an attempt to determine which indicator were most unsuitable for the Path Model and needed to be removed. The composite reliability produced values of 0.846 for Acquisition, 0.752 for Assimilation, 0.827 for Transformation, 0.828 for Exploitation, 0.890 for Implementation, 0.848 for Exploitation activities and 0.828 for Exploration activities which meant the indicators collectively were reliable for their variables as these values were all greater than 0.708. However, the Convergent Validity results showed otherwise with values of 0.580 for Acquisition, 0.449 for Assimilation, 0.559 for Transformation, 0.558 for Exploitation, 0.669 for Implementation, 0.486 for Exploitation activities and 0.548 for Exploration activities. Using the Average Variance Extracted (AVE) with a criterion of greater than 0.50, values that are less were looked into for unreliable indicators and those indicators were removed before proceeding with further tests. As such, Assimilation and Exploitation activities which had values of 0.449 and 0.486 respectively, had their indicators Asm4 (0.352); Ext6 (0.586) were removed as well as Expt1 (0.440) to strengthen the reliability of the Outer Model. The PLS Algorithm was run again to analyse the removal of the above indicators and its effect on the Composite Reliability and AVE.

4.4.2   Development of the Structural Model

The PLS Algorithm was run a second time to confirm the reliability and validity of the current indicators after the unsatisfactory indicators were removed. Below were the findings of the analysis:
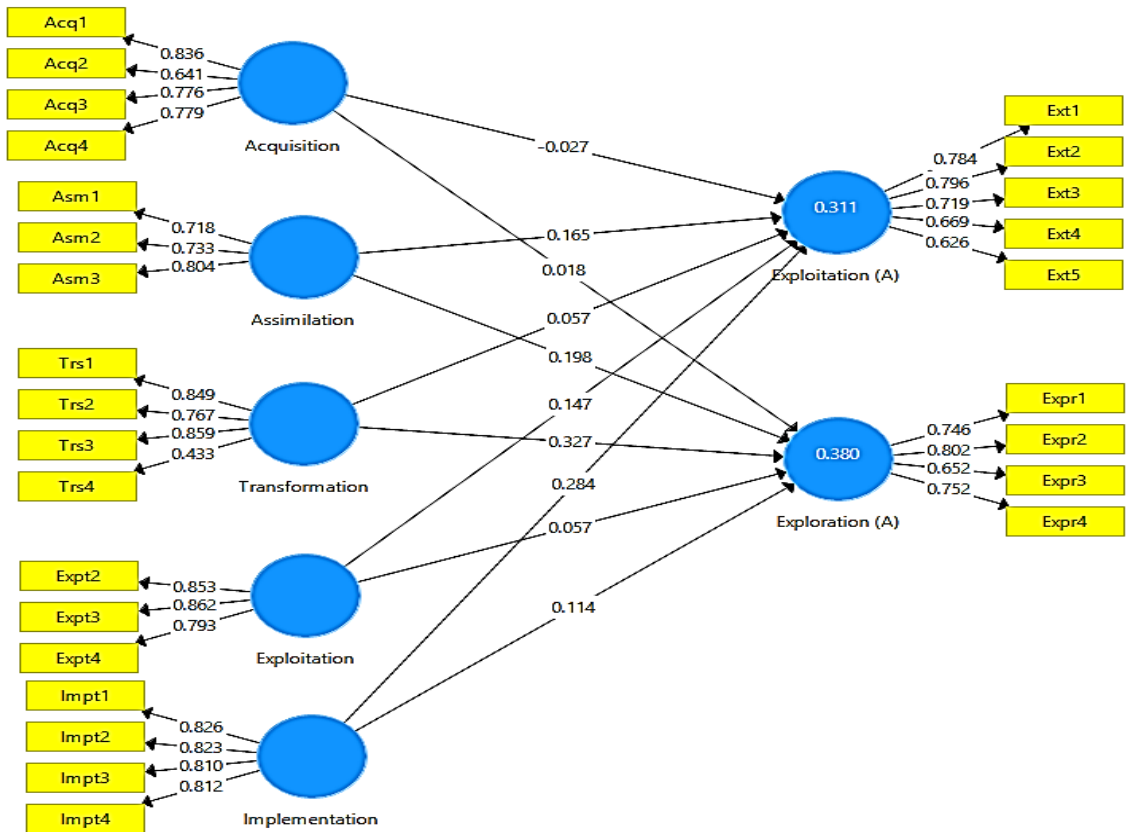
Figure 4.3   **Final PLS Model Showing both Measurement and Structural models**

Figure 4.3 displays the results of the second PLS-SEM algorithm test which was used to determine how reliable and valid the current indicators of Absorptive Capacity and Ambidexterity latent variables are. For Absorptive Capacity, the indicators of Acquisition, Acq1 to Acq4, had values of 0.836, 0.641, 0.776, and 0.779 respectively. Indicators of Assimilation, Asm1 to Asm3, had values of 0.718, 0.733, and 0.804 respectively. Trs1 to Trs4, for Transformation, had values of 0.849, 0.767, 0.859, and 0.433. For Exploitation, Expt2 to Expt4 had the values 0.853, 0.862, and 0.793 respectively. And lastly for implementation, Impt1 to Impt4 had the values 0.826, 0.823, 0.810, and 0.812 respectively. For Ambidexterity, Exploitation activities had values of 0.784, 0.786, 0.719, 0.669, and 0.626 for its indicators, Ext1 to Ext5 respectively. And for Exploration activities, Expr1 to Expr4 had the values 0.746, 0.802,

0.652, and 0.752 respectively. Despite changes in values from the previous Outer Loadings, the table above showed values that still fell below the acceptable range of greater than 0.708. While most indicators were above the value of 0.708, making them acceptable, the following indicators fell below and were highlighted for removal: Expr3 (0.652); Ext4 (0.699); Ext5 (0.626); and Trs4 (0.433). As with the previous algorithm run, the Composite Reliability and Convergent Validity test were done to accurately determine which indicators to further remove or to proceed to the Structural Model. Table 4.14 contains the results produced.

Table 4.14   Results for Outer Model (2nd Run)

Latent Variable	Indicators	Indicator Reliability	Composite Reliability	Average Variance Extracted (AVE)
Acquisition	Acq1	0.836	0.846	0.580
	Acq2	0.641		
	Acq3	0.776		
	Acq4	0.779		
Assimilation	Asm1	0.718	0.796	0.566
	Asm2	0.733		
	Asm3	0.804		
Transformation	Trs1	0.849	0.827	0.559
	Trs2	0.767		
	Trs3	0.859		
	Trs4	0.433		
Exploitation	Expt2	0.853	0.875	0.700
	Expt3	0.862		
	Expt4	0.793		
Implementation	Impt1	0.826	0.890	0.669
	Impt2	0.823		
	Impt3	0.810		
	Impt4	0.812		
Exploitation (A)	Ext1	0.784	0.843	0.521
	Ext2	0.796		
	Ext3	0.719		
	Ext4	0.669		
	Ext5	0.626		
Exploration (A)	Expr1	0.746	0.828	0.548
	Expr2	0.802		
	Expr3	0.652		
	Expr4	0.752		

The Composite Reliability produced values of 0.846 for Acquisition, 0.796 for Assimilation, 0.827 for Transformation, 0.875 for Exploitation, 0.890 for Implementation, 0.843 for Exploitation activities and 0.828 for Exploration activities which meant the indicators collectively were reliable for their variables as these values were all greater than 0.708. There were changes to the values for Assimilation, Exploitation, and Exploitation activities. Similarly, the Convergent Validity results showed values of 0.580 for Acquisition, 0.556 for Assimilation, 0.559 for Transformation, 0.700 for Exploitation, 0.669 for Implementation, 0.521 for Exploitation activities and 0.548 for Exploration activities. Given the current results, the indicators did not need any removal and were found reliable for the processing of the Structural Model as their composite values all exceeded 0.708 and AVE values exceeded 0.50, thus, a reliable model depicting the relationship between Absorptive Capacity and Ambidexterity in the construction project organisations can be produced.
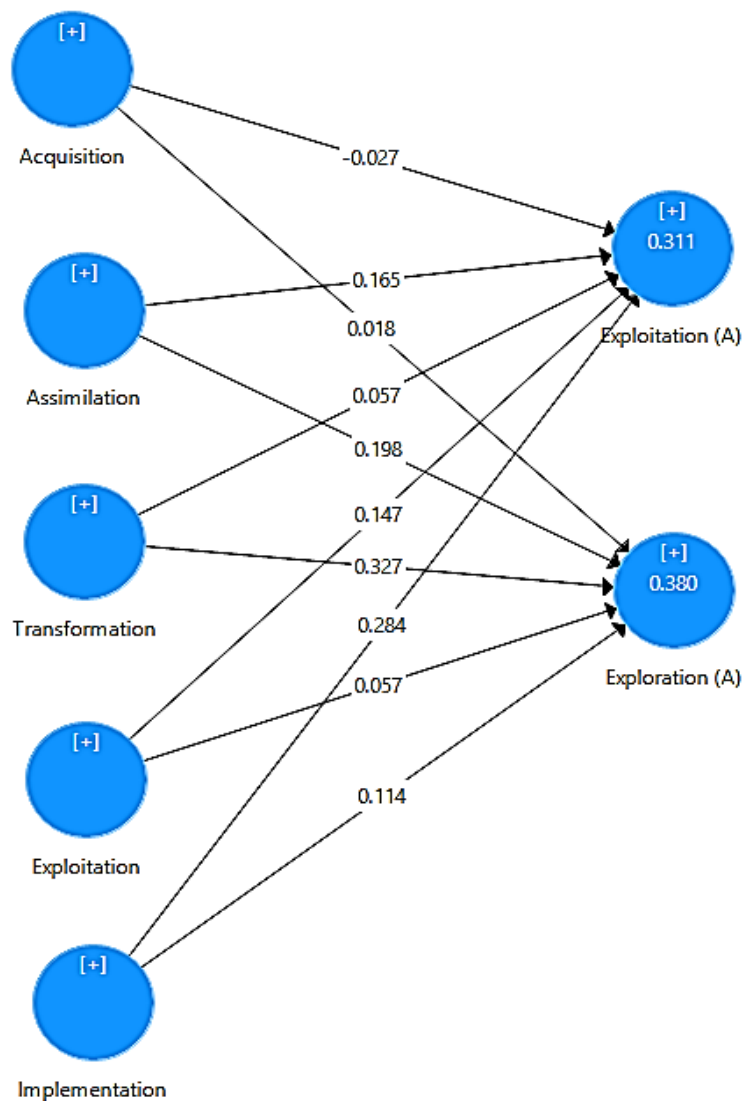
Figure 4.4   Final PLS Model showing only the Structural Model

The Structural Model in Figure 4.4 displayed the relationships between the variables of Absorptive Capacity and the variables of Ambidexterity with their derived path coefficients from the last PLS algorithm run. The Structural Model is the relationship between the variables without their indicators present. This is a result of the indicators in the previous Path Model being acceptable and suitable for the analysis of the Inner Model. The variables to the left are the measures of Absorptive Capacity and to the right are the measures of Ambidexterity. The arrows

are directed from the Absorptive Capacity constructs to Ambidexterity latent variables in order to establish the effect of their relationship. Within the Ambidexterity constructs are values called R Square values. These are the coefficients of determination and they are used to measure the model's predictability levels as well as represent the effect of the independent variables on the dependent variables. As PLS-SEM establishes cause-effect relationship structural model with use of hypotheses, the R Square values in conjunction with Path Coefficients of the model are used to determine if the hypotheses are to be accepted or rejected. The Path Coefficients derived were as follows:

Table 4.15   Path Coefficients of Structural Model

	Exploitation (A)	Exploration (A)
Acquisition	-0.027	0.018
Assimilation	0.165	0.198
Transformation	0.057	0.327
Exploitation (A)		
Exploration (A)		
Exploitation	0.147	0.057
Implementation	0.284	0.114

The table above contains the Path Coefficients of the Absorptive Capacity variables on the variables of Ambidexterity which are values representing the relationship Acquisition, Assimilation, Transformation, Exploitation and Implementation have on the Exploitation activities and Exploration activities. The relationship between Acquisition and Exploitation activities had a coefficient of -0.027 and the relationship between Acquisition and Exploration activities had a coefficient of 0.018. Assimilation had a path coefficient of 0.165 with Exploitation activities and 0.198 with Exploration activities. The relationship between Transformation and Exploitation activities had a path coefficient of 0.057 and the relationship between Transformation and Exploration activities had a coefficient of 0.327. Exploitation had a path coefficient of 0.147 with Exploitation activities and 0.057 with Exploration activities.

Lastly, Implement had a coefficient of 0.284 with Exploitation activities and 0.114 with Exploration activities. All the path coefficients were of a positive value, that is, greater than 0.00 with the only exception being the path coefficient of Acquisition on Exploitation activities which had a value of -0.027. This means that with the exception of Acquisition on Exploitation activities, all other coefficients were deemed to be statistically significant. However, that these values are positive is not enough to conclude that which leads to the R Square test which truly determine their significance. The R Square values are shown in Table 4.16.

Table 4.16 **Coefficients of Determination**

	R Square	R Square Adjusted
Exploitation (A)	0.311	0.269
Exploration (A)	0.38	0.343

This table presents the Coefficients of Determination or R Square values which used to establish the significance of the path coefficients between the independent variables of Absorptive Capacity and the dependent variables of Ambidexterity in the Structural Model. As such, the PLS Algorithm test produces both the R Square Value and an Adjusted R Square value which serves as a range to measure the significance of the model's established path coefficient values. For the hypotheses drawn about the effect of the independent variables on the dependent variables, if the values of the path coefficient fall within the range of R Square and Adjusted R Square values, they are significant and support the hypotheses. If this is not is the case, the coefficients are insignificant and the hypotheses are rejected. This was confirmed using the PLS-SEM Bootstrapping test.

4.4.3   Significance of the Structural Model

The PLS-SEM Bootstrapping was done to resample the path coefficients from the previous PLS Algorithm analysis (Run 2) in order to determine standard errors of the coefficients and process their statistical significance. The results were depicted in the table below.

Table 4.17   Path Coefficient Significance (Bootstrapping Run)

Relationships	Original Sample	Mean	Standard. Deviation	t Values
Acquisition -> Exploitation (A)	-0.027	-0.008	0.124	0.217
Acquisition -> Exploration (A)	0.018	0.046	0.127	0.139
Assimilation -> Exploitation (A)	0.165	0.165	0.172	0.957
Assimilation -> Exploration (A)	0.198	0.186	0.173	1.145
Transformation -> Exploitation (A)	0.057	0.054	0.168	0.338
Transformation -> Exploration (A)	0.327	0.317	0.157	2.078
Exploitation -> Exploitation (A)	0.147	0.151	0.165	0.891
Exploitation -> Exploration (A)	0.057	0.058	0.169	0.340
Implementation -> Exploitation (A)	0.284	0.285	0.141	2.010
Implementation -> Exploration (A)	0.114	0.123	0.161	0.708

Table 4.17 showed that the coefficients of the relationship between the variables of Absorptive Capacity and Ambidexterity and their significance as a result of the PLS-SE bootstrapping run. For the relationships to be significant, they must have t values of greater than 1.960. Acquisition and Exploitation activities had a path coefficient of -0.027 and a t value of 0.217 which meant that this relationship was not significant. This was similar for Acquisition and Exploration activities with a path coefficient of 0.018 and t value of 0.139; Assimilation and Exploitation activities with a path coefficient of 0.165 and t value of 0.957; Assimilation and Exploration activities with a path coefficient of 0.198 and t value of 1.145; Exploitation and Exploitation activities with a path coefficient of 0.147 and t value of 0.891; Exploitation and Exploration activities with a path coefficient of 0.057 and t value of 0.340; Implementation and Exploration activities with a path coefficient of 0.114 and t value of 0.708; and Transformation and Exploitation activities with a path coefficient of 0.057 and t value of 0.338. The only exceptions

were the relationships between Implementation and Exploitation activities which have a path coefficient of 0.284 and a *t* value of 2.010; and Transformation and Exploration with a path coefficient of 0.327 and a *t* value of 2.078. These two relationships were significant.

While the bootstrapping showed that there was little significance to the relationship between the aspects of Absorptive Capacity and the components of Ambidexterity, the hypothesed effects of the relationships remained unconfirmed. Using the t values as the new path coefficients as part of the processes of the bootstrapping run, the Structural Model was generated. With the t values serving as the new path coefficients, the bootstrapping run produced *p* values which provide a significance of the relationships based on an error margin of 0.05 to confirm the effects of the relationships using hypotheses drawn from literature. To determine the effect of Absorptive Capacity on Ambidexterity, the PLS-SEM makes use of the relationship between their variables established in the Structural Model and the hypotheses gotten from literature. There were 10 hypotheses drawn which assumed the significant effects of the Acquisition, Assimilation, Transformation, Exploitation and Exploration aspects on the Exploitation and Exploration activities and these are:

H1. Acquisition has no significant effect with Exploitation activities in construction project organisations.

H2. Acquisition has a significant effect with Exploration activities in construction project organisations.

H3. Assimilation has a significant effect with Exploitation activities in construction project organisations.

H4. Assimilation has a significant effect with Exploration activities in construction project organisations.

H5. Transformation has a significant effect with Exploitation activities in construction project organisations.

H6. Transformation has no significant effect with Exploration activities in construction project organisations.

H7. Exploitation has a significant effect with Exploitation activities in construction project organisations.

H8. Exploitation has no significant effect with Exploration activities in construction project organisations.

H9. Implementation has a significant effect with Exploitation activities in construction project organisations.

H10. Implementation has no significant effect with Exploration activities in construction project organisations.

The p values, which measure the significance of the relationship between the Absorptive Capacity and Ambidexterity variables, were used to validate the hypotheses. Table 4.18 contains the results.

Table 4.18 Effect of Absorptive Capacity on Ambidexterity in Construction Project Organisations

Relationships	Hypotheses	Coefficients	p values*	Significance Level
Acquisition -> Exploitation (A)	H1	0.217	0.829	Accept
Acquisition -> Exploration (A)	H2	0.139	0.890	Reject
Assimilation -> Exploitation (A)	H3	0.957	0.339	Reject
Assimilation -> Exploration (A)	H4	1.145	0.253	Reject
Transformation -> Exploitation (A)	H5	0.338	0.736	Reject
Transformation -> Exploration (A)	H6	2.078	0.038	Reject
Exploitation -> Exploitation (A)	H7	0.891	0.373	Reject
Exploitation -> Exploration (A)	H8	0.340	0.734	Accept
Implementation -> Exploitation (A)	H9	2.010	0.045	Accept
Implementation -> Exploration (A)	H10	0.708	0.479	Accept

*p value is significant at less than 0.05

Table 4.18 shows the effect of absorptive capacity on ambidexterity, thus, accepting or rejecting the hypotheses given. Any relationship with coefficients greater than 1.960 and p values less than 0.05 are considered to be significant and the effect confirmed. A total of 10 hypotheses were drawn for this study and only 4 were accepted; **H1, H8, H9** and **H10** with the remaining being rejected. However, the results of the table show that absorptive capacity has a significant effect on ambidexterity in construction project organisations in two specific areas. These include their transformation of external knowledge to internal processes which has a significant effect how the construction project organisations explore new processes to enhance project delivery (p-value of 2.078); and the implementation of the newly internalised processes which has a significant effect on the construction project organisation's exploitation of their current capabilities (p value of 2.010). The other relationships were indicated to have no significant effect. This implies that absorptive capacity does not necessarily influence ambidexterity in enhancing construction project organisation performance and project delivery.

Chapter 5

Summary of Findings, Conclusion and Recommendation

The aim of the research was to investigate the effect of Absorptive Capacity on Ambidexterity within construction project organisations with a view to enhancing the usability of both concepts in project delivery as such had been explored and observed to improve organisational performance and project delivery in other industries such as manufacturing and technology. In this regard, four objectives were drawn to achieve the purpose of this research and data was collected from construction project organisation participants to fulfill the objectives. The data retrieved and the resulting information showed the measures of Absorptive Capacity and Ambidexterity; the capability for Absorptive Capacity and Ambidexterity in these construction project organisations based on the identified measures as well as the extent to which the utilisation of external knowledge has an effect on the current routines and future capacities within the organisations. These are discussed in detail in the sections below.

5.1 Summary of Findings

In line with the first objective, identifying the measures of absorptive capacity and ambidexterity in such organisations, literature was used to highlight various aspects of these concepts and their measures for the purpose of the research. The aspects of absorptive capacity were Acquisition, Assimilation, Transformation, Exploitation and Implementation as identified by Kamal and Flanagan (2014) in construction project organisations. In general literature, these aspects comprised the first four. Kamal and Flanagan (2014) while acknowledging these, however, proposed that Exploitation be expanded to Exploitation and Implementation as this would be more thorough especially for project organisations given their temporary nature. Activities

representing these aspects served as measures of Absorptive Capacity. For Ambidexterity, the exploitation and exploration components were identified (Eriksson, 2014; Petro *et al.*, 2019) with activities in these regards serving as measures. These measures formed crucial parts the questionnaires used for data collection form the project organisation's participants and were further used to address the second objective which involved appraising the level of absorptive capacity and ambidexterity in construction project organisations in Nigeria.

In fulfilling the second and third objectives, the appraisal of the incidence of absorptive capacity and ambidexterity in the construction project organisations required information from the responses to section 2 of the questionnaire which comprised information on Absorptive Capacity and Ambidexterity in these organisations. The respondents provided information that agreed or disagreed their organisations allowed them to seek and utilise external knowledge using the identified measures of Absorptive Capacity to which 72% of the respondents agreed that their organisations did and 28% disagreed which inferred that majority of construction projects do have allow for the utilisation of external knowledge, thus, they have possess the potential for Absorptive Capacity. Similarly, with the measures of Ambidexterity, the respondents were asked to provide information that agreed or disagreed their organisations engaged in Exploitation activities and Exploration activities. 79% of the respondents agreed and 21% disagreed indicating that majority of the project organisations used both current routines and sort new processes to handle projects at hand, thus, possessing the potential for Ambidexterity.

In line with the fourth and final objective, determining the effect of Absorptive Capacity and Ambidexterity in construction project organisations, the PLS-SEM was used to prepare a Path Model which represented the relationship between the variables of Absorptive Capacity and variables of Ambidexterity and their respective measures. After two PLS algorithm run

comprising Internal Consistency Reliability, Composite Reliability, and Convergence validity tests, which verified the measures as reliable, a Structural Model was produced and its initial coefficients confirmed most relationships between the variables as statistically significant, however, further readings using the determination coefficients confirmed otherwise as subsequent results showed that only two relationships were statistically significant. A possible reason for the non-significant relationships can be either of the following the 0.05 error margin used in the PLS-SEM analysis was too strict.

The research made use of the results of the PLS-SEM analysis from the previous objective with hypotheses drawn from literature. These hypotheses were tested using the significance values with a 0.05 error margin which showed that while four hypotheses were accepted, only two relationships were validated; Transformation had a significant effect on Exploration activities and Implementation has a significant effect on Exploitation activities. Thus, in determining the effect of Absorptive Capacity on Ambidexterity in construction project organisations, only two relationships between the latent variables had a significant effect.

5.2   Conclusion

The study investigated the effect of Absorptive Capacity on Ambidexterity within construction project organisations with a view to enhancing the usability of both concepts in project delivery and implies construction project organisations across Nigeria do, in fact, possess the potential and need for absorptive capacity as well as the enhancing their routines with newer processes given the increasing complexity of construction projects and client demands. While these concepts improve these organisations' ability to effectively delivery projects in their dynamic

industry, however, Absorptive Capacity does not a significant effect on Ambidexterity in construction project organisations.

5.3   Recommendations

This study recommends the following:

1. Given their nature, emphasis should be given to the transformation of external knowledge to internal capabilities; and the implementation of these improved capabilities as construction project organisations balance the use of their current routines with acquiring new processes.

2. As construction project organisations do possess potential for both absorptive capacity and ambidexterity, knowledge and awareness on the concepts are also recommended.

3. As this research focused on only the aspects of absorptive capacity and the components of ambidexterity, other areas such as dimensions, levels and mechanisms are yet to be explored in regards to the relationship between absorptive capacity and ambidexterity in construction project organisations and its effect thereof.

5.4   Contributions of Knowledge

This research adds to knowledge as shown in the following:

1. Construction project organisations identified the measures of absorptive capacity and ambidexterity; implying the usability of absorptive capacity and ambidexterity in enhancing project delivery.

2. Despite being temporary organisations, 43% - 85% of construction project organisations indicate incidences of activities pertinent absorptive capacity. This implies construction

project organisations do have the potential to utilise external knowledge towards achieving project objectives.

3. Construction project organisations are more exploitative than they are explorative. However, 64% - 84% of these organisations indicate that they engage in both exploitative and explorative activities on a given project implying construction project organisations do balance current routines while seeking newer processes to improve performance and project delivery.

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Appendix

Appendix A: The Questionnaire

Data Gathering for an M.Sc Research Project

DEPARTMENT OF QUANTITY SURVEYING
FACULTY OF ENVIRONMENTAL DESIGN
AHMADU BELLO UNIVERSITY
ZARIA-KADUNA STATE

Dear Respondent,

REQUEST FOR ASSISTANCE IN DATA COLLECTION FOR RESEARCH PROJECT

I am a postgraduate student with the above mentioned department undertaking my research towards earning a degree of Masters of Project Management. I would like to solicit your participation in the questionnaire survey by filling the attached questionnaire.

The research is geared towards understanding organisational ambidexterity and how it relates to absorptive capacity. Filling the attached questionnaire will take 20 to 30 minutes of your time and I would appreciate if you can fill it based on your knowledge of the project you are currently working on or a recent one you are very familiar with.

Information provided by you shall be strictly treated as confidential and will not in any way appear in the form given in the research work. Your valuable contributions towards the success of this work will be highly appreciated.

Thank you.

Yours Sincerely,

Musa, Stanley Majiyebo.
08035076409

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Data Gathering for an M.Sc Research Project

* Required

Section 1

1. Which of these professions best describes you? *

○ Architecture

○ Quantity Surveying

○ Structural Engineering

○ Civil Engineering

○ M&E Engineering

○ Project Management

○ Others

2. How long are/were you on the project? *

○ Less than 6 months

○ 6 - 12 months

○ Above 12 months

3. Nature of project for which you are providing information. *

○ Building Works

○ Civil Engineering Works

○ Heavy Engineering Works

○ Others

4. How complex is/was the project? *

○ Not Complex

○ Slightly Complex

○ Complex

○ Very Complex

○ Extremely Complex

5. Current status of the project *

○ Ongoing

○ Completed

○ Suspended

○ Abandoned

6. Kindly provide an approximate value of project *

○ Less than N500 million

○ N500 million to N1 billion

○ N2 billion to N5 billion

○ N6 billion to N10 billion

○ Greater than N10 billion

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Section 2

Given your knowledge of the project organisation for which you are providing information, indicate the extent you disagree/agree you were allowed to undertake/perform each of the activities outlined below.

Giving prevalence to new knowledge and technologies *

○ Strongly Disagree

○ Disagree

○ Neutral

○ Agree

○ Strongly Agree

Acquiring new knowledge critical to the organisation's activities *

○ Strongly Disagree

○ Disagree

○ Neutral

○ Agree

○ Strongly Agree

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Focusing on prototype development, novel techniques and processes *

○ Strongly Disagree

○ Disagree

○ Neutral

○ Agree

○ Strongly Agree

Relying on feedback to develop efficient product delivery *

○ Strongly Disagree

○ Disagree

○ Neutral

○ Agree

○ Strongly Agree

Establishing efficient means of communication amongst stakeholders *

○ Strongly Disagree

○ Disagree

○ Neutral

○ Agree

○ Strongly Agree

Using relevant technologies to handle knowledge sharing between consultants *

◯ Strongly Disagree

◯ Disagree

◯ Neutral

◯ Agree

◯ Strongly Agree

Providing allowance for proper processing and utilisation of new technologies *

◯ Strongly Disagree

◯ Disagree

◯ Neutral

◯ Agree

◯ Strongly Agree

Adapting existing structure of communication as per the task at hand *

◯ Strongly Disagree

◯ Disagree

◯ Neutral

◯ Agree

◯ Strongly Agree

Integrating new processes into the organisation's existing system *

○ Strongly Disagree

○ Disagree

○ Neutral

○ Agree

○ Strongly Agree

Revamping routines to facilitate paradigm shifts *

○ Strongly Disagree

○ Disagree

○ Neutral

○ Agree

○ Strongly Agree

Acquiring technologies that accommodate new processes and techniques *

○ Strongly Disagree

○ Disagree

○ Neutral

○ Agree

○ Strongly Agree

Changing existing approach in handling the project in its entirety *

○ Strongly Disagree

○ Disagree

○ Neutral

○ Agree

○ Strongly Agree

Adopting new processes into the organisation's current projects *

○ Strongly Disagree

○ Disagree

○ Neutral

○ Agree

○ Strongly Agree

Assessing organisational performance with new technologies *

○ Strongly Disagree

○ Disagree

○ Neutral

○ Agree

○ Strongly Agree

Acquainting current parties with new techniques and processes *

◯ Strongly Disagree

◯ Disagree

◯ Neutral

◯ Agree

◯ Strongly Agree

Improving project delivery as demands for services increase *

◯ Strongly Disagree

◯ Disagree

◯ Neutral

◯ Agree

◯ Strongly Agree

Interacting newly developed techniques and processes with new projects *

◯ Strongly Disagree

◯ Disagree

◯ Neutral

◯ Agree

◯ Strongly Agree

Expanding services offered based on the organisation's new system *

○ Strongly Disagree

○ Disagree

○ Neutral

○ Agree

○ Strongly Agree

Matching new services with market dynamics *

○ Strongly Disagree

○ Disagree

○ Neutral

○ Agree

○ Strongly Agree

Refining new technologies to keep up with client demands *

○ Strongly Disagree

○ Disagree

○ Neutral

○ Agree

○ Strongly Agree

Based on your experience working in this project, indicate the extent to which you disagree/agree that the organisation engages in the activities listed below.

Seeking out new and efficient processes for project delivery *

○ Strongly Disagree

○ Disagree

○ Neutral

○ Agree

○ Strongly Agree

Achieving project delivery based on its ability to explore new technologies *

○ Strongly Disagree

○ Disagree

○ Neutral

○ Agree

○ Strongly Agree

Improving reliability of projects delivered *

○ Strongly Disagree

○ Disagree

○ Neutral

○ Agree

○ Strongly Agree

Seeking ways to partner with existing clients *

○ Strongly Disagree

○ Disagree

○ Neutral

○ Agree

○ Strongly Agree

Exploring diverse means of using internal resources to reduce production costs *

○ Strongly Disagree

○ Disagree

○ Neutral

○ Agree

○ Strongly Agree

Mitigating conflicts within the organisation during project delivery *

○ Strongly Disagree

○ Disagree

○ Neutral

○ Agree

○ Strongly Agree

Using interim feedback to ensure clients' satisfaction *

○ Strongly Disagree

○ Disagree

○ Neutral

○ Agree

○ Strongly Agree

Back   Submit   ▬▬▬▬▬▬▬▬ Page 3 of 3

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