STRATEGIC PROJECT MANAGEMENT CONCEPT FOR EXECUTING RESEARCH AND DEVELOPMENT PROJECTS IN PUBLIC RESEARCH ORGANISATIONS IN NIGERIA: AN EMPIRICAL STUDY

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A thesis submitted in partial fulfilment of the requirements of Liverpool John Moores University for the degree of Doctor of Philosophy

January 2016

DECLARATION

LIVERPOOL JOHN MOORES UNIVERSITY

Candidate's declaration form (This form must be typed)

Note: This form must be submitted to the University with the candidate's thesis.

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School: Built Environment Degree for which thesis is submitted: PhD

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ABSTRACT

As observed from the reviewed literature, the execution of research and development (R and D) projects in Nigeria is challenged by many social, political and economic factors interacting in complex and dynamic ways. This interaction is reflected in the history of science and technology in Nigeria, its culture, legal systems, institutional frameworks and social capital. The economic and social development of Nigeria is critically dependent upon the ability to establish a competitive, productive and efficient industrial sector built on a strong technology base. This implies that her natural resources must be developed and utilised as inputs to industrial production and as direct products to improve the life of the population. Public research organisations (PROs) are considered to be critical to the survival of industries and to the achievement of self-reliance through the use of locally available raw materials.

This thesis explores the application of strategic project management (SPM) practices in the execution of R and D projects in PROs in Nigeria. The research employed a mixed method of quantitative and qualitative research in order to capture the experiences of project management practitioners with SPM practices in PROs in Nigeria. Although areas of variations in practice were identified, the major findings highlighted that there was a gap in the practical implementation of SPM. The findings also revealed key determinants associated with the implementation of SPM and the factors that affected its application in PROs in Nigeria.

The research findings were further synthesised into a framework, capturing ten key dimensions that must be taken into account in the execution of research and development projects. The determinants include having a project-based organisational structure, top management involvement in the project execution, strategic project leadership style, the appointment of a project team, the project team's competence, project alignment with organisational strategy, project prioritisation and selection, maximising R and D strategy, the project management process, and the SPM process.

The framework validation was a follow-up discussion, which was conducted with project management practitioners in the selected research organisations in Nigeria. Reflecting on their experiences in the management of R and D projects, the participants acknowledged that the proposed SPM framework and its ten key variables were fundamental to the effective execution of R and D projects in PROs in Nigeria. It was concluded that the use of such a framework would highlight areas that needed to be addressed in order to achieve effective execution of R and D projects in these organisations.

Keywords: Public research organisations (PROs), Research and development projects (R and D), Framework, Strategic project management (SPM), Project management practitioners, Project management, Nigeria.

DEDICATION

This thesis is dedicated to

The Most High God,

My beloved husband, Mr Damian Chidozie Ugonna

and

My children: Ogechi, Chukwudi, Onyekachi and Uchechukwu

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PREFACE

During the time of undertaking this research, a number of research papers were produced. They are:

Refereed journal publications:

1. Ugonna, C. U and Ochieng, E. G. (2015). Strategic project Management in Public Research Organisations: The Gap in Practice. *International Journal of Information Technology Project Management, **7** (2), 2016 (In print)*

Refereed conference publications:

2. Ugonna, C. U; Ochieng, E. G; Matipa, W. and Shah, R. (2015). Strategic Project Management (SPM): An empirical perspective on the practice in public research organisations. *The 6th International Conference on Management, Finance and Entrepreneurship (ICMFE-2015). October 17–18, 2015. Istanbul city, Istanbul, Turkey. Pp. 43 – 52.*

3. Ugonna, C. U; Ochieng, E. G; Matipa, W. and Shah, R. "Strategies for Enhancing the Application of Strategic Project Management (SPM) in Research Organisations: Case Nigeria" *International Conference on Organization and Management (ICOM). November 22-23, 2015 at InterContinental Hotel, Abu Dhabi, UAE*.

TABLE OF CONTENT

CHAPTER THREE: THE CONCEPTUAL FRAMEWORK

CHAPTER FOUR: RESEARCH METHODOLOGY

CHAPTER FIVE: QUANTITATIVE FINDINGS

CHAPTER SIX: QUALITATIVE FINDINGS

CHAPTER SEVEN: DISCUSSION OF RESULTS

CHAPTER EIGHT: FRAMEWORK DEVELOPMENT AND VALIDATION

CHAPTER NINE: CONCLUSIONS AND RECOMMENDATIONS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE: INTRODUCTION TO THE RESEARCH

1.1 INTRODUCTION: PUBLIC RESEARCH ORGANISATIONS

From the beginning of the 1980s, there was a large influx of private sector principles and tools into the public sector in an attempt to improve efficiency and effectiveness in the management of projects. The reform movement in the public sector, which could be summarised as “New Public Management” or “New Steering Model”, as practised in Germany, has been adopted and implemented with different results almost worldwide (Crawford and Castello, 2000).

In the 1990s, Governance emerged as an additional concept, which some see as an enrichment of the New Public Management philosophy, while others believe it is paradigmatic shift towards a more outward focused public sector, emphasizing co-operation, democracy and citizen participation (Kooiman, 1999; Schedler and Siegel, 2005; Benz *et al*., 2007; Schedher, 2007).

The acute phase of the global financial crisis has passed, and economic recovery is underway, but recovery remains fragile and is expected to slow down, as the growth impact of financial and monetary measures wane (World Bank, 2010). Despite this, the public sector is under increasing pressure worldwide to increase outcomes and enhance performance. To meet these considerable challenges, public research organisations (PROs) must revisit their strategic management processes and measurement systems. John Bryson, a notable public sector strategist, argued that “leaders and managers of public sector organisations must become effective strategists if these organisations are to fulfil their missions, meet their mandates, satisfy their constituents, and create public value in the years ahead” (Bryson, 2004, p. 16).

Public research organisations in Nigeria occupy an understandably prominent, central position in current thinking and planning about the future of development in the country. The term “public research organisation” as it is used here includes technology research organisations, and research institutions that engage in research and development and research training activities with substantial funding support from government and non-government organisations such as the World Bank, United Nations Industrial Development Organisations (UNIDO) etc. Most PROs in Nigeria are government agencies under the Federal Ministry of Science and Technology, the Ministry of Agriculture and the Ministry of the Environment. For the purpose of this work, the researcher focused on the research organisations under the Federal Ministry of Science and Technology.

These organisations are known to carry out research and development projects that address industrial needs and could therefore be of help in determining the application of strategic project management (SPM) in project execution. The character and span of the multi-functional activities of PROs give them a critical role, not only in programmes and policies that aim to advance the knowledge base of R and D and technological innovation, but also in the country’s economic growth. The application of SPM in public organisations is therefore based on the need for the leaders and project managers of such organisations to fulfil their missions, meet their mandates and create public value in the years ahead (Bryson, 2004).

Public research organisations have been identified as having a wider role in innovation systems than simply providing new technologies to individual businesses (Arnold *et al.*, 2012). They provide access to skilled personnel, assist businesses with short-term problem solving, support the development of research and innovation capabilities through collaborative work, and provide access to new ideas and concepts (Arnold *et al.*, 2012). Public research organisations are also unique with peculiar challenges due to the unpredictable nature of research outcomes and their applications, coupled with the fact that only a few lines of research will ultimately have any significant impact (OECD, 2011). This is

because the length of time required for the impact and research effort to be felt may be too long to be useful for present-day management and policy decisions. Yet PROs are increasingly expected to enhance their performance and impact rating for the nation and the international research community (OECD, 2011).

Currently, great emphasis is placed on competitiveness and programme funding as a way to steer research and implement priorities, although governments still represent the highest share of funding for PROs (Olsson and Cooke, 2013). This trend has raised some concerns to PROs with regards to their long-term capabilities to address frontier and fundamental research or to provide independent advice to governments (Nedeva and Boden, 2006). However, in Nigeria, PROs occupy a very prominent position, and indeed the central focal point, in current thinking and planning about the future of the country.

Due to the multi-functional activities of PROs, they are known to play a critical role not only in programmes and policies that aim to advance the knowledge base for technological innovation and economic growth, but also in the knowledge society, the industrial sector of the country and the world at large (David and Metcalfe, 2007). From a global perspective, the public sector is under increasing pressure worldwide to increase outcomes and improve outputs of their organisations, while simultaneously improving efficiencies and effectiveness. This pressure originates from a broad group of stakeholders, including the government, demanding accountability for spending and the implementation of measures that are more easily benchmarked (Technology One, 2010).

1.2 THE NEED FOR GLOBAL RESEARCH AND DEVELOPMENT PROJECT

Since the 1800s, science and technology have significantly improved survival rates, longevity, and material conditions of human life such as transport and communications. In the second half of the twentieth century however, questions were raised about the continuation of this trajectory, which in turn generated considerable debates about the role of

science (European Union, 2012).

Historically, science and technology have at times been pursued without proper respect for ethical boundaries and put to monstrously destructive uses. In the more recent past, scientific research policies and technology assessment have focused heavily on identifying the risks and potential adverse effects of techno scientific advances. But while it is essential to practice science in an ethically acceptable manner, this is only one prerequisite for making positive contributions to enhancing the quality of human life. Likewise, the avoidance and management of unintended negative consequences, which have been found to be insufficient (European Union, 2012).

Today it is important to guide science, especially insofar as science is dependent on publicly funded research, towards positive outcomes that can improve human lives (European Union, 2012). Innovation is the key to economic competitiveness and technological breakthroughs that improve our lives. Basic research thus fuels technological innovations and is critical in fostering the vitality of any Nation's science and technology enterprise and the growth of highly skilled jobs (NSB, 2008).

The scientific and technological advances have led to developed countries like U.S, China and European Countries to contribute to the creation of new industries and jobs, improve the standard of living for people, and provide sophisticated technology that ensures national security that can be traced back to the outcomes of research and development (NSB, 2008).

Although in some countries, the industry funds two-thirds of R and D projects, generally universities and research institute conduct majority of basic research. For example, according to NSB (2008), the U.S Government recognised the importance of public support for research institutions and established the basis for the Nation's land grant institutions through the Morrill Acts of 1862 and 1890 during the second half of the 19th century (NSB, 2008).

Furthermore, the WHO Expert Working Group published a report on Research and Development Financing and highlighted the need and importance of possible mechanisms for increased coordination of research and development on a global level. It proposes a globally coordinated approach to R and D, involving three key elements: coordination in the identification of priorities for action, coordination in the distribution of research among various entities and coordination in the financing of R and D (Viergever, 2010).

This shows that the governance of scientific research and technological innovation has become a political and policy concern throughout the world. With the challenges posed by the complexities of the global economy and their implications for human well-being. There is the need to create a dynamic space for research, from the conceptual to the practical and across disciplines, on the myriad places where human rights, fairness and justice intersect with economic globalisation. This necessitated the need to develop a process that will enhance and improve the governance and effective execution of scientific research in Nigerian public research organisations and can be adopted for other African developing countries.

The importance of R and D as one of the main contributors to sustainable growth in highly industrialised economies is undisputed among economists and especially in the context of the modern knowledge-based economies (George *et al*., 2014). This means that government support for R and D activities is widely accepted, in contrast to public support in the area of investment, production or commercial protection (Garcia-Quevedo, 2004; Giebe *et al*., 2006; Heijs, 2003).

Furthermore, according to Greenstone (2011), from the historical point of view, the importance of R and D has been evident for at least a century as future economic progress is driven by the invention and application of new technologies. R and D is the category that develops and drives these new technologies (Greenstone, 2011). Although private sector

firms carry out R and D projects, they are mainly focused on “applied” research projects, where the pay-off to their bottom line is likely to only benefit them. Their role is not to undertake broad R and D for the general benefit of our nation. In contrast, the government sponsors the “basic” research projects that seek wide ranging scientific understanding that can affect entire industries, rather than individual firms (Greenstone, 2011).

This research focused on government-sponsored R and D projects because the impacts transcend all spheres of human endeavour – social, economic, political, educational, scientific and technological – clearly serving as determinants of the pace of growth and development of the entire society (Odia and Omofonmwan, 2013). Research and Development also plays an important role in innovation, which, in recent years, has taken centre stage as one of the main drivers of economic growth and poverty alleviation. The policy makers, in turn, can help spread the benefits of innovation through policies that encourage growth in the areas of science, technology and innovation (UNESCO 2010). However, Nigerian political leaders, policy makers/implementers, and organisation administrators have unfortunately not yet become fully attuned to this global trend that R and D revolutionises crude production, poor yield, insufficiency, poverty, dissatisfaction, stagnation, under-development etc. into high proficiency/productivity, poverty eradication, fulfilment and development, as observed in certain other parts of the world (Odia and Omofonmwan, 2013). Rather the Nigerian experience is that the government adopted the framework of establishing organisations and institutions (research institutions and universities) but failed to adapt the true tenets upon which such institutes evolved in their source of origin. These tenets include establishment, proper management led by sound/seasoned administrators appointed in an unbiased manner, proper project funding, desired research outcomes, appreciation, and acceptance/utilisation of the end products by its own people (Odia and Omofonmwan, 2013).

In view of the current global competitiveness, the need for PROs to intensify scientific research has been identified as being of great importance for competitiveness in modern economies (Coccia and Rolfo, 2009). Nigerian PROs must therefore intensify and improve their scientific research; this will result in innovations, which will in turn, drive the economic growth of the country. Despite the unique environment in PROs, one could suggest that R and D projects would benefit immensely from the application of SPM techniques. In a rapidly changing environment with diverse issues impacting on projects, SPM can also support the achievement of projects as well as organisational goals (Brown, 2007). This will also improve the R and D impact, which will give rise to growth in science and technology and in turn lead to industrialisation. This will then generate job opportunities, increase income, increase the production of goods and services, create wealth and improve the quality of life in Nigeria.

1.3 BACKGROUND TO RESEARCH

In today's highly competitive environment, project management has become a key activity in most modern organisations, requiring new and improved methods of management and technical skills, hence the need for the application of project management as a strategic tool. The success and survival of an organisation is determined by its projects, and this has led to the use of project management as a tactical tool to execute projects (Wessels, 2007). The role played by project management has increased significantly in recent years, with both private and public organisations in Nigeria adopting project management as a way to implement strategic objectives and manage operations. However, the effectiveness with which projects are planned and managed is known to have a major impact on the business's competitiveness and its environment. With the increasing complexities of technologies, in addition to shorter project life cycles, organisations are forced to rely on R and D as a key strategy (Mikkola, 2001).

Project management has been identified as a means of avoiding the pitfalls inherent in the management of projects (especially R and D projects) in PROs in Nigeria; these difficulties

are in most cases the reasons for the failure or abandonment of a project (Nwachukwu *et al*., 2010). The PROs in Nigeria under the Federal Ministry of Science and Technology were established for research, development and innovations that contribute to the growth of the nation. According to the traditional project management approach, projects are successful if they meet the time, budget, and quality or performance goals, yet research has shown that most projects are late, over-budgeted, and do not deliver their expected objectives (Stefanivic and Shenhar, 2007).

This research was therefore motivated by the need to reduce the rate of project failure in PROs in Nigeria. It also aims to aid project managers to focus on project management best practices that will improve capacity utilisation and promote new research ideas. Research can then be carried out which will lead to innovation and the commercialisation of research results in Nigeria. The application of SPM tools and techniques in PROs is gradually becoming an important issue in developing economies, especially in a country such as Nigeria where projects of different sizes and structures are undertaken. Although R and D projects are known to be different from other types of projects due to their long-term nature, their dependency on the actions of others and the difficulty of project definition (Technologyone, 2011), their ultimate benefits to the economy informed the need for the implementation of SPM concepts. Also, rapid changes in environmental policy, with new breakthroughs, problems and risk issues, affect the relevance of R and D projects. This also emphasises the need for the application of SPM and for PROs to have robust supporting frameworks for the management of their projects.

1.4 WHY STRATEGIC PROJECT MANAGEMENT (SPM)?

According to Brown (2007), SPM is a project management tool used to manage and measure project outcomes and ensure optimal value for an organisation. Furthermore, projects undertaken by an organisation must meet a set of criteria determined by the organisation's leadership to ensure alignment with the organisation's strategic vision. The

application of SPM in PROs would therefore assist with the implementation and maintenance of R and D projects. It would also address the holistic method of applying the soft skill-set of the project management body of knowledge (leadership, team management, complexity and ambiguity management) (Quadri, 2010). This will develop the capacity, competence and tacit knowledge necessary to ensure successful prioritisation, management, implementation and procedural closeout of R and D projects in PROs.

One of the goals of strategy is to determine why some organisations are more successful than others, and to understand the mechanisms that can help organisations achieve and sustain a competitive advantage (Grant, 2010; Rumelt *et al*., 1994). Competitive advantage is the ability of an organisation to create more value than its rivals, and therefore achieve a superior return on investment (Barney and Hesterley, 2006). Sustained competitive advantage requires capabilities that provide enduring benefits and are not easily copied by competitors or rendered obsolete (Barney and Clark, 2007; Kwak and Anbari, 2009). Strategic projects, which are considered to represent the core of corporate growth, change and wealth creation (Asrilhant *et al*., 2005) can be observed in R and D projects carried out by PROs.

The application of SPM crystallises the concept of project differentiation and integration management. It is the fusion of the W5-H3 embodiments of a typical development project (what, when, where, who, why, how, how much and how well) and their application, relevance and dynamism to the whole lifecycle of developing projects – initiation, planning, execution, monitoring and closing (Quadri, 2010). This process would help in the establishment of an easy process of project evaluation, and the identification of the root causes of project failures in PROs. Therefore, SPM as a project management tool is used to select and manage projects that will address the mission, vision and strategic objectives, leveraging on the tacit knowledge of creation and innovation enthusiasm in the organisations. This comprehensive but streamlined unique approach with emphasis on R and D projects

simplifies the justification for reengineering the management and execution of R and D projects in such a way as to incorporate the SPM techniques and minimise the incidence of project failures in PROs.

This research study therefore aims to identify the barriers affecting the application of strategic project management, proffering a framework for addressing those barriers and improving the effectiveness of R and D projects implementation in in PROs in Nigeria. This was achieved by using a mixed-method approach to assess SPM practices in selected PROs. The importance of the approach can also be seen in Ghauri and Gronhaug (2002), where it was observed that the mixed-method approach produces a more complete, holistic and contextual portrait of the object(s) under study.

1.5 RESEARCH IN STRATEGIC PROJECT MANAGEMENT

Although SPM is not new in the project management field, little research has been carried out, especially with regard to PROs. Research carried out so far in this area has focused mainly on SPM in the UK upstream oil and gas sector. First, the study has been aimed at understanding the extent to which SPM processes can be characterised by sets of elements that are recognised by management and also in line with the wider literature (Asrilhant *et al*., 2005). Secondly, the need to implement the SPM approach and to sustain successful economic development projects in Less Developed Countries (LDCs) (Habeeb, 2010). Among the most in-depth studies on SPM were those carried out by Grundy and Brown (2002), Callahan and Brooks (2004), Green (2005), Heerkens (2007), Brown (2007), Wessels (2007) and Quadri (2010); these authors identified that the five phases of project management considered by the Project Management Institute (PMI) and many project managers worldwide were necessary phases for starting, executing and completing projects but have been found to be insufficient for effective execution of projects.

These phases provided a good framework for running projects and the focus of Project Management Body of Knowledge (PMBOK) was strictly on the execution of projects. However, Morris (2002) argued that the PMBOK has some shortcomings because it does not contain details of project strategy, project definition or value management, and it is completely silent on technology management and its link with programmes and portfolios. These shortcomings identified by Morris (2002) led to other researchers focusing on the execution of projects, which has created 'tactical' tunnel vision within organisations (Brown, 2007). Brown believes that while tactical thinking is needed for ensuring that 'things get done' within a project, strategic thinking is also necessary to ensure optimal use of time, resources and money, to ensure that each project undertaken is aligned with the organisation's strategy (Brown, 2007).

The project management discipline has changed dramatically in recent years with emphasis on the need to include the strategic perspective in the execution of projects (PMI White Paper, 2010). As argued in this study, the application of SPM in the execution of R and D projects aimed to reduce factors that affect projects' execution and enhance organisations' performance. This thesis will demonstrate the importance of SPM and its potential for implementation in the execution of R and D projects in PROs. To ensure that the findings encapsulated the key contextual issues in SPM, the processes used for the execution of R and D projects were investigated and assessed against the theoretical concepts of SPM.

1.6 RESEARCH PROBLEM

The execution of R and D projects in Nigeria is challenged by many social, political and economic factors interacting in complex and dynamic ways. This interaction is reflected in the history of science and technology in Nigeria, the culture, legal systems, institutional frameworks and social capital. The economic and social development of Nigeria is critically dependent upon the ability to establish a competitive, productive and efficient industrial sector built on a strong technology base. This implies that her natural resources must be

developed and utilised as inputs to industrial production and as direct products to better the life of the citizenry. PROs are considered critical to the survival of industries and to the achievement of self-reliance through sourcing of raw materials locally. This study was considered desirable in order to evaluate the management of research projects in public research organisations, and successful project management is expected to assist industries to achieve self-reliance. In a competitive environment and considering the challenges of globalisation, the successful implementation of projects depends significantly on the skill and the strategic management of these projects adopted.

A study on SPM became very important considering the number of projects emanating from research organisations and also the challenges of global competition, requiring new ways to improve competitiveness, and project management is at the top of the list of most organisations. Hence, the central problem of this research was to identify the barriers affecting the application of SPM in the execution of R and D projects in PROs. Based on the findings, the existing knowledge and relevant SPM concepts and methodologies, a framework will be proposed for senior project management practitioners that will improve the execution of R and D projects and enhance research organisations' performance.

1.7 RESEARCH QUESTIONS

Some of the pertinent questions considered critical to the successful implementation of SPM in PROs in Nigeria were:

- To what extent do these projects focus on the strategic and business interests of the organisations during project execution?
- Does the SPM approach enhance the chances of project success?
- What are the project management tools and techniques adopted in PROs in Nigeria?
- What are the factors that hinder the application of SPM in public research institutions?

1.8 RESEARCH AIM

The aim of this research was to identify the barriers affecting the application of strategic project management and proffering a framework for senior project management practitioners working in PROs in Nigeria. The resulting framework comprises strategies and practices to be employed at the strategic, operational and project levels for effective execution of R and D projects. As suggested in this study, the proposed framework will be used as a guide to minimise barriers and enhance SPM application in R and D projects in Nigeria.

1.9 RESEARCH OBJECTIVES

The specific objectives developed to achieve the aim of the research were to:

1. Establish the relationship that exists between theory and practice in relation to SPM;
2. Appraise the key determinants associated with the SPM process and their importance in the effective implementation of projects in PROs;
3. Identify the key variables that inhibit SPM application in PROs;
4. Measure the impact of SPM initiatives in improving and enhancing project success in PROs;
5. To develop an SPM framework that will enhance the execution of R and D projects in PROs in Nigeria.

1.10 NOVELTY OF THE RESEARCH

The novelty and significance of this study are due to the importance of research and development (R and D) as one of the main contributors to sustainable growth in highly industrialised economies. The overall objective therefore was to carry out a comprehensive analysis on the application of SPM in the execution of R and D projects in PROs. Tap into the tacit knowledge of the SPM concept and bring it to the surface where it can serve as a project management tool for project management practitioners in PROs in Nigeria. As found from the reviewed literature, recent studies on project management have concentrated on

engineering, construction and IT, with little or no research on R and D projects (Ahadzie *et al*., 2008; Pathirage *et al*., 2005; Walsh and Sawhney, 2004; Kululanga and McCaffer, 2001).

Even though some researchers worked on SPM application in the oil and gas sector, there has been a paucity of work on PROs. Considering the global quest for innovative research outcomes that can contribute to economic development and alleviate poverty, there was the need for an SPM framework. The primary purpose of the framework is to aid senior project management practitioners to enhance organisations' performance through the effective execution of R and D projects. The novelty of this research is primarily significant for the following reasons:

- There have been no studies on the application of SPM concepts in the execution of R and D projects and this topic is of significant interest to both the researcher and PROs in Nigeria;
- The research findings would contribute to the body of knowledge and the study will make recommendations that will support PROs with the strategic management of R and D projects in Nigeria;
- The developed framework in this study is expected to contribute to the body of knowledge and help senior project management practitioners in PROs in Nigeria; and
- The reviewed literature on SPM in PROs in Nigeria will contribute to a better understanding of the lack of growth in science and technology when compared with the global trend that revolutionises under-development through research and development into high proficiency or productivity, as observed in certain other parts of the world.

1.11 RESEARCH PROCESS

The research method employed for this study was a mixed-method research approach that included procedures for collecting, analysing and mixing both quantitative and qualitative data at various stages of the research process. An exploratory literature review of the SPM of R and D projects in PROs in Nigeria was conducted. The review revealed that the poor execution of R and D projects could be addressed through the effective implementation of SPM. The research questions were developed from the literature review. The research aim and objectives were then articulated and an appropriate research methodology was selected. A self-administered questionnaire was employed to investigate the current practices of SPM application in the selected research organisations. The questions explored the current SPM tools. Semi-structured interviews were also used to validate the questionnaire and to identify the processes employed in the execution of R and D projects in PROs in Nigeria. Figure 1.1 provides a flow diagram summarising the research process.

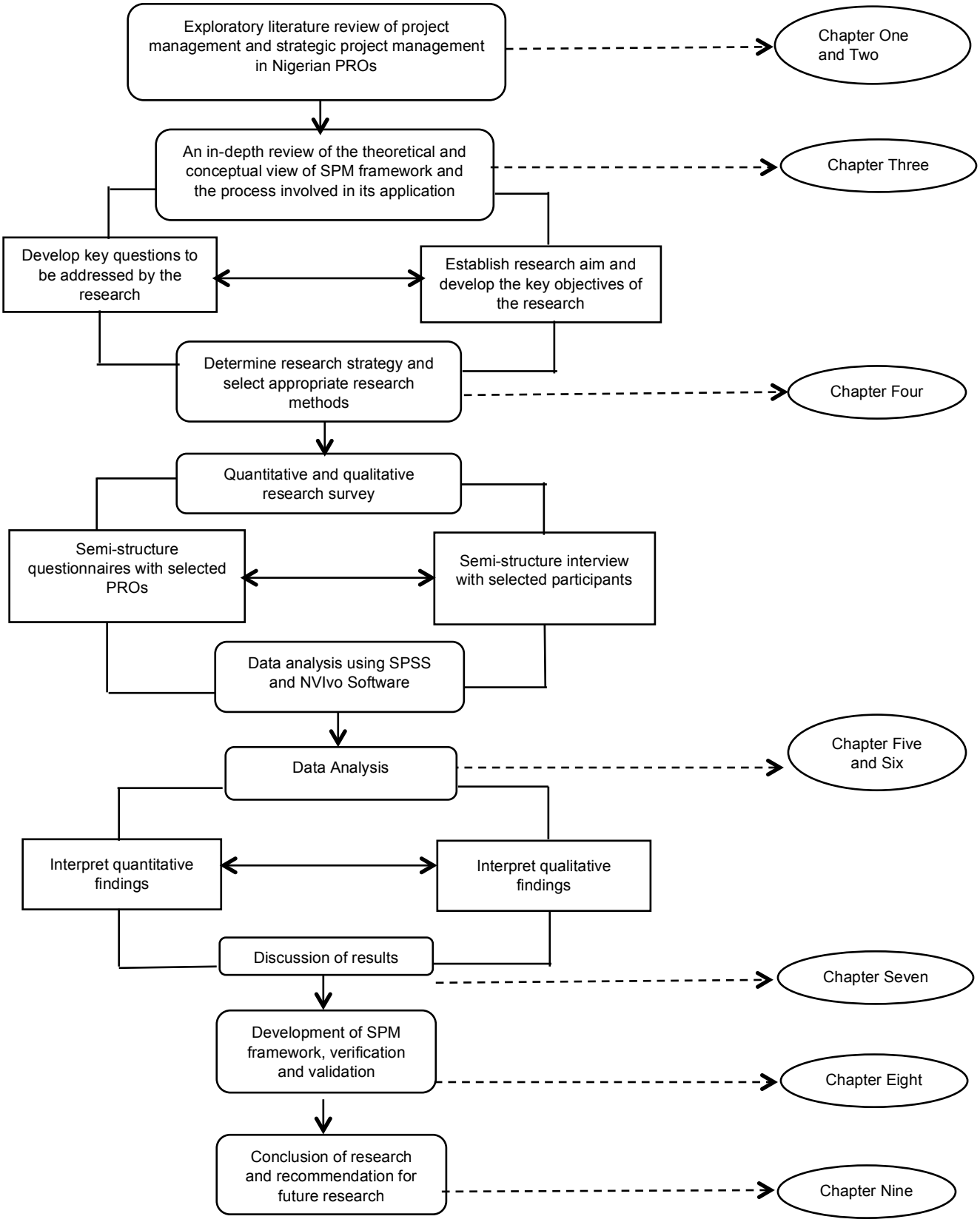

Figure 1.1: Flow diagram of research methodology

1.12 Research findings and recommendations

The findings from this study identified issues and procedural variances, both in its use and concept of SPM, which had been lacking in the literature. A number of factors affecting the effective execution of R and D projects in PROs in Nigeria were also identified. These include: project funding, development of project teams, organisational culture, employees' motivation, lack of knowledge with respect to project management principles and SPM concepts, organisational culture, lack motivation for project management practitioners, and poor project planning, especially with regard to risk management.

To ensure an effective application of SPM in the execution of R and D projects there is the need for PROs in Nigeria to adopt the SPM framework that will ensure strategic selection, prioritisation and alignment of projects with the organisational strategy. The success of PROs depends on the effective execution of R and D projects. Thus it is recommended that PROs should ensure the adoption of SPM concepts. Furthermore, in accordance with current project management best practices, there should be an emphasis on developing, training and enhancing the skills and management abilities of existing staff. For the Nigerian Federal Ministry of Science and Technology, there should be a repository of policies to enhance the commercialisation of R and D projects. Encourage the adoption of a standard and consistent structure for the effective monitoring of R and D project activities, and maintain constant compliance with such.

1.13 STRUCTURE OF RESEARCH REPORT

To successfully achieve the aim of this research and also contribute to project management practices, this thesis report structure is divided into nine chapters.

Chapter One: this is the introduction to the research topic that sets the context, highlighting the research background, problem statement, justification for the research, research questions, aim, and objectives, overview and background of the selected research institutes

for the study. The chapter briefly describes the research process and the structure of the research report.

Chapter Two: presents a review of the Federal Republic of Nigeria and its PROs. An overview of project management, SPM and previous related works carried out on the application of SPM, are reviewed. It also discusses the current practices and effective execution of research and development projects. Finally, the chapter summarises the level of SPM application in PROs and key SPM factors for further research.

Chapter Three: reviews the theoretical and conceptual view of SPM framework and the process involved in its application. The SPM core phases that would enhance the implementation of the SPM framework are discussed.

Chapter Four: presents a detailed description of the research design, which includes methodologies, research types, sampling strategies, and data collection techniques. Based on this assessment, the most suitable research strategy for this study emerged as one that involves a combination of both quantitative and qualitative methods.

Chapter Five: contains the quantitative survey findings relating to project management practices, level of strategic project management implementation and factors affecting the implementation of SPM in the execution of R and D projects. Finally, the chapter identifies the gap in the theory and the practice of SPM.

Chapter Six: analyses the qualitative findings related to the research objectives, and presents the findings from the data collected through semi-structured interviews. The chapter also discusses the respondents' experiences of managing R and D projects in PROs in Nigeria.

Chapter Seven: contains a discussion synthesising the interview, survey and validation results reported in Chapters Five and Six. The chapter also shows how these results either confirm or contradict existing literature and, where appropriate, makes suggestions regarding the possible modifications to existing theory.

Chapter Eight: is devoted to the development of the SPM framework. The purpose of the SPM framework and an overview of the variables of the framework are discussed. The chapter gives a detailed description of the proposed integrated framework and also discusses the validation of the SPM framework.

Chapter Nine: presents the conclusions and recommendations of the research based on the research findings. Recommendations for project management practitioners and PROs in Nigeria are presented. Suggestions for further work are also provided.

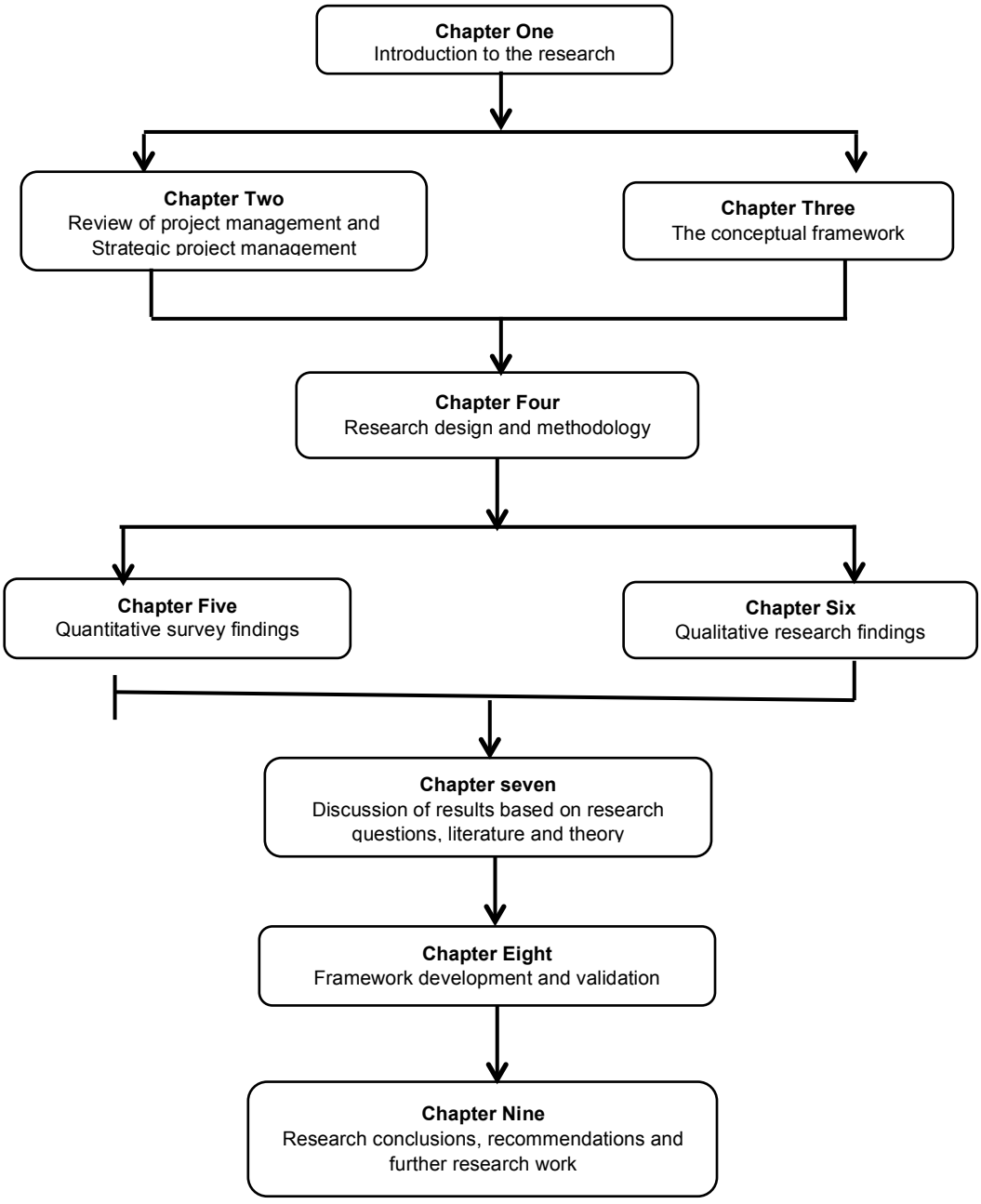

Figure 1.2: Outline of thesis structure

CHAPTER TWO: REVIEW OF PROS AND SPM

2.1 INTRODUCTION

The dynamic and competitive nature of today's environment has led top management of organisations to continually make adjustments in order to attain a sustainable competitive advantage in the management of projects. Research has shown that organisations, which emphasise strategic management generally, out-perform those that do not, and in strategic management, the most difficult stage is not how to formulate a plan but rather how to implement them (Puthamont and Charoenngam, 2007). The success of any organisation often depends on the success or failure of the projects which it embarks on, and on the pace, scale and complexity of projects that are designed for the long-term benefits of the organisation (Norrie, 2006). Project management has emerged as a strong discipline practised by highly trained, certified professionals, as organisations have come to realise that they cannot stay in business if they cannot manage their projects successfully (Wessels, 2007). In the traditional project management world, projects were typically focused on efficiency, operational performance, and meeting time and budget goals (Shenhar, 2004). However, today's dynamic business environment and global competition require finding new ways to transform projects into powerful, competitive weapons (Shenhar, 2004). SPM provides a modern view of projects that helps to develop competencies and capabilities, which contribute to the firm's sustainable competitive advantage (Green, 2005).

PROs have been found to have a wider role in innovation systems than just providing new technologies to the industrial sector and individual businesses. They provide access to skilled personnel, problem solving, support the development of research and innovation capabilities through collaborative works and also provide access to new ideas and concepts (Arnold *et al.*, 2012). This highlighted the need for research on the role and effect of SPM in PROs in Nigeria.

This chapter reviews PROs with particular reference to Nigeria and the concept of SPM. It discusses the Federal Republic of Nigeria, its society, socio-economic development, the political context, and the development challenges faced by the country. It provides an overview of PROs from a global perspective, and the evolution of PROs in Nigeria. Furthermore, the chapter examines the concept of project management, the evolution of SPM and SPM, and the role of strategy in the management of projects and SPM practices in Nigeria. The chapter also reviews the factors affecting the application of SPM and the need for an SPM approach in PROs in Nigeria. Finally, there is an analysis of previous work identified in the body of literature concerning the application of SPM.

2.2 FEDERAL REPUBLIC OF NIGERIA

Nigeria is the most populous country in Africa and the tenth largest country by population in the world. It is located at the Gulf of Guinea in West Africa, with Benin, Niger, Cameroon, and Chad as its neighbours (see Figure 2.1). Nigeria is an amalgam of ancient kingdoms, caliphates, empires and city-states with a long history of organised societies. As with many of the other African nations, Nigeria's national boundaries were drawn as a result of trade and overseas territorial ambitions of Western European powers in the 19th century. The first inhabitants of what is now Nigeria were thought to have been the Nok people (500 BC – AD 200). The Kanuri, Hausa, and Fulani peoples subsequently migrated there. Islam was introduced in the 13th century, and the empire of Kanem controlled the area from the end of the 11th century to the 14th. The Fulani Empire ruled the region from the beginning of the 19th century until the British annexed Lagos in 1851 and seized control of the rest of the region by 1886 (Rediscover Nigeria, 2006).

Figure 2.1: The Nigerian Flag and the Map
Source: Nigeria – Infoplease.com

The name Nigeria was adopted in 1898 to designate the British Protectorates on the River Niger. The Nigerian flag was also designed to show the River Niger bisecting the countryside, with the green stripes representing agriculture, and the white stripe also representing peace and unity. Nigeria has a total area of 923,768 square kilometres. In Africa as a whole, it is the fourteenth largest country by area. The maximum north-south distance within the country is about 1,040 kilometres, while the maximum east-west distance is about 1,120 kilometres. Although it accounts for only about 3 per cent of the surface area of Africa, Nigeria has a population of 168.8 million, which represents about 20 per cent of the total population of sub-Saharan Africa (Nigerian Handbook, 2014).

2.2.1 The birth of Nigeria (Colonial period, 1914-1959)

In 1914, Sir Frederick Lugard merged the protectorate of Northern Nigeria and the Colony and Protectorate of Southern Nigeria. The whole country then became known as the Colony and Protectorate of Nigeria, with Lugard as the first Governor-General, ruling until 1919. However, in 1959, when a federal election was held to usher in the new independent nation, Nigeria voted for independence and that led to the first republic (Rediscover Nigeria, 2006; Nigerian Handbook, 2014).

2.2.2 The first republic and first military rule

On the 1st of October 1960, Nigeria gained independence from Britain (Nigerian Handbook, 2014). Alhaji Sir Abubakar Tafawa Balewa became the first Prime Minister of the all-Nigerian

Executive Council (Rediscover Nigeria, 2006). By November 16, 1960, Dr. Nnamdi Azikiwe, a pioneer of West African nationalism, became the first Governor-General of a Federation of three regions - North, East and West, with Lagos as the Federal Capital. A Premier with a Governor as ceremonial head headed each of the regions. On October 1, 1963, Nigeria became a Federal Republic and severed its ties with Britain. She decided, however, to remain in the British Commonwealth of Nations.

The Governor-General was, therefore, re-designated President. The first republic was over-thrown through a military coup in 1966, leading to the first military rule and political and ethnic problems in the country with General Aguiyi Ironsi as Head of State (Rediscover Nigeria, 2006; Nigerian Handbook, 2014). During this period, the eastern part of the Country decided to pull out of the country as Biafra. On the 9th of August, 1967, Nigeria declared full-scale war on Biafra after its forces had invaded and captured the Mid-West State. With Biafra's collapse in 1970, the region was reunited with the Federal Republic of Nigeria and a period of reconciliation and reconstruction followed. Military rule continued until 1979. Within this period, General Gowon, Murtala Mohamed and Olusegun Obasanjo served as Head of State through military coups (Rediscover Nigeria, 2006; Nigerian Handbook, 2014).

2.2.3 Second republic and more military intervention

In October 1979, after more than 13 years of military rule, Nigeria was returned to democratic rule (Rediscover Nigeria, 2006). The National Party of Nigeria emerged victorious in the presidential election and Alhaji Shehu Aliyu Shagari was elected the first Executive President. It was not to last. The hunger and poverty that characterised the last days of the Second Republic prompted the Armed Forces to take power in December 1983 (Rediscover Nigeria, 2006). Major General Muhammadu Buhari emerged as the leader of the Supreme Military Council (SMC), the country's ruling body and was installed as the new Head of State. Major General Muhammadu Buhari accused the civilian government of economic mismanagement, widespread corruption, election fraud, and a general lack of concern for the

problems of Nigerians. Major General Muhammadu Buhari also pledged to restore prosperity to Nigeria and to return the government to civilian rule. Being unable to deal with Nigeria's severe economic problems, the Buhari government was peacefully overthrown by the SMC's third-ranking member, Army Chief of Staff Maj. Gen. Ibrahim Babangida, in August 1985 (Rediscover Nigeria, 2006; Nigerian Handbook, 2014).

On the historic June 12, 1993 presidential elections, which most observers deemed to be Nigeria's fairest, early returns indicated that M.K.O. Abiola had won a decisive victory (Rediscover Nigeria, 2006). However, on June 23, Babangida, using several pending lawsuits as justification, annulled the election, throwing Nigeria into turmoil. More than 100 persons were killed in riots forcing Babangida to hand over power to an "interim government" headed by Ernest Sonekan on August 27, 1993. Shonekan was to rule until new elections, scheduled for February 1994 (Rediscover Nigeria, 2006). Although he led Babangida's Transitional Council from early 1993, Shonekan was unable to reverse Nigeria's ever-growing economic problems or to defuse lingering political tensions.

With the country sliding into chaos, Defense Minister Sani Abacha quickly assumed power and forced Shonekan's "resignation" on November 17, 1993. Abacha dissolved all democratic political institutions and replaced elected Governors with military officers (Rediscover Nigeria, 2006). Abacha promised to return the country to civilian rule but refused to announce a timetable until his October 1, 1995 Independence Day address. Abacha, widely believed to be plotting to succeed himself as a civilian President on October 1, 1998, remained Head of State until his death on June 8 of that year and was replaced by Gen. Abdulsalami Abubakar. Gen. Abdulsalami Abubakar, as an interim president, swiftly conducted elections and returned the country once again to democratic rule with Olusegun Obasonjo, a retired army general and former military Head of State as president (Rediscover Nigeria, 2006).

2.2.4 Nigeria Today: The fourth republic

On May 29, 1999, Chief Olusegun Obasanjo was sworn in as President and Commander-in-Chief of the Federal Republic of Nigeria (Nigerian Handbook, 2014). This followed his victory at the presidential polls conducted in 1999 and he was re-elected in 2003. Elected civilian Governors for all the thirty-six states also took oaths of office on that day. Nigeria's Fourth Republic consists of the Executive and Judiciary as well as a bi-cameral legislature – the Senate (upper house) and the House of Representatives (Nigerian Handbook, 2014). On May 29, 2007, AlhajiUmaru Musa Yar'Adua was sworn in as President and Commander-in-Chief of the Federal Republic of Nigeria. The administration of AlhajiUmaru Musa Yar'Adua, after the eight-year rule of Chief Obasanjo, marked the first time that Nigeria had transited successfully from one civilian administration to the other since the country's independence in 1960.

Following Yar'Adua's death on 5th May 2010, the then Vice President, Dr Goodluck Jonathan was sworn in as Yar'Adua's replacement on 6th May 2010, becoming Nigeria's fourteenth Head of State (Nigerian handbook, 2014). On the 18th May 2010, the National Assembly approved President Goodluck Jonathan's nomination of former Kaduna State Governor, Namadi Sambo, an architect, for the position of Vice President. President Goodluck Jonathan and Namadi Sambo also won presidential polls in 2011 (Nigerian Handbook, 2014). Currently with the new presidential and general election that took place on 28th of March 2015, Major General Muhammadu Buhari won the election and was sworn in on the 29th of May 2015. He is the President of the Federal Republic of Nigeria and fifteenth Head of State, with Prof. Yemi Osinbanjo as the Vice President.

2.2.5 The society

The Nigerian population, which is about 168.8 million, is unevenly distributed with a large percentage living within several hundred kilometres of the coast (World Bank, 2013). The

population is also dense along the northern river basin areas such as Kano and Sokoto. Population densities, especially in the southwest near Lagos and the rich agricultural regions around Enugu and Owerri, exceed 400 inhabitants per square kilometre. None of the neighbouring states of West and Central Africa approach the total level of Nigerian population or the densities found in the areas of greatest concentration in Nigeria (Nigerian Handbook, 2014).

2.2.6 The socio-economic development

Nigeria is the most populous country in Africa and accounts for 47 per cent of West Africa's population (World Bank, 2013). It is also known to be the biggest oil exporter in Africa, with the largest natural gas reserves in the continent (World Bank, 2013). Considering the extent of Nigeria's endowment of natural resources and its large population of about 168.8 million, the country's economic development plan should have been one that would add value to its natural resources. However, the crises in the political, social and economic aspects of the nation, especially the frequent changes in government and the inconsistency in polices towards science, technology, development and innovation, have also led to prolonged poverty which in effect has prevented the country from attaining a sustainable socio-economic development (Ighodalo, 2012).

This is particularly worrisome given the efforts that some of the governments have made over the years, without commensurate return, for a better life for the people. The majority of the governments that come to power in Nigeria promise to fight poverty in order to achieve sustainable social and economic development. Yet the level of poverty is still paramount and is also spreading its tentacles to virtually all aspects of human life in the country. This calls for concern and requires a strategy for sustainable socio-economic development.

In the developed countries, governments strive towards a certain minimum standard of living for their citizenry. While no nation has been able to totally abolish poverty from its society,

some of them have been able to achieve high human development by expanding capabilities through the choices they make to live a creative life. Some of the experiences which individuals can enjoy include living a long and healthy life; having access to quality education and to resources needed for a decent standard of living; and participation in decision making and the implementation of decisions (Ighodalo, 2012). The sum of all these could be presumed to lead to development, thus there is a need for developing countries like Nigeria to improve not just the planning but the implementation of research and development efforts so as to achieve a sustainable social and economic development. Furthermore, the solution to this problem also depends on the development and deployment of appropriate technologies through research and development.

In Nigeria, the Federal Government has established a number of research organisations to address this problem. But their performance is being hindered by inappropriate polices for the research and development institutes, also poor project management knowledge, skills, tools and techniques. The R and D projects, which are unique due to their long-term outcomes and their dependence on actions by others, have also been a factor hindering the execution of the projects (Technologyone, 2011). The inappropriate use of project management knowledge skills, tools and techniques in the management of projects has also been a factor and have led to incomplete and/or failed projects (O'Sheedy, 2012).

Project management in recent times has improved in the application of tools and techniques, especially the application of SPM (PMI, 2010). It has helped with the management of programme and project portfolio management in developed economies, but developing countries like Nigeria are faced with many barriers to successful project management. This research will therefore identify and address those barriers affecting the application of SPM techniques, and will also propose an effective strategic framework that will enhance the effective application of SPM in PROs in Nigeria. This, if properly executed, would assist in

enhancing economic development and increase the value addition to the abundant raw materials available in Nigeria.

2.2.7 The political context

Nigerian is made up of around 200 ethnic groups with approximately 500 indigenous languages and two major religions – Christianity and Islam (Nigerian Handbook, 2014). The largest ethnic groups are the Hausa-Fulani in the North, the Igbo in the Southeast and the Yoruba in the Southwest. The reality of Nigeria's geographical, ethnic and cultural diversity is effectively balanced by the country's strong federal structure which emphasises an all-inclusive representation of the six geo-political zones arrangement, comprising of thirty-six states and Abuja, the Federal capital Territory (Nigeria handbook, 2014). Though Nigeria's socio-political environment is fairly stable, there are pockets of instability in some part of the country (World Bank, 2013).

The fourth consecutive national election was held in April 2011, further consolidating the culture of democratic rule that began in 1999. The elections signified substantial progress in electoral and democratic development and were adjudged by observers as the freest and fairest in the country's election history (Nigerian Handbook, 2014). There were, however, frequent incidents of violence before and after the elections, calling for resolute actions to bring sectarian strife under control, and signalling the need to make more rapid progress on social inclusion, especially youth employment. The fifth Nigerian general elections took place in March 28th, 2015. On the international scene, Nigeria continues to be a leading player in the African Union, the New Partnership for African's Development (NEPAD), and the Economic Community of West African States (ECOWAS) (World Bank, 2013).

2.2.8 Development challenges in Nigeria

Despite the strong economic track record of Nigeria, poverty is still a significant challenge, and to address this would require a strong focus on non-oil growth as well as on human capital development. The challenges confronting the Nigerian economy are diverse and enormous. The deplorable state of Nigeria's economy is most unfortunate given the country's vast endowments of natural and human resources, which if efficiently harnessed and managed would ensure that Nigeria's immense potentials are realised (Iweriebor, 2004). This can be seen more clearly when the country is compared to some of the Asian countries, such as Singapore and Malaysia, which had a similar colonial heritage, with its associated attributes, and similar natural resource endowments. They have recorded significant successes in the development of their economies since 1965 when they were on a par or even behind Nigeria (Mathew-Daniel, 2014).

Some of the constraints affecting the economic growth of the country include a weak investment climate, poor infrastructure, inadequate policy incentives, poor funding of research and development initiatives in science and technology innovation systems, and a low quality of education, especially with regards to the tertiary level (Iweriebor, 2004). In spite of successful initiatives in human development, according to a World Bank report, Nigeria may not be on track for meeting most of the Millennium Development Goals (MDGs). Underpinning these challenges is the core issue of governance, in particular with regard to policy autonomy at the state level, control of 50 per cent of government revenues, and responsibility for delivery of public services (World Bank, 2013). Although Nigeria is in the process of making up for the substantial ground she has lost in her quest for development, especially in the last 20 years, this has to be achieved within the context of a world economy characterised by significant features. These features include advancement in technology (including information technology); investment in science and technology; an increase in the knowledge base of the country; and enhanced environmental management (Mathew-Daniel, 2014).

Nigeria is well-endowed with raw materials and natural resources that, with the application of appropriate technology and production processes, will promote linkages between her raw and natural resources, production capability, and industry (Nigerian Academy of Science, 2002). It is the continued lack of this linkage between the research and development organisations and the industry that has largely affected the economy. To promote this, appropriate project management technology needs to be implemented; this will enhance the execution of R and D projects which could be used to grow the industrial sector, and hence sustainable development. The next section reviews PROs and their role in research and development.

2.3 AN OVERVIEW OF PUBLIC RESEARCH ORGANISATIONS

PROs have been identified to have a wider role in innovation system than simply providing new technologies to individual businesses (Arnold *et al.,* 2012). They provide access to skilled personnel, assist business with short-term problem solving, support the development of research and innovation capabilities through collaborative working and provide access to new ideas and concepts. In this sense, they are engaged in knowledge and not solely technology transfer (Arnold *et al*., 2012).

Globally, in the last decades, despite the predominant role of block grants and direct transfers, governments have put more emphasis on competitive programme funding as a way to steer research and implement priorities, although government funding still represents the highest share of public funding for PROs. This trend has raised some concerns on behalf of PROs with regard to their long-term capabilities to address frontier and fundamental research or to provide independent advice to governments (Nedeva and Boden, 2006). Development has in the past been taken to be synonymous with the economic growth of any nation. There is now, however, a more comprehensive meaning attached to development; although economic growth is one of its key ingredients, it is no longer regarded as the only one (Science and Technology, 1992). Rather, innovation is now universally regarded as an

engine of economic growth in developing as well as developed countries – it is therefore an important driver of poverty alleviation. To set effective innovation policies, policy makers need trustworthy indicators to benchmark and monitor these policies (Science and Technology, 1992). Research and development is an important component of a country's National Innovation System (NIS) and R and D statistics are among the most widely used indicators to monitor the NIS (Science and Technology, 1992).

From a global perspective, R and D are concentrated in countries like the United States, the European Union and Japan (World Bank, 2010), while in the developing countries, R and D expenditure and output are also concentrated in a relatively small group of countries in each region. An example of this can be seen in the rapid rise of R and D in China over the last decade. R and D intensity, an indicator used to monitor resources devoted to science, technology and innovation worldwide, is conventionally measured as the ratio of gross domestic expenditure on R and D to gross domestic product (GDP) expressed as a percentage. The acute phase of the global financial crisis has passed and economic recovery is underway, but recovery remains fragile and is expected to slow down, as the growth impact of financial and monetary measures wane (World Bank, 2010). Despite this, the public sector is under increasing pressure worldwide to increase outcomes and improve outputs of their organisations, while simultaneously improving efficiencies and effectiveness. This pressure originates from a broad group of stakeholders, including the government, demanding accountability for spending and the implementation of measures that are more easily benchmarked (Technology One, 2010).

This is also experienced in Nigeria with the federal government threatening to close down and merge some PROs due to lack of success and low performance in project execution (Leadership Newspaper, 2013). The population of the research organisations has also experienced a trend of increasing diversity. The term PROs is used to refer to a heterogeneous group of research performing centres and institutes with varying degrees of

"publicness". This is understood in broad terms as the level of governmental influence on their research activities and funding, rather than just mere ownership (OECD, 2011). To meet these considerable challenges, PROs must revisit their strategic management processes and measurement systems. John Bryson, notable public sector strategist argued "leaders and managers of public sector organisations must become effective strategists if these organisations are to fulfil their missions, meet their mandates, satisfy their constituents, and create public value in the years ahead" (Bryson, 2004, pp 14).

2.3.1 Types of public research organisations

According to OECD (2011), there are four ideal types of PROs that exist in different countries, namely:

- **Traditional Mission-Oriented Centres (MOCs):** these are owned and run by government departments or ministries at the national and sub-national levels. They are set up to carry out research in specific areas that could be used to support policy-making in the country;
- **Public Research Centres and Councils (PRCs):** the PRCs are set up with the mandate to perform basic and applied research in several fields. These types of institutions are of large size in several countries thus representing a significant share of the national R and D capabilities;
- **Research Technology Organisations (RTOs):** these are also known as industrial research institutes and are known for the development and transfer of science and technology to the private sector and society. These are also known to be owned by government and the administrative links of the RTOs with the governments are better than with other types; and
- **Independent Research Institutes (IRIs):** the IRIs are known to perform both basic and applied research motivated on "issues" or "problems" rather than just fields. In many cases in some countries, IRIs could be regarded as "semi-public" due to their

funding pattern and also their activities, which have substantial public support and/or participation of public representatives in their governance.

In many countries, there have been some changes due to social demands that have led to the government expanding the task of their traditional PROs and also to the creation of new ones (OECD, 2011). The mission-oriented centres, as a result of their tighter links to governmental bureaucracies, are likely to have experienced fewer changes lately; in fact, some have diversified their roles and outputs to include measurement, certification and standardisation (OECD, 2011). The public research centres have kept their focus on traditional roles by providing a science base for the innovative capacities of their country through research and training, but with more pressure on technology transfer and a diminishing funding role (OECD, 2011). However, in some countries, their role as a research funders has been diminished in favour of external funding agencies and councils. Research technology organisations have become more important in their role of linking research and private sector innovation, and increasingly accessing markets and competencies internationally (OECD, 2011). The IRIs, which have been created more recently, sometimes in the context of particular programmes, are highly innovative in organisational terms and some of them have outstanding performances (OECD, 2011).

Therefore, the different types of PROs, depending on their particular profile, perform a variety of roles. These include: basic and applied research; policy support; training; knowledge and technology transfer; service provision; research funding; technological facilities; standardisation and certification. The trend towards diversification of roles in PROs was identified a decade ago (Eurolabs, 2002). It is difficult to establish whether increasing competition for funding will lead to a shift from role diversification to specialisation. This shift, however, is unlikely to occur in the policy context where PROs are increasingly facing multiple demands.

2.3.2 Motivations and interests of public research organisations

The diverse institutional arrangements of the PROs are also known to impact on their relative competences to select and perform roles within the innovation systems and, specifically, their strategic capacity to adapt to changes (OECD, 2011). Some PROs have very specific and stable missions, but are all subject to change and adaptation processes. These changes have mostly been policy-driven, while in some countries, they have witnessed privatisation (Boden *et al.,* 2004) and transfer of ownership to universities. The main mechanisms have been due to changes in funding or reduction of public support, together with the emergence of new normative models of research centres with a strong emphasis on scientific excellence, knowledge, transfer to firms and service to society (Cruz and Sanz 2007; Schimank and Stucke, 1994).

The increasing demands for research that is both relevant and excellent, have led the different types of PROs to aim for greater management flexibility and to seek a diversification of funding sources in order to increase their autonomy. The RTOs are more market-driven, but are equally subjected to the policy framework or paradigm dominant in the field (OECD, 2011). In fact, many of them belong to the non-profit sector where government is the major customer or the main driver behind their creation and existence. In the near future, it is unlikely that there will be “radical” innovations in the core motivations and interests of PROs altogether, but rather incremental adaptive processes and reforms with different speeds depending on their typology (OECD, 2011).

There are two institutional arrangements that affect how PROs perform their roles in order to attain a competitive advantage. The first is the autonomy of the PROs with respect to the political system in terms of their budget, employment and structure (OECD, 2011). Governments tend to keep a considerable degree of control over employment and funding, but for those PROs that are strongly dependent on the state, the ease with which they can establish new goals is limited unless the state directly allocates new resources (Whitley,

2010). The IRIs and the RTOs usually have more flexibility to determine employment conditions, resource allocation and organisational structures. The second dimension refers to the internal distribution of authority. Within PROs, the distribution of authority between the central headquarters, the institutes' directors, and the researchers, varies across cases. In systems where such distribution is decentralised and researchers very autonomous, PROs may find it harder to develop strategic approaches towards role selection. As a result the overall profile of the PROs will tend to be the aggregate of the individual preferences and orientations of the researchers. There probably has to be some degree of internal centralisation in the form of managerial leadership for the PROs to plan strategically (Cruz-Castro *et al*., 2011).

2.4 THE PUBLIC RESEARCH ORGANISATIONS IN NIGERIA

The PROs in Nigeria occupy an explicably prominent position, and indeed central, focal point in current thinking and planning about the future of the country. The term public 'research organisation' refers to the government-owned research organisations that engage in research and development with substantial funding support from the government and some international organisations such as the World Bank, UN, etc. (David and Metcalfe, 2007). The character and span of their multi-functional activities gives these institutions a critical role, not only in programmes and policies that aim to advance the knowledge base for technological innovation and economic growth, but also in the knowledge society, the industrial sector of the country, and the world at large (David and Metcalfe, 2007).

2.4.1 Evolution of public research organisations in Nigeria

The aim of the scientific/technological R and D in the pre-independent period of Nigeria was primarily to boost production in those aspects of the economy that were export-oriented (Science and Technology, 1992). At that time, there was an agricultural experimental station, which was established in 1899, and also a Geological Survey department, which was

established in 1919 (Science and Technology, 1992). By the year 1960, there were only eleven research institutes in existence. Of eleven research institutes, ten were agricultural. However, by 1983 the number of research organisations increased from eleven to twenty-two, although eighteen of these were again specifically for agricultural research (Science and Technology, 1992).

In the immediate post-independence period, the Nigerian government undertook developmental activities under the neo-colonial framework of development supplied to it by British colonial officials and the 'experts' of the emergent multilateral imperialist agency, the World Bank (Iweriebor, 2004). In the area of research and development, this meant the maintenance and expansion of inherited agricultural research institutions and a nod of approval to industrial development research. This was a result of the fact that under the neo-colonial strategy, Nigeria's development was undertaken primarily by maintaining and expanding the colonial economic patterns of raw materials production and exportation, and some industrial assembly activity by foreign investors; there was no general programme or policy for endogenous industrial development (Iweriebor, 2004).

Therefore, the need to promote industrial research activity was not pressing and from the 1960s, the science and technology research field was faced with a number of problems (Iweribor, 2004). These included the lack of a clearly articulated policy on the role of science and technology in the development process, an inadequate institutional framework and lack of funding. A major condition that affected the research organisations was the poor understanding by the political leadership of the importance of science and technology research. The state's neo-colonial mentality was exhibited by the low priority given to the funding of scientific research, with a preference for, and dependence on, foreign expertise and solutions, and a lack of faith in indigenous experts and resources (Iweribor, 2004).

It was not until 1970 that scientific and technological development efforts changed with the government formulating a general approach to R and D (Iweriebor, 2004 and Momah, 1999). This resulted in the establishment of the Nigerian Council for Science and Technology (NCST) in 1970, which was purely an advisory organ of the Federal Government. Under the NCST, there were sectorial research councils known as:

- The Agricultural Research Council of Nigeria (ARCN), under the federal Ministry of Agriculture and Natural Resources;
- The Medical Research Council of Nigeria (MRCN) under the federal Ministry of Health;
- The Industrial Research Council of Nigeria (IRCN) under the federal Ministry of Industry; and
- The Natural Science Research Council of Nigeria (NSRCN) under the federal Ministry of Education.

The National Council for Science and Technology, for the first time in 1975 became an executive arm of government and by the instrument of Decree 5, it was given executive powers and renamed in 1976 the National Science and Technology Development Agency (NSTDA) and placed under the chairmanship of the then chief of staff supreme headquarters, the late Gen. ShehuYar' Adua (Momah, 1999). Later, in 1980, the Agency matured into a full-fledged Federal Ministry of Science and Technology with its pioneer minister as Dr. Sylvester Ugoh (Momah, 1999).

However, in 1984, supposedly for cost-saving reasons, the Federal Ministry of Science and Technology was merged with the Ministry of Education by the military administration of General Muhammadu Buhari and it remained a wing under the Ministry (Momah, 1999). In 1985, the General Ibrahim Babangida regime restored it again to its full status as Federal Ministry of Science and Technology.

Six years after its restoration, it was once again dissolved as an autonomous ministry in January 1992 by the same administration, following a reorganisation of federal ministries and agencies (Momah, 1999). The technology section was merged with another agency to form the Ministry of Industry and Technology. However, on the 26th of August 1993 the two were separated and the Ministry of Science and Technology was re-established by Chief Ernest Shonekan's interim national government (Momah, 1999). There were a total of twenty-five research institutes and parastatals that were originally part of the Federal Ministry of Science and Technology before its dissolution in 1992, but only ten were restored with the ministry, with as many as 15 yet to be returned to the ministry (Momah, 1999).

This inconsistent experience of the science and technology ministerial portfolio suggests the absence of a firm and steady commitment by the Nigerian state and political leadership to the effective deployment of these disciplines for national development. At the same time, there is little doubt that there is an increasing acceptance in official political circles of the fact that science and technology are crucial to economic development and need more than lip service to contribute to this development (Momah, 1999 and Iweriebor, 2004).

A notable achievement of the Babangida administration was the final promulgation of the National Policy on Science and Technology in 1986. This policy document for the first time stated the national philosophy, objectives, strategies and funding method for the systematic development and application of science and technology to all spheres of national life (Iweriebor, 2004). It articulated policy guidelines in a variety of areas for the realisation of the basic objectives. These included making the educational system science-oriented; the development of a national scientific culture and its inculcation among the citizens; the promotion of science and technology by all levels of government; and the development of capital goods industries, basic materials (minerals) and energy resources.

The other objectives were the promotion of the development of local technological capacity and the un-packaging of imported technology to deepen the national acquisition of engineering and design knowledge; the standardisation of materials, machinery and products; and the application of science and technology in such fields as agriculture, health care, military science and the environment (Iweriebor, 2004). This policy gave birth to a number of research institutes. However after over 30 years of implementation, it was obvious that there was still a need to incorporate the issue of innovation in to the policy. Thus in 2012, a new National Policy on Science, Technology and Innovation (STI) was formulated, and launched in 2013 by the Federal Ministry of Science Technology (Ajoku and Onwualu, 2013). This chequered history explains the poor performance of research institutes under the ministry.

This inconsistency in the establishment of PROs affected the establishment of guidelines or a framework for the execution of their projects, hence the need for this study. The country currently has over fifty federal public R and D organisations under different ministries, some of which are shown in Table 2.1 (***see Appendix A***). The focus for this study was the institutions specifically concerned with industrial and technological research. Up until the 1970s and 1980s, there were only two industrial research institutions - the Federal Institute of Industrial Research, Oshodi (FIIRO) and the Projects Development Agency (later Institute) (PRODA) Enugu, that was originally established by the former East Central State Government, but subsequently taken over by the Federal Government (Iweriebor, 2004).

For the purpose of this research, the researcher examined PROs under the Federal Ministry of Science and Technology that promote industrial research activities (***see Appendix A***). These organisations carry out research and development projects, the results of which are then transferred to the industrial sector, which was helpful in determining the application of SPM in the execution of projects. Three out of seven different departments in the Federal Ministry of Science and Technology supervise these research organisations: the Department

of Physical and Life Sciences (DPLS), Chemical Technology and Energy Research, and Technology Acquisition and Assessment.

The character and span of the multi-functional activities of PROs gives them a critical role, not only in programmes and policies that aim to advance the knowledge base of research, development and technological innovation, but in the economic growth of the country. The application of SPM in PROs is therefore based on the need for the leaders and project managers of such organisations to fulfil their missions, meet their mandates and create public value in the years ahead (Bryson, 2004). The literature reviewed above presented an explanation of how the implementation of SPM will contribute to the alignment of an organisations' strategies with the project strategy, which if implemented would lead to an overall competitive advantage through the management of organisational competencies, capabilities and project leadership.

2.5 OVERVIEW OF PROJECT MANAGEMENT

The growth and survival of organisations are achieved with the execution of projects (DyReyes, 2008; Shenhar and Dvir, 2007) and the organisational strategic change is also largely delivered through multiple, simultaneous projects (Patton and White, 2002). Projects therefore are regarded as a temporary endeavour undertaken to create a unique product, services or result (Project Management Institute, 2004). According to Milosevic and Srivannaboon (2006), the essence of project management is to support the execution of an organisation's competitive strategy to deliver a desired outcome. As a result, organisations that conduct complex strategic activities within a specific timeframe, which require the commitment of significant resources, will organise their activities into either projects or programmes (Roney, 2004). Project management is defined as management that supports the execution of an organisation's competitive strategy to deliver a desired outcome (such as fast time-to-market, high-quality and low-cost products) as one of the key business processes that enable companies to implement value delivery systems (Milosevic and

Srivannaboon, 2006). It is also viewed as that discipline which employs skills and knowledge to achieve project goals through various project activities (Longman and Mullins, 2004).

The early history of project management reveals that projects are not new but have been in existence from the ancient times and the earliest civilisation testifies to the achievements recorded by our forebears, which even now evoke our wonder and admiration (Lock, 2007). However, the evolution of the industrialised world, competition, greater regards for value and well-being, and the cost of employing people have contributed to the development of new project management ideas and techniques (Lock, 2007). Every organisation now creates and implements projects to help it move towards its goals. Successful projects rarely happen by accident but are planned and executed with the support of the management and the organisation in general. For a project to be successful, it must have a responsible and empowered manager to drive, direct, and monitor the project. Project management is that discipline which employs skills and knowledge to achieve project goals through various project activities (Kerzner 2009). It involves controlling costs, time, risks, project scope, and quality through project management processes. The functions of project management include (Kerzner, 2009):

- Planning – planning the project and establishing its lifecycle;
- Organising – organising resources: personnel, equipment, materials, facilities, and finances. Coordinating work and resources;
- Leading – assigning the right people to the right job. Motivating people, setting the course and goals for the project;
- Controlling – evaluating the progress of the project and, when necessary, applying changes to set it back on track; and
- Performing these functions in an organised framework of processes, which is the job of the project manager.

Projects from ancient times have left impressive legacies on our architectural and industrial culture and sometimes one wonders how some of those early masters managed without the technology that is cheaply available today (Lock, 2007). However, with the exception of a few notable philanthropic employers, concern for the welfare and safety of workers was generally lacking and many early project workers actually lost their lives through injuries, disease and unbearable physical exhaustion. People were often regarded as a cheap and expendable resource, but by the end of the 1960s, project management became a reorganised profession with companies showing concern for the welfare of the people at work (Lock, 2007).

Formal management organisational structures that existed from early times, and flourished in military, church and civil administrations, now exist in industrial organisations (Lock, 2007). Rapid industrialisation and the demands for ammunition production in World War One saw the emergence of management scientists and industrial engineers such as Elton Mayo and Frederick Winslow Taylor, who studied people and productivity in factories (Kanigel, 1997). Henry Ford made production-line manufacturing famous with his Model T automobile and Henry Gantt (1861-1919) developed the famous chart (Gantt chart) which is still popular and universally used today, with a special importance for project managers. By the end of the 1930s, modern project management had begun to emerge most conspicuously in the military and process engineering industries. The Manhattan project, which involved the development of the first atomic bomb, is commonly presented as the first evidence of modern project management, although it did not use abundantly available project management tools such as network planning or work breakdown structures (Janem, 2011). It is not generally appreciated that early examples of critical path networks were developed before the 1950's, as their value was not widely appreciated at the time. Without the existence of computers, these networks were inflexible to change, tedious to translate into working schedules and thus impracticable and difficult to use. Gantt's bar charts were generally preferred and were

often set up on proprietary charts that allowed rescheduling using movable magnetic or plug-in strips or cards. Everything from the allocation of labour and machinery to holiday schedules was controlled by charts which were usually displayed prominently on office walls (Janem, 2011).

The early 1950s showed little progress in the formalisation of project management, but by the end of the decade, this situation had been significantly changed by two major developments: the development of network project planning and the monitoring techniques of PERT (Project Evaluation Review Technique), CPM1 (Critical Path Method), and PDM (Precedence Diagramming Method); and Systems Engineering (Morris, 1994). The 1960s witnessed an intellectual push to apply general management theories to project management, particularly in terms of the "system approach" and organisational factors such as differentiation, integration, and interdependence.

In the early 1960s, project management evolved from a traditional paradigm and the underlying idea of the “specification-planning-execution-control theory” was the result (Saynisch, 2010). For example, the nine Knowledge Areas in *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)* Fourth Edition (Project Management Institute [PMI], 2008), and most elements of the International Project Management Association (IPMA) Competence Baseline (IPMA, 2006), represent an understanding of traditional project management. However, traditional project management was found to be deficient in solving the widespread profound challenges encountered in project management, therefore the need arose for strategy in the execution of projects (Saynisch, 2010).

The late 1960s witnessed a shift in focus from organisational and scheduling aspects to more comprehensive texts on project management (Morris, 1994). The 1960s also witnessed the establishment of bodies of knowledge, and the two major professional project management bodies independently in Europe and North America: The IPMA and PMI (Lock, 2007).

The 1970s saw the emergence of information technology, with project management software available, bringing wider recognition of the role of project management, and by the end of 1989, project managers became far less dependent on IT experts with Microsoft Project, developed by the Microsoft Company, available to all (Lock, 2007). Although there was rapid growth in technology, this could not be reflected in project management outputs, as project managers were largely preoccupied with learning the software, rather than doing the job (Lock, 2007).

Currently, with the power of communication made possible by satellites and the internet, effectively shrinking the world and making it feasible to share reports, drawings and other project management documents instantaneously, there is a wider acceptance that managing organisational changes in the form of projects can bring faster and better results (Lock, 2007). There are also different types of projects, of different sizes. They can be small, large or mega projects, and these are discussed in the following sections.

2.5.1 Types of projects

According to Lock (2007), projects are classified into four different general types. These are detailed below, together with R and D projects:

- **Civil or chemical engineering and construction projects**: These types of projects are mainly industrial projects and are usually conducted on site, exposed to the elements. They include building and construction projects; land reclamation; tunnels and bridges projects; mining and quarrying; petrochemical plants; and oil and gas projects.
- **Manufacturing projects:** Manufacturing projects result in the production of mechanical or electronic equipment, and products or items of specially designed hardware. These include new R and D products; equipment manufacturing; ship

building; automotive manufacturing; aircraft and aerospace; heavy engineering; food and drink; and pharmaceuticals.

- **Management projects**: These are projects often carried out internally for the benefit of the organisation. These include IT systems, reorganisation, recruiting drives, regulatory changes and marketing projects.
- **Projects for pure scientific research**: Pure scientific projects are special projects and are not to be confused with R and D projects. Pure scientific projects occasionally result in a dramatically profitable discovery. The project objectives are usually difficult to define and there may be no awareness of possible outcomes. Therefore pure research projects are not amenable to the project management methods that can be applied to industrial manufacturing or management projects.
- **Research and development (R and D) projects**: R and D projects, according to the Business Dictionary, are projects with systematic activities combining both basic and applied research, and are aimed at discovering solutions to problems or creating new goods and knowledge. R and D may result in the ownership of intellectual property such as patents. In accounting for R and D costs, the development cost may be carried forward but the basic and applied research costs are often written-off as incurred. This study is focused on this type of project.

2.5.2 The current perspective of project management

A considerable amount of literature has been published on project management. These studies have shown that lack of infrastructures and very limited resources have led to the evolution of project management from a methodology based on scheduling and budget constraints to a key business process that contributes to strategy realisation (Andersen *et al*., 2006; Anderson and Merna, 2005; Baca *et al*., 2007; Boto, 2006; Dietrich and Lehtonen, 2005; Graham and Longman, 2006; Jugdev, 2006; Kenny, 2006; Longman and Mullins, 2004; Milosevic and Srivannaboon, 2006; Patton and White, 2002; Shenhar, 2004;

Srivannaboon, 2006; Stanleigh, 2006; Thiry and Deguire, 2007). Project management has transformed from a practice of project execution that is based on the standard time, cost, and quality performance metrics (Andersen, *et al*., 2006; Cicmil and Hodgson, 2006; Jugdev, 2006; Kenny, 2006; Milosevic and Srivannaboon, 2006) to a process of executing organisational strategy (Cabanis-Brewin and Pennypacker, 2006).

This evolution marked a conceptual shift away from the orthodox engineering view of project management to a more business and value-centric view, wherein the primary concerns of the organisation are implementing business strategy, improving organisational performance and increasing stakeholder benefits (Andersen *et al*., 2006). Several scholars suggest that project success should be considered in the context of the achievement of the strategic goals of the organisation (Dietrich and Lehtonen, 2005; Kenny, 2006) and it has been found that when organisations link their projects to their business or organisational strategy, they are better able to accomplish their goals (Dietrich and Lehtonen, 2005; Longman and Mullins, 2004; Milosevic and Srivannaboon, 2006).

2.5.3 Current crisis in project management

According to Kloppenborg and Opfer (2002) in DyReyes (2008), the discipline of project management is used as a key strategy to manage change in contemporary organisations. Although projects are essential to the growth and survival of organisations, the more projects are used to accomplish organisational purposes, the more reliant the organisation is on the effective and efficient management of these projects (Cleland, 1999). Recent studies have shown that the majority of organisations all over the world are losing billions from money wasted on projects, and according to Stanleigh (2006), one of the biggest contributing factors to this waste is a severe lack of alignment between projects and corporate strategy. Literature regarding the efficacy of project management highlights the extreme failure rates in the IT sector (Stanleigh, 2006). For example, the results of “The Chaos Survey” by the Standish Group, show that the overall success rate for IT projects is only 16.2 per cent, while

challenged projects account for 52.7 per cent, and impaired (cancelled) projects account for 31.1 per cent (The Standish Group Report, 1995). This statistic has not effectively changed since 1995 (Stanleigh, 2006).

In project management, the crises experienced led to the need for the implementation of strategy. Strategy implementation occurs when a firm "adopts organisational policies and practices that are consistent with its strategy" (Barney and Hesterly, 2006). According to Johnson et al. (2005), translating strategy into action ensures that strategies are working operationally and includes the following characteristics:

- ***Structuring*** an organisation to support successful performance (including organisational structures, processes and relationships and the interaction between these elements); and
- ***Enabling*** success through the way in which the various resource areas (people, information, Finance, IT, etc.) of an organisation support strategies.

For an organisation to achieve its strategy, it is necessary to combine these aspects of strategy implementation and critical integrative links, known as the critical elements for aligning business objectives with project strategy. According to Hussey (1999), there are five critical elements required for an organisation to achieve strategic success, and these include the notion of strategy implementation. Hussey (1999) recognised that strategy cannot be successful until it is implemented, and also suggested that this process is a combination of the "hard" and "soft" aspects of management. This has been demonstrated in Figure 2.2.

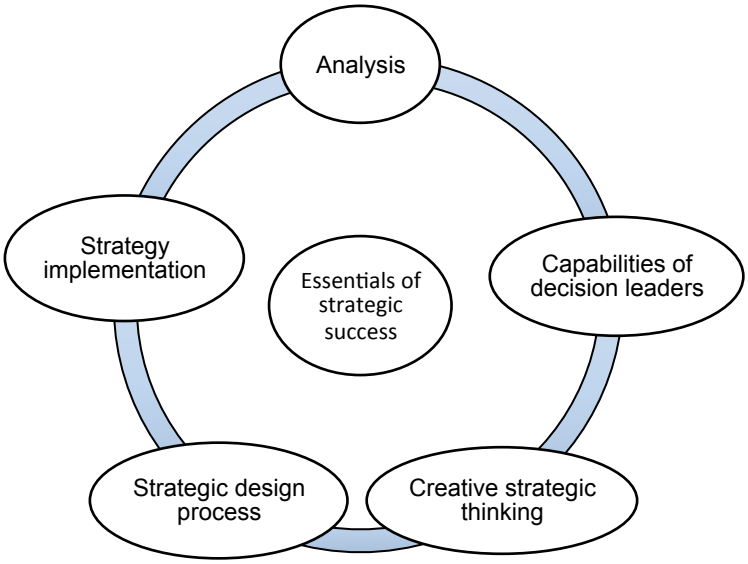

Figure 2.2: Five Essentials for Strategic Success
Source: Adapted from Hussey (1999)

The other essentials, as shown in Figure 2.2, are analysis, the capabilities of the management leaders to take decisions, and the ability of the organisation to develop a creative strategy. According to Lamb (1984), the most neglected and important aspect of the project management field is strategy implementation and that "an organisation's ability to achieve global competitive advantage is directly tied to its success in implementing its chosen strategy" (p. 220). Lamb (1984) further argued that companies that emerge as leaders in the global market are those that are able to successfully transform the complex elements of strategic planning into competitive advantage. Heracleous (2003) stated, in support of this argument, that organisations found to plan and implement their strategic plans generally perform better in the growth of sales, earnings, and deposits, and in the return on assets, equity, sales, and total invested capital, than those companies that do not.

In addition, companies that engage in strategic planning and implementation for the longer term (as opposed to short-term forecasting or annual planning) deliver higher returns both relative to their industry and in absolute terms (Heracleous, 2003). On the other hand, Patton

and White (2002) are of the opinion that, if an organisation is to attain and sustain a competitive advantage, then it is essential to closing the integration gaps between strategic planning and implementation. As a result, implementation of a methodology that provides the processes and tools to achieve total alignment of the organisation is a critical factor in achieving a competitive advantage (Kenny, 2006).

Furthermore, Morris and Jamieson (2005) noted that the majority of traditional management research only covers the strategic management processes used when formulating and implementing strategy at the corporate level. Anderson and Merna (2003), Dietrich and Lehtonen (2005), Heracleous (2003), Morris and Jamieson (2005), Milosevic and Srivannaboon (2006) and Roney (2004) also identified that there is a lack of knowledge or skills in organisations regarding how to translate business strategies into projects. This shows that there is a deficit of research regarding how corporate strategy is both translated and operationalised, particularly at the programme or project level. Yet, according to Morris and Jamieson (2005), these two sets of business activities are interrelated, as projects are important mechanisms for strategy execution in organisations.

For example, Patton and White (2003) state that effective strategic management involves the process of formulating strategies and then executing those strategies to create a sustainable competitive advantage. Thus, Pettigrew *et al.* (2002) are of the opinion that the most promising approaches to the analysis of corporate strategy are those that investigate both the characteristics of the resources and capabilities that underpin corporate strategy, and also the organisational structures and mechanisms that implement it. However, it could be deduced from the research of Hussey (1999), Lamb (1984), Anderson and Merna (2003), Dietrich and Lehtonen (2005), Heracleous (2003), Morris and Jamieson (2005), Milosevic and Srivannaboon (2006) and Roney (2004), that strategy implementation (found to be a critical factor in strategy [Hussey, 1999]) has yet to be addressed in the current project

management field. This can explain why SPM implementation remains a challenge for most project managers. A strategic plan does not have any meaning until it is implemented.

2.6 DEFINING STRATEGIES AND STRATEGIC MANAGEMENT

The word strategy, adopted from the military for use in business, has numerous notions and definitions attached to it that emerged from strategists and practitioners dealing with strategy in various contexts; each emphasises different views and understanding of strategy (Riemer, 2008). Different authors viewed strategy in different ways. According to De Wit and Meyer (1998 cited in Ochieng *et al*. 2013), strategy can be broadly conceived as a course of action for achieving an organisation's purpose. Quinin (1980 cited in Ochieng *et al*. 2013) stated that a strategy is the pattern or plan that integrates an organisation's major goals, polices and action sequences onto a cohesive whole. De Wit and Meyer argued that there are strong different opinions on most of the key issues and the disagreements run so deep that even a common definition of the term "strategy" is illusive (De Wit and Meyer, 2010).

However, an understanding of strategy can only be gained by grappling with the diversity of insight presented by prominent authors, and by realising that strategy can be viewed as two different approaches to learning – the tools-driven approach and the problem-driven approach (De Wit and Meyer, 2010). Without strategy, organisations are exposed to the risk of project failure due to unclear aims and objectives and fragmentation of decision-making, leading to conflicts in the prioritisation of projects and programmes (OGC, 2005).

Strategic management therefore is one of the key tools available to managers of organisations to enhance their efficiency. According to Mintzberg cited in Ochieng *et al.*, the process of strategy configuration, as seen by different schools of thought, can comprise many fascinating and varied standpoints (Ochieng *et al*., 2013). The key elements of the strategic management process are strategic planning, implementation and control. Although

these steps are separate and sequential, it is worth noting that considerable overlap exists between them (Berzins, 2010). Strategic planning is increasingly seen as a basic tool for good management (Bryson, 2004), as it places emphasis on certain planning methods, while the strategic implementation process is based on issues of the implementation plan, principles of adaptation to the internal and external environment, and an understanding of the methods (Berzins, 2010).

2.7 STRATEGIC PLANNING IN PUBLIC SECTOR ORGANISATIONS

Strategic planning in the public sector organisations is based on the premise that leaders and managers of public organisations must be effective strategists if their organisations are to fulfil their missions, meet their mandates, and satisfy shareholders in the years ahead (Bryson, 2004). Although the notion of strategy has its origins in the military arena, strategic planning in recent years has been primarily focused on private sector organisations and much of the theory assumes that those in executive control of an organisation have the freedom to determine its direction (Kriemadis and Theakou, 2007).

However, in the public sector, those in executive positions often have their powers constrained by government regulations which determine to various degrees not only the very purpose of the organisation, but also their levels of freedom to diversify or, for example, to reduce a loss-making service (Duncan, 1990; Kriemadis and Theakou, 2007). The primary driver in these organisations is not profit, but the desire to maximise output within a given budget (Kriemadis and Theakou, 2007). According to Bryson (2004), strategic planning can help public organisations to anticipate and respond effectively to their dramatically changing environments. OGC (2009) discovered that strategic management is a dynamic process of aligning strategies, performance and business results in an organisation.

However, in management, there has been a trend to attach the ‘strategic’ label wherever possible, thereby transforming general management into a strategic concept. At first it was

strategic planning, then strategic management, strategic marketing, strategic manufacturing, strategic accounting and finance, and now strategic project management (SPM) (Green, 2005). In order to understand the notions of SPM and its development, the researcher examined the evolution of SPM, presented in the following section.

2.8 EVOLUTION OF STRATEGIC PROJECT MANAGEMENT (SPM)

In the early days, project management practices started out as a tactical tool used for the execution of individual projects and programmes which coincided with the business schools' push towards management by objectives (Wessels, 2007). This was first initiated in 1954 by Peter F. Drucker in *The Practice of Management*, in which he defined Management by Objective as a process of agreeing upon objectives and obtaining buy-in from management and employees (Wessels, 2007). However, according to Drucker in Wessels (2007), management by objectives proved to be a failure, because results are achieved only when the objectives are known, and most of the time this is not the case. Management by objectives required precise, written description and guidelines for monitoring and evaluation, and the concept proved incapable of accomplishing the desired strategic objectives, such as entering a new market, increasing revenues, and reducing costs. The call for management by projects evolved after Tom Peters launched a management revolution with his book, *In Search of Excellence*, and organisations started using SPM as a tactical tool for project execution (Wessels, 2007).

The process that has been found to assist organisations and bridge the gap between organisational strategic objectives and project management strategy is known as strategic project management (DyRayes, 2008). It is relatively new in the field of project management and in order to understand the concept, its application and how different authors view it, the researcher reviewed their models and views on the implementation of SPM. Callahan and Brooks (2004) defined SPM as "the use of the appropriate project management knowledge,

skills, tools and techniques in the context of the company's goals and objectives so that the project deliverables will contribute to company value in a way that can be measured" (p. 23). However, Brown (2007) and Green (2005) in their work identified an omission in Callahan and Brooks's definition, which is the role of leadership, referred to as the most important part of SPM (Brown, 2007; Green, 2005). This led Brown (2007) to define SPM as a process that involves selecting, managing and measuring project outcomes to ensure optimal value for an organisation. Brown (2007) also stated that all projects undertaken by an organisation must meet a set of criteria established by the organisations' leadership, in order to ensure alignment with the strategic vision of the organisation. Green (2005) defined SPM as: "the management of projects in such a way as to develop competencies and capabilities, which contribute to the organisation's sustainable competitive advantage" (p. 2).

Green, (2005) and Wessels (2007) identified project managers as strategic implementers, and cross-functional project teams as strategic tools, whose aim is to convert strategy into execution. Green (2005) specifically identified SPM as a source of sustainable competitive advantage, and underlying the theory of SPM was the notion that "project management skills and leadership skills are scarce, firm specific and highly valuable" so that SPM "promotes them and the tacit knowledge which they engender" (p. 2). The notion of SPM is based on the relationship between competitive advantage and strategic capabilities, which is known as the "resource-based view of strategy" – wherein the competitive advantage of an organisation is explained by the distinctiveness of its capabilities (Green, 2005). According to Green (2005), project managers contribute to competitive advantage because of their skills in managing relationships, and an organisational willingness to foster these skills throughout the organisation, so that project managers can be used to teach others how to manage people and relationships across organisational functions and boundaries. This is to say that Green's view of SPM is based on the constructs of competitive advantage, strategic capabilities and tacit knowledge management within the framework of the resource-based view of strategy. Heerkens (2007) also defined SPM as "a series of practices, procedures,

processes, tools, and behaviours which, when considered collectively, characterize the extent to which an organisation creates effective linkages between excellent project management practices and excellent business practices – all in the name of advancing the overall strategic objectives of the organisation" (p.1).

This definition identified the core elements associated with the concept of SPM and the relationship between project management and strategic business objectives. Heerkens (2007) identified that strategic project management is made up of four main aspects of higher-level project management practices: these include strategic alignment of projects, project portfolio management, programme management and the business results of projects.

- **Strategic alignment of projects:** This practice refers to the extent to which an organisation ensures that the projects it pursues are directly tied to the organisational strategy.
- **Project portfolio management:** This practice refers to the identification of a project investment categorisation scheme to assist the organisation with prioritising projects. According to Rao (2007), project portfolio management forms one of the building blocks used for relating projects to strategy, and can be considered as a key driver for aligning projects or programmes to organisational objectives.
- **Programme management:** The Project Management Institute (2004) defined the concept of *"programme management"* as "the centralised coordinated management of groups of projects to achieve the program's strategic objectives and benefits" (p. 16). Heerkens (2007) in addition stated that programme management practices are inherent within the pursuit of SPM and are demonstrated as the management of groups of projects and the management of interactions between projects.

- **The business results of projects:** Since projects are financial investments, organisations should estimate and measure project impacts on organisations from a business results perspective.

These aspects of project management practice, according to Heerkens (2007), show that the SPM process starts with defining the strategic intent of an organisation, and then moves through a series of five steps (*Figure 2.3*) that require:

- The identification of an optimum solution that will address the strategic objective of the organisation;
- The comprehensive evaluation of each proposed project using a combination of financial metrics (such as Net Present Value (NPV), Internal Rate of Return (IRR), etc.) and non-financial metrics (such as stakeholder and customer satisfaction, degree of product innovation, etc.);
- The prioritisation of projects;
- The determination of the project(s) that the organisation will pursue;
- The execution of the project(s) by project managers.

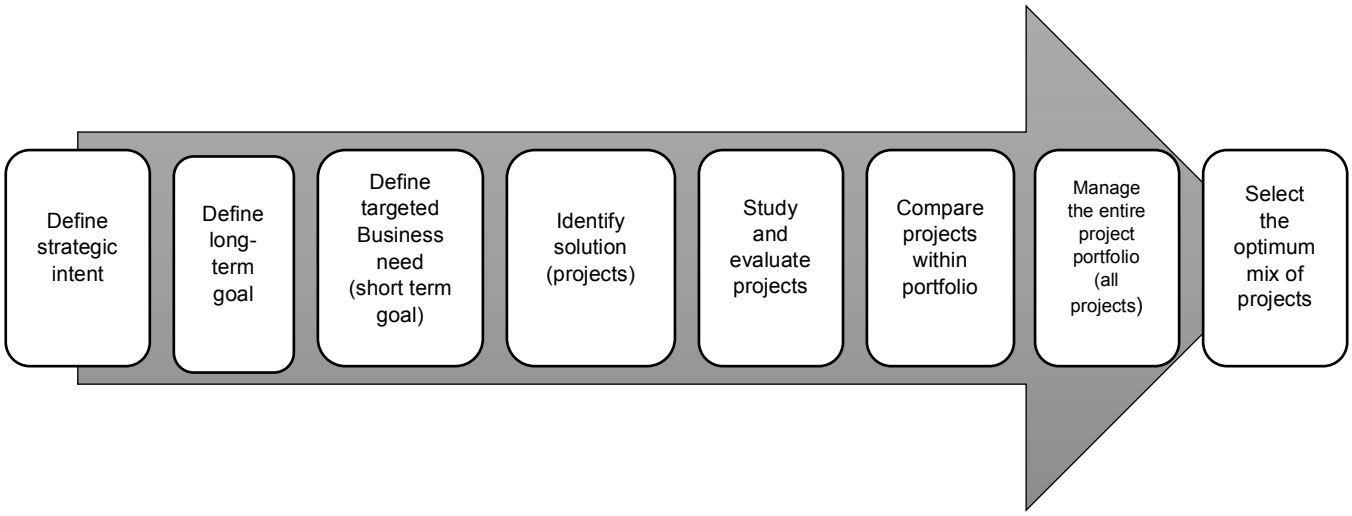

Figure 2.3: Strategic project management process
Source: Heerkens (2007)

However, from the definition and description of the SPM process by Heerkens, it was observed that it was more about the process of selecting strategic projects than the actual

process of implementing SPM. Wessels (2007) on the other hand explained that for strategic business objectives to actualise value they must be converted into programme initiatives and supporting projects. Wessels further suggested that adopting SPM would help organisations to select, manage and support multiple projects that would move the organisation forward by keeping the company vibrant in the marketplace and returning maximum value for shareholders. Furthermore, just like Heekens (2007), Wessels (2007) identified the following key characteristics of SPM:

- Alignment of the following key business processes: strategic planning, strategic goal setting, and enterprise project management;
- Functions as a well-managed portfolio of investments as it: (a) allows for the most effective use of constrained resources; (b) ensures a high return on investment since projects are managed collectively; (c) maintains alignment between the projects and the organisation's short, medium and long-term goals; and
- A new management process embedded between strategic planning and project execution that manages project investments strategically and combines business planning and management with project management best practices.

In alignment with Green (2005), Wessels makes a distinction between the orthodox perception of project managers as implementers of solutions that were focused on cost, time and quality, and the major transformation of their role, where project managers are perceived as key managers of strategy implementation and thus require "broad skills that encompass all aspects of business management" (p. 5). Wessels (2007) further suggested that firms should invest in developing their strategic project leaders by assisting in the development of their competencies and capabilities through formal on-the-job training and professional certifications i.e., PMP, mentoring, evaluation and competitive compensation methods, and advancement opportunities. This will enhance their ability to execute projects successfully.

Naughton (2006) defined SPM as “the management of those projects which are of critical importance to enable the organisation as a whole to have competitive advantage”. According to Naughton (2006), there is a gap between aligning project management competencies and the selection of projects that will give organisations a competitive edge. Specifically, strategy is formulated at the senior management level and for it to be implemented, it needs to be broken down into discrete projects. Project management becomes a source of competitive advantage when an organisation outperforms other companies through the experience and knowledge built up over time through managing projects.

Quadri (2010) identified SPM as a method of applying the soft skill-set of the project management body of knowledge (leadership, team management, complexity and ambiguity management, political and diplomatic management) to develop the capacity, competency and tacit knowledge necessary to ensure successful prioritisation, management, implementation and procedural closeout of projects (Quadri, 2010). On the other hand, Grundy and Brown (2002) view SPM as the process of managing complex projects by combining enterprise strategy and project management techniques in order to implement the business strategy and to deliver organisational breakthroughs. The process of SPM is illustrated in Figure 2.4.

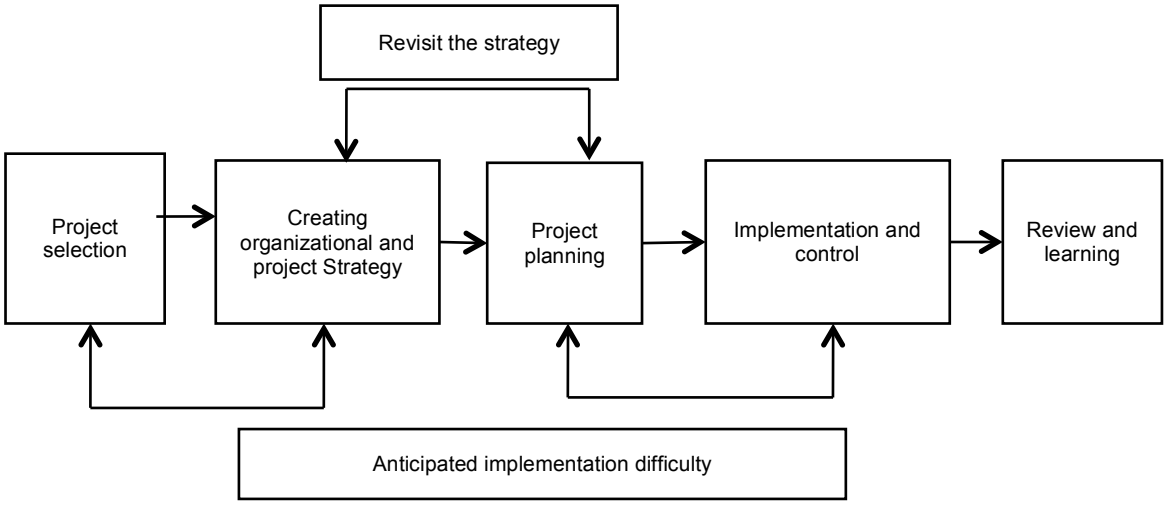

Figure 2.4: The SPM process
Source: Grundy and Brown (2002).

This figure shows the process of selecting the appropriate project for execution so as to address the project and organisational strategy during project planning. The aim is correct implementation of strategies that will enable the organisation to achieve its goals and objectives. The figure also emphasises the redefining or revisiting of the project strategy to ensure that implementation difficulties are addressed.

2.8.1 Theories of strategic project management

Researchers have different views of the importance and application of SPM in the field of project management. Some of the SPM theories are presented in Wessels (2007), who believes that adopting SPM to select, manage and support multiple projects gives companies the best chance of moving the organisation forward by keeping the company vibrant in the marketplace and returning maximum value for shareholders. Stanleigh (2006) also states that the implementation of SPM provides organisations with the necessary business intelligence to identify and terminate (as early as possible) projects that are of low priority and not linked to business strategy, so that misaligned projects can stop costing organisations money, resources and customers. SPM was therefore based on a methodology of aligning projects with business-level strategic plans that includes:

- Communicating the strategy throughout the organisation and cascading it through lower level strategies, involving initiatives that align the culture, policies and measures with the strategy (Morris and Jamieson, 2005);
- Analysing the possible value of each potential project, based on an assessment of its alignment to the organisation's goals and objectives (Garfein, 2007);
- Implementing projects at various levels of the organisation that reflect the vision of the strategy (Brache, 2002); and
- Integrating an extensive range of project management leadership, competencies and capabilities into the organisational context (Jamieson and Morris, 2004).

Heerkens' (2007) theory of SPM is presented as the alignment of projects, processes and resources with strategic business objectives (the traditional tactical and operational view); however, this study also expands the current field of research by demonstrating how the adoption of SPM methodologies contributes to sustainable competitive advantage (Green, 2005). Heerkens' work identified the core elements that constitute the concept of SPM, while advancing the relationship between project management and strategic business objectives; it is utilised as the context within which the selected models of alignment between business and project strategy are examined.

A review of the literature that describes SPM is carried out as a way of improving and extending the collective discussion in the literature. Theories include those presented by Collahan and Brooks (2004), Heerkens (2007), Green (2005), Wessels (2007), Stanleigh (2006), Grudy and Brown (2002), Brown (2007) and Naughton (2006) and an examination of these theories reveals several common, underlying determinants of competitive advantage (see Table 2.2). All the authors agree that the theory of SPM is based on alignment between organisational business strategy and project strategy, and that project portfolio management is a critical and necessary requirement for the implementation of SPM.

Furthermore, Green (2005), Wessels (2007), Stanleigh (2006), Grudy and Brown (2002), Brown (2007) and Naughton (2006) argued that the core competencies and capabilities of an organisation's internal assets are a significant component of SPM, with an emphasis on the strategic leadership and project management skills of project managers. In addition, Green (2005), Wessels (2007) and Naughton (2006) suggested that the competitive advantage of an organisation is based upon the scarcity and unique qualities of their resources. This is in accordance with the resource-based view of strategy, according to Pettigrew *et al*. (2002), which emphasises firm-specific resources as the fundamental determinants of competitive advantage and performance.

2.8.2 Implementing strategic project management

For organisations to implement SPM practices, it is important that they are able to measure the strategic contribution of a single project, and to understand strategy at the enterprise/organisational level in precise, measurable terms. In the existing literature, we see parts of this as an early focus on "success criteria" or "benefits realisation" by linking project success to externally referenced deliverables (Turner and Cochrane, 1993; Wateridge, 1998; Wells, 1998). But more recently, other authors have noted the lack of insightful studies that can adequately define "SPM" (Artto *et al*., 2001; Benko and McFarlan, 2003; Jamieson and Morries, 2004; Morris and Pinto, 2005) and what must be done to convince senior executives of the value of making investments in improved project management practices. Morris and Jamieson (2005) present several case studies from a variety of industries and point out that the maturity of strategic project management practices varies by industry and may be perceived quite differently.

Furthermore, Patton and White (2002) argued that rapid implementations of strategic plans requires "critical integrative links" (CILs) to "transform the broad plan [strategic] into specific integrated action steps and to establish processes that enable the high-velocity strategic implementation needed for a sustainable competitive advantage" (p. 2). These authors also suggested that strategies need to be transferred down to the operational levels of the organisation where they can quickly evolve into a large number of projects. These projects would be derived from the high-level strategic plan, and would initiate the various specific cross-organisational changes that are necessary to implement the strategies, goals and vision of the strategic plan (Patton and White, 2002). There are foundational CILs that assist organisations with formally defining, articulating, managing and aligning project strategy with business strategy (Shenhar, 2001). According to Patton and White (2002), they serve to bridge the gap between strategic planning and implementation while ensuring that links between the strategic direction of the organisation and its execution via projects are tightly integrated. They do this by:

- Adopting project portfolio management to maximise the value of the total collection of an organisation's projects and programmes, so as to ensure projects and programmes selected for execution align with the business-level strategies (Garfein, 2007); and
- Developing strategic project leadership (Patton and White, 2002) through project management competencies and capabilities that contribute to an organisation's sustainable competitive advantage (Hamel and Prahalad, 1990; Green, 2005).

Additional authors cited in the review of literature provided theoretical support for implementing the concept of SPM by aligning projects within the organisational project portfolio to the business strategy. This process incorporates the development and cultivation of appropriate skills, capabilities and competencies to undertake projects and execute them successfully so as to achieve the required business objectives. When viewed collectively, they present a larger construct for SPM that is based on a methodology of aligning projects with the business-level strategic plans.

2.9 THE NEED FOR STRATEGIC PROJECT MANAGEMENT IN RESEARCH AND DEVELOPMENT PROJECTS

Innovation is the key to the development of skills, generating ideas through research and turning them into commercial successes. It is not only vital for high-technology industries, but also essential to the future of many of our traditional sectors such as agriculture, manufacturing and mining (Hall and Williams, 2008). PROs are known to support such innovations through well-articulated projects. Strategic projects which are considered to represent the core of corporate growth, change and wealth creation (Asrilhant *et al*., 2005), can be observed in R and D projects due to their long-term outcomes and the ultimate benefits which form the basis for future projects. As such they could be regarded as strategic projects. Although the policy environment changes rapidly, with new breakthroughs and risk issues affecting the relevance of R and D projects, they have been found to motivate the

creation, acquisition and development of competencies, and the accumulation of diverse options, and are often conducted in a complex environment (Asrilhant *et al*., 2005). This aspect of R and D projects emphasises the need for SPM, and for PROs to have robust supporting frameworks for project management.

SPM also crystallises the concept of project differentiation and integration management. It is the fusion of the W5-H3 embodiments of a typical development project (what, when, where, who, why, how, how much and how well) and their application, relevance and dynamism to the whole lifecycle of developing projects – initiation, planning, executing, monitoring and closing (Quadri, 2010). This process helps with project evaluation and the identification of the root causes of project failures in public organisations. SPM could therefore be used as a project management tool, to select and manage the right projects that will address the organisation's mission, vision and strategic objectives, exploiting the tacit knowledge of creation and innovation enthusiasm in the organisation (Wessels, 2007).

Most projects today are conceived with a business perspective in mind; their goals are focused on future improved business and organisational performance, with enhanced profits, growth, and market position (Shenhar *et al*., 2005). Yet, ironically, when project managers and teams are engaged in day-to-day project execution, they are not focused on the business aspects. Their focus and attention, rather, is operational, and their mind-set is on "getting the job done". While this mind-set may focus on doing the job efficiently, it may lead to disappointing business results and even failure (Shenhar *et al*., 2005). Strategically managed projects are focused on achieving business results, while operationally managed projects are focused on getting the job done.

Management teams in strategically managed projects focus attention on activities and decisions that will improve business results in the long run, and are concerned with customer needs, competitive advantage, and future market success. Rather than sticking to the initial

product definition and project plan, they continuously make adjustments that will create better business outcomes (Shenhar *et al*., 2005). While the operational approach may be justified in some cases, the long-term (strategic) perspective is rather more acceptable. What is needed therefore is a new mind-set and framework that will focus project management in the new millennium on strategic issues to improve business performance (Shenhar *et al*., 2002). In view of the above, PROs will not only enhance the execution of R and D projects but will also achieve a project strategy that will address the needs of the populace in Nigeria.

2.10 THE ROLE OF STRATEGY IN PROJECT MANAGEMENT

Maskendahl (2010) reported Mankins and Steele's (2005) research on the performance of strategy where firms were identified as realising only 63 per cent of their strategies' potential value. Similarly, Johnson (2004) reported that 66 per cent of corporate strategies were never implemented. This shortfall, which is usually experienced in the public sector according to Milosevic and Sabin (2005), is due to non-alignment of the business strategy, portfolio management and project selection, which are the responsibility of senior management, while project planning and execution processes are the responsibility of project managers and project teams. These roles have been observed to be executed differently by different sets of people within the enterprise, and are therefore not aligned, and consequently the projects are not directly connected to either the business strategy or the organisational strategy (Milosevic and Srivannaboon, 2006). While strategy implementation – also regarded as the graveyard of strategy (Grundy, 1998) – has been neglected, emphasis in strategy research had been more on its formulation than the implementation. Hence, Hrebiniak (2006) stated that it is more difficult to make strategy work than to make strategy. This is where SPM and the need to establish a relationship between theory and practice become relevant. Therefore, the SPM approach to public sector research projects underscores the urgent need to contain the alarming rate of failure of projects in organisations (Quadril, 2010).

Research has shown that projects are “powerful strategic weapons” and are considered to be the central building block in implementing the intended strategy (Cleland, 1999; Dietrich and Lehtonen, 2005; Grundy, 2000). During initiation, projects are known to naturally start with a project plan that would include the project goal, scope, deliverables, milestones, resources, and also a business strategy conceived at the corporate level in an organisation (Shenhar, 2004). The question that needs to be addressed is how exactly this plan is translated into action in the project arena. Some projects are seen to do better than others, which means practically that there is a missing link between the business strategy and the project plan. This, according to Shenhar (2004), is called the project strategy (see Figure 2.5).

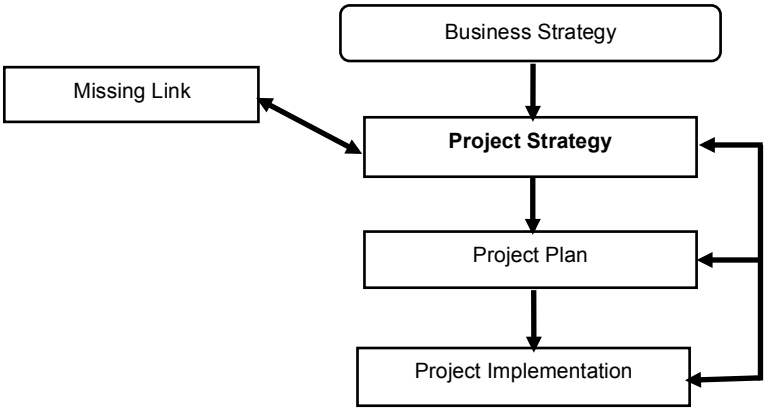

Figure 2.5: Project strategy – the missing link
Source: Shenhar (2004)

The strategy of a project is related to the project’s aim to achieve a desired position in the competitive environment. In order to understand project strategy, it is necessary to understand the project environment and the possible objective. However, the process of strategy implementation requires the alignment of business or organisational strategy and the project strategy at the initiation stage of the project (Shenhar *et al.,* 2002). As shown in Figure 2.5, the business strategy is considered along with the project strategy for a successful preparation of a project plan. However, in the majority of projects, the project strategy is omitted, which is the missing link (Shenhar, 2004) for a successful implementation. Project strategy, which is defined as “a direction in a project that contributes

to the success of the project in its environment" (Artto *et al*., 2008), needs to be considered in project implementation if organisations are to achieve a sustainable competitive advantage.

In today's project management environment, a project objective is not all about the product or services, but also how the project will help to create a competitive advantage. A good project strategy therefore, will be able to create competitive advantage (Shenhar *et al*., 2002). This explains why Green (2005) and Brown (2007) defined SPM as the management of those projects which are of critical importance to the organisation as a whole in order to attain a sustainable competitive advantage. Thus project strategy is of great importance in the field of project management and its application will enhance the application of SPM in public sector organisations.

2.11 STRATEGIC PROJECT MANAGEMENT PRACTICES IN NIGERIA

As found from the reviewed literature, SPM is used by researchers and practitioners of project and programme management to refer to alignment of organisational strategy with the project management techniques for effective implementation and management of project-based organisations (Callahan and Brooks, 2004; Green 2005; Grundy and Brown, 2002). Project management is an innovative management practice that aims to achieve the stated or specified objectives within specific time and budget limits through optimum use of resources (Stuckenbruck and Zomorrodian, 1987). SPM has been found to help organisations to invest their limited resources in the best way possible so as to achieve success and also meet the expectations of all the stakeholders (Stefanovic and Shenhar, 2007). Governments and organisations usually embark on different projects with the aim of creating new services, or improving the functional efficiency of the existing ones. All these projects require appropriate skills and techniques that go beyond technical expertise to also encompass effective skills to manage limited budgets, and monitor shrinking schedules and unpredicted outcomes, while at the same time dealing with people and organisational issues (Abbasi and Al-Mharmah, 2000).

The application of SPM practices in PROs has been identified as an efficient approach that would help in upgrading management capabilities and enable public organisations to efficiently complete projects and attain developmental objectives (Arnaboldi *et al*., 2004). Studies have confirmed that the application of modern SPM methods and techniques has a great effect on public institutions (Olateju *et al*., 2011). Arnaboldi *et al*. (2004) observed that the application of project management strategy in public organisations was as a result of pressure on governments to abandon bureaucratic organisation in favour of leaner structures. The study carried out by White and Fortune (2002) examined the current project management practices in the public sector in the UK by collecting data from 236 project managers in some public institutions. The study investigated the effectiveness of project management methods, tools, and techniques that had been used in successful projects. The study revealed that 41 per cent of the reported projects were judged to be completely successful based on time, budget and specification, although the respondents reported that there were some drawbacks experienced in the execution of the projects. Similarly, Abbasi and Al-Mharmah (2000) investigated the SPM tools and techniques used by the public sector in Jordan by surveying fifty industrial public firms. The research identified that the use of SPM tools and techniques among the public sector companies was considerably low.

In Nigeria, the implementation of modern project management tools, methods and techniques is still not well established in public organisations. This has resulted in the failure of public institutions and their contractors to perform their duties concerning the budget, specifications and deadlines of the projects awarded (Olateju *et al.,* 2011). Similarly, Idoro and Patunola-Ajayi (2009) identified social and political systems, cultural blocks and lack of financial support as barriers to successful project planning and execution in Nigerian public sector. It is noteworthy to state that recently PROs have started the application of SPM in the planning and execution of their projects but this is yet to be fully implemented. Some of the organisations have come up with strategic and action plan for their projects, thus the problem

is not with the planning but the implementation of those plans to enhance project success. This necessitated the need for this study on the implementation of SPM in PROs.

Research carried out by Asrilhant *et al.* (2006) on techniques to support SPM in UK oil and gas organisations identified that there were two processes involved in the application of SPM in the organisation. These are evaluation and control, and while evaluation involves framing, planning and valuing a strategic project, which may end with its approval or not, control involves management review and redesign of a strategic project through to its completion (Asrilhant *et al*., 2006). Furthermore, Asrilhant *et al*. (2007) also identified that the key concepts of the SPM process known as the 'critical elements' are the context, content and output elements. These help the organisation to focus attention on the success of the project. Notwithstanding, a gap was also identified between the critical elements, and the project managers were found to not pay attention to the management of strategic projects (Asrilhant *et al*., 2007). It is therefore not surprising that Stefanovic and Shenhar (2007) reported that since the establishment of modern project management as a formal discipline, it has focused on the execution of processes in the most efficient way, and while SPM is the most recommended tool, its implementation is yet to be adopted fully.

The non-application of SPM by some organisations can be seen in a study carried out by Stanleigh (2006) and a report entitled "*From Crisis to Control: New Standards for Project Management"*. The report showed that a small fraction of projects undertaken by organisations (roughly 2.5 per cent) are 100 per cent successful (Stanleigh, 2006). It emphasised the need for organisations to ensure that only those projects that are aligned with the corporate strategic vision are executed, thus the need for the implementation of SPM. For a successful implementation of SPM in an organisation, Stanleigh (2006) suggested four key strategies that could assist organisations in regaining control over their projects and ensuring a strategic fit (Brown, 2007):

- Ensure that all projects are strategically aligned;

- Create a project management-focused culture;
- Implement SPM best practices; and
- Create a strategic project measurement system.

Shenhar *et al*. (2002) also suggested a new framework for SPM, which he called the project strategy framework. This framework is made up of four elements, which are (Shenhar *et al*., 2002):

- Product definition and competitive advantage;
- Business perspective;
- Project scope; and
- Strategic focus.

In view of the unique nature of PROs, an insight into the political and cultural context of the organisation needs to be considered when applying the strategic framework. Therefore, a combination of Stanleigh's strategy and Shenhar *et al*.' s strategy framework, linked to the critical elements (context, content and output) of SPM along the project life cycle as illustrated in Figure 2.6, could be employed by the research organisations for effective implementation of SPM in the management of R and D projects.

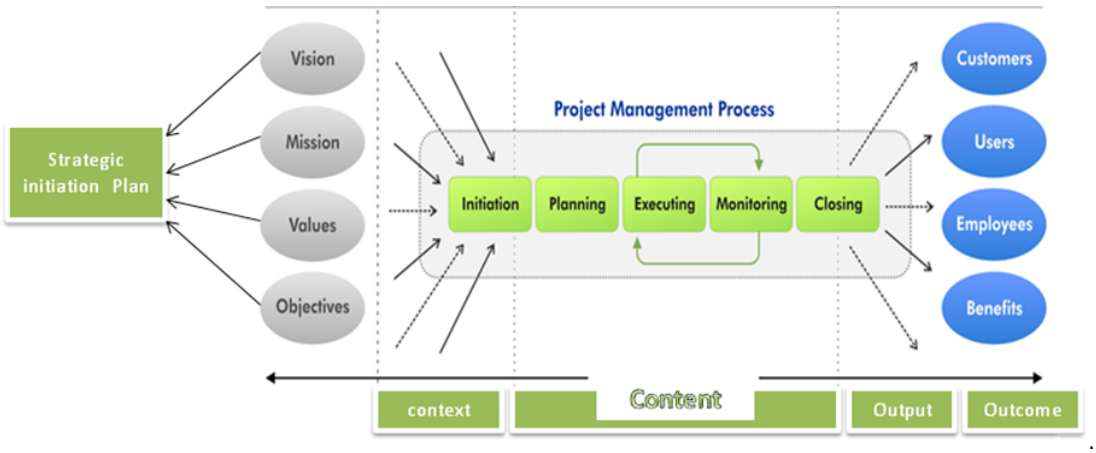

Figure 2.6: Project Framework from strategy intention

Source: Adapted from Shenhar *et al*. (2002)

According to the 2000 PMI Guide to the Project Management Body of Knowledge, the context and content elements in Figure 2.6 are the most influential elements that affect the achievement of a strategic project's outputs. The context element includes the structural, cultural, economic, social, political, competitive and sectorial environment in which organisations are located (Pettigrew, 1997), while the content element is for conducting process research to link the analysis of the process to the project outcome (Pettigrew, 1997). These form the essence of the SPM process (Asrilhant *et al*., 2007), and as such could be used in the execution of R and D projects in PROs in Nigeria.

Notwithstanding all the strategies, research and outcomes regarding the implementation of SPM, most organisations, according to Brown (2006), have not taken the time to adopt the high-level view of their projects to ensure that the resources consumed (i.e., time, money and people) are adding value to the organisation. The application of SPM in PROs, which has come to stay, has gone through the planning stage in most organisations in Nigeria but is not yet fully implemented, as can be seen from the research; this highlights the need for a conceptual framework for the strategic management of projects.

2.12 STRATEGIC ALIGNMENT OF PROGRAMMES AND PROJECTS

Beyond the management of the triple constraints (cost, time and scope), one of the most crucial factors for organisational success is the alignment of the programmes and projects with corporate strategy (Aular-Hernández 2004). Avison *et al*. (2004) identified that alignment assists organisations in three different ways: by maximising return on investment, helping to achieve competitive advantage, and providing direction and openness to new opportunities. Programmes are veritable channels for executing the strategic action plans of an organisation and several authors refer to programmes and projects as *"the bridge that connects organisational strategy and business operations"* (Avison *et al*., 2004). Although this metaphor is very significant, Aular-Hernández (2004) argued that it is not complete

without the organisational structures being flexible and able to adapt to the changes in the elements that link them together. Thus an important part of programmes and projects is strategic alignment; although the implementation of such a structure involves high cost, the losses caused by the execution of badly aligned projects are even higher (OGC, 2005; Aular-Hernández, 2004).

Strategic alignment, according to Bergeron *et al*. (2004), originated from a body of conceptual and empirical work in organisational literature. The proposition is that organisational performance is the consequence of the fit between two or more factors such as strategy, structure, technology, culture, and environment (Bergeron *et al*., 2004). Among all the factors, the organisational strategy and structure has received the most attention; according to Freel (2000), this has been studied extensively in large and small manufacturing and service organisations. The view of strategic management researchers and organisation theorists is that it involves aligning the organisation with its environment and arranging resources to support that alignment (Freel 2000). However, strategy has been identified as the force that mediates between the organisation and its environment. It is, in practical terms, the basic alignment mechanism, and the organisational structure must be well-suited to it if a significant competitive advantage is to be created. Thus organisations whose strategy and structure are aligned will be less vulnerable to external change and internal inefficiencies, and therefore will perform better (Bergeron *et al*., 2004).

Avison *et al*. (2004) stated that the importance of strategic alignment is a key concern for business executives. It ensures that management is in full control and that projects can deliberately be aligned with emerging management insights (Galliers and Newell, 2003). On the other hand, Maes (1999) in Avison *et al*. (2004) argued that strategic alignment is illusory, even inexpedient. Hamel and Prahalad (1990) also stated that in the application of strategic fit between resources and opportunities, generic strategies of low cost versus differentiation and focus, and the strategic hierarchy of goals, may make the strategic

process rigid. Hamel and Prahalad (1990) further suggested that this might have a negative effect rather than a positive impact on an organisation when followed specifically and pedantically.

Against the backdrop of the debate in the literature on what constitutes alignment, the need for it and how organisations are to carry it out, the importance of strategic alignment cannot be over-emphasised. This has been stated frequently as the central theme of both theory and practice of strategy (Avison *et al*., 2004; Galliers and Newell, 2003). By concentrating on the elements critical to the strategic alignment of programmes and projects which have been identified and widely researched as the organisational strategy and structure, organisations may not only achieve synergy and facilitate the development of R and D projects, but also increase profitability and efficiency in those projects that can contribute to the development of the economy.

The set of elements identified to be involved in the SPM process are the context, content and outputs (Pettigrew, 1997; Dyson and O'Brien, 1998). Asrilhant *et al*. (2006) described the context and content elements as being interrelated, focusing on the description of the SPM process, while the output element focuses broadly on the achievement of results. It could therefore be suggested that the key concepts in the SPM process are the 'critical elements', which need to receive constant and careful attention from management, as they aid the organisation to focus attention on the success of the project at hand (Asrilhant *et al*., 2007). According to the Pareto rule, which separates ''the important few from the trivial many'' (Clarke, 1999, p. 139), if attention is paid to the sets of critical elements (context, content and output) and their interactions, success is more likely. This has been identified in the research carried out by Asrilhant *et al*. (2006) which confirmed that this set of critical elements determine the strategic project's success. However, if this proposed set of critical elements, which could be regarded as 'success elements' are implemented, one could suggest that

they would enhance the management's focus on the application of SPM in the public sector organisation.

2.13 COMPARISON OF STUDIES IDENTIFIED IN THE LITERATURE

A review of science and technology publications by Momah (1999) and Iweriebor (2004) on the PROs in Nigeria, revealed that right from neo-colonial times, Nigeria's development was driven by the desire to maintain and expand the colonial economic patterns of raw material production and exportation. There were no programmes or policies established for indigenous industrial development, so as such industrial research activity was lacking. There was also lack of a clearly articulated policy on the role of science and technology in the development process, an inadequate institutional framework, and lack of funds.

From the review, Momah (1999) and Iweriebor (2004) claimed that during the neo-colonial period, the political leaders did not understand the importance of science and technology research; as such there was no institutional framework for R and D organisations. Although the leadership of General Ibrahim Babagida made efforts to correct this, they were not sustained and this has affected R and D organisations until this day. This could therefore be regarded as a major factor affecting the organisations and it reinforces the need for this research work, which aims to identify the barriers affecting the application of SPM, proffering a framework for addressing these barriers and improving the effectiveness of project implementation in PROs in Nigeria.

Examining the SPM theories presented by Grundy and Brown (2002), Callahan and Brooks, (2004), Green (2005), Naughton (2006), Brown (2007), Heerkens (2007), Wessels (2007) and Quadri (2010) reveals several common, underlying determinants of competitive advantage (see Table 2.2). The authors confirmed that the theory of SPM is based on the alignment of organisational business strategy and project strategy, and that project portfolio management is a critical and necessary requirement for the implementation of SPM.

However, six of the authors, with the exception of Collahan and Brooks (2004) and Heerkens (2007), included the core competencies and capabilities of an organisation's internal assets as a significant component of SPM, with emphasis on the strategic leadership and project management skills of project managers. In addition, Green (2005), Wessels (2007) and Naughton (2006) surmised that the competitive advantage of an organisation is based upon the scarcity and unique qualities of their resources, which is in accordance with the resource-based view of strategy.

This is to say that the quality of leaders and the competencies of project managers in the application of project management practices is also a determinant factor in the application of SPM. This has therefore motivated this study and the exploration of project management practices in PROs in Nigeria, in order to identify the gaps experienced, and also the factors that affect the successful execution of R and D projects in PROs in Nigeria.

Table 2.2: SPM models and their determination on competitive advantage

Determinants of Competitive Advantage	SPM Theories							
	Callahan and Brooks (2004)	Brown (2007)	Green (2005)	Heerkens (2007)	Wessels (2007)	Naughton (2006)	Quadri (2010)	Grundy and Brown (2002)
Project strategy aligned with business strategy	✓	✓	✓	✓	✓	✓	✓	✓
Project portfolio management	✓	✓	✓	✓	✓	✓	✓	✓
Project management office (PMO)								
Programme management				✓				
Competences and capabilities of internal assets		✓	✓		✓	✓	✓	
Project management skills and leadership	✓	✓	✓	✓	✓	✓	✓	✓
Project management process and methodology	✓	✓	✓	✓	✓		✓	✓
Evaluation of core competences against competition		✓	✓		✓	✓	✓	
Business results, metrics and value				✓				
Organisational culture								
Scarce, valuable and firm specific resources		✓	✓		✓	✓	✓	

Source: Adapted from DyReyes (2008)

The theory of Heerken's concept of SPM differs from the other authors in two different aspects, which are the practice of programme management and the measurement of the

business results of projects via financial metrics. With regards to programme management, the other authors did not specifically articulate the value of this practice in its relation to competitive advantage, nor did they cite financial metrics to measure the return on investment (ROI) of projects as elements of SPM. Although these two aspects of Heerken's model are related to higher-level, general categorisation of project management processes and methodologies as determinants of competitive advantage, neither of these components is cited as having a direct impact on an organisation's degree of competitive advantage (DyReyes, 2008).

Furthermore, Stanleigh (2006) found that the non-implementation of four strategies of SPM (project definition and competitive advantage, business perspective, project scope and strategic focus) contributed to project failure, while Shenhar *et al.* (2002) identified that projects failed due to non-implementation of project strategy, which is called the missing link. Berzin (2010) also stated that the key elements in the strategic management process, strategic planning, implementation and control, have not been fully implemented to enhance project success, as emphasis has been placed solely on strategic planning rather than all three of the key elements. Berzin (2010) further emphasised the need to enhance strategic implementation in order to increase project success. The theory of Berzin (2010) on SPM process is key to this research, as the research focuses on the implementation of SPM rather than on the planning and control, although the inclusion of the three key elements of SPM process would be better for organisations.

An example can be seen in a recent study carried out by Asrilhart *et al*. (2006) on "Techniques to support successful SPM in the UK upstream oil and gas sector" which investigated the use of SPM techniques by project managers to evaluate and control their projects. The study identified that the use of SPM techniques contributed to proper management and control of oil and gas projects. Asrilhart *et al.* (2007) also investigated the SPM processes in the UK upstream oil and gas sector, which revealed that the set of critical

elements in SPM (strategic context, content and output) contribute to project success when implemented. This is to say that the problem of PROs in Nigeria is not in the planning but rather in the implementation of the strategic plan.

Furthermore, Bryson (2004), supporting Berzin (2010), pointed out that strategic planning can help public organisations to cope with project execution in a challenging environment. Grundy and Brown (2002) also suggested that a combination of the organisation's strategy and project management technique would help in the process of managing complex projects, which is one of the key objectives for this research (see section 1.9). Quadri (2010), Brown (2007) and Green (2005) identified SPM as the key to successful project management and stated that its importance lies more in the use of the soft skill-set of project management tools for effective and efficient management of projects in organisations. A process whereby the organisations' strategy is applied in combination with project management techniques in the execution of R and D projects in PROs in Nigeria, would enhance the organisations' performance.

This research took into account that for an effective implementation of SPM, it is important to employ the soft skill-set of project management tools, which involves the project leaders or the project managers. The project manager's skills have an important role to play in the implementation of SPM techniques, which explains why Asrilhart *et al*. (2006) investigated the use of SPM techniques by project managers to ascertain the success rate of oil and gas projects. It could be deduced from the past literature on the importance and practice of SPM that its implementation in the execution of R and D projects in PROs would improve the success story of their projects.

2.14 CHAPTER SUMMARY

The above review provided an overview of the Federal Republic of Nigeria, the PROs and the different types of PROs as recognised globally. It discussed the motivations and interests

of PROs, an overview of project management, the development of project management, the evolution of SPM, strategic management with an emphasis on projects, the need for effective implementation of SPM in public organisations, the current practice compared to the theory and the key element critical to the strategic alignment of programmes and projects in PROs. The review showed that little has been done with SPM to ensure the success of project execution in PROs in Nigeria. Yet, the development of a developing economy such as Nigeria depends on innovations generated by the R and D projects executed by these institutions. Thus it is necessary to investigate the level to which SPM has been applied in these institutions, and how they can be internalised to ensure project success on a sustainable basis.

CHAPTER THREE: CONCEPTUAL FRAMEWORK OF THE STUDY

3.1 INTRODUCTION

This chapter reviews the existing SPM processes and offers a proposed change that could improve their practical application and strategic outcome in the execution of R and D projects. Although the literature review chapter provided the theoretical background and knowledge of strategic project management that will assist in addressing the research questions, the theory of SPM and its framework will enhance the development of a holistic framework that will be adopted for effective implementation of R and D projects in PROs in Nigeria. This chapter will therefore review the theoretical and conceptual views of SPM, comparing the contributions of different authors on SPM processes, the research strategy for the SPM framework and the processes involved in the implementation of R and D projects in PROs.

3.2 THE THEORETICAL AND CONCEPTUAL VIEW OF SPM

As demonstrated from the reviewed literature, the dramatic rise in the use of project management tools and techniques in the management of projects has challenged organisations to focus more on the benefits of projects and also their comparative advantages to the organisation. The frequency of project failures in PROs necessitated the need for this research. This research was aimed at developing an SPM framework for PROs in Nigeria to enable project officers to plan and execute R and D projects with a more definitive and standard structure. In most PROs, experience has shown that the organisations attempt to execute too many projects at the same time with little or no link to the organisational mandate and where there is a link, there are no standard processes or frameworks for R and D projects' execution. As such the successes of those projects are not guaranteed, and the majority of them either fail or are abandoned. The need for knowledge transfer and for project officers to learn from the mistakes of past projects provided a primary motivation for this work.

According to PMBOK (2008), knowledge and information are vital to projects' completion, successfully managing stakeholders' expectations, and meeting requirements. Thus one of the key aspects of SPM is the sharing of information and knowledge from previous projects executed within the project-based organisation (Stanleigh, 2006). Experience has shown that the absence of, or little or no knowledge and information on the standard SPM processes and framework for the execution of R and D projects, have led PROs to execute projects in different ways without following an identified process, or even ensuring that such projects are tailored to the needs of their environment. In order to address this, it is necessary to explore the existing theories and also the concept of SPM, its processes and framework, as well as the perception and the views of other authors. This review enabled the researcher to understand the concept of SPM that would enable users to plan and implement projects in a disciplined way so that all the relevant issues are addressed, thereby maximising the chances of successful outcomes (Brown, 2007). The theoretical propositions of SPM by different authors are highlighted in the Table 3.1:

Table 3.1: Comparison of authors' views on SPM

Authors	Views about SPM	Remarks
Grundy and Brown (2002)	Viewed SPM as the process of managing complex projects by combining enterprise strategy and project management techniques in order to implement the business strategy and to deliver organisational breakthroughs.	• Believes also that SPM involves the alignment of organisational strategy, project strategy and project management principles so as to ensure organisational success.
Callahan and Brooks, (2004)	Defined SPM as "the use of the appropriate project management knowledge, skills, tools and techniques in the context of the company's goals and objectives so that the project deliverables will contribute to company value in a way that can be measured".	• The use of project management principles, to achieve organisation's goals and objectives.
Green (2005)	Noted that underlying the theory of SPM is the notion that "project management skills and leadership skills are scarce, firm specific and highly valuable" and that strategic project management "promotes them and the tacit knowledge which they engender" Furthermore, that SPM is based on the relationship between competitive advantage and strategic capabilities, which is known as the "resource-based view of strategy" – wherein the competitive advantage of an organisation is explained by the distinctiveness of its capabilities.	• Green believes that the organisational strategy, project strategy and project portfolio management is key to the implementation of SPM and only project leaders can achieve this.
Naughton (2006)	Identified that there is a gap between aligning project management competences to the selection of projects that will give organisations a competitive edge. Specifically, strategy is formulated at the senior management level and for it to be implemented; it should be broken down into discrete projects. Project management becomes a source of competitive advantage when an organisation outperforms other companies through the experience and knowledge built up over time through managing projects.	• Believes that the use of SPM will enhance the alignment of project management competencies i.e. the organisational strategy to the selection (project strategy) of projects so as to give organisations a competitive edge.
Brown (2007)	Defined SPM as a process that involves selecting, managing and measuring project outcomes to ensure optimal value for an organisation. Brown (2007) also stated that all projects undertaken by an organisation must meet a set of criteria set up by the organisation's leadership to ensure alignment with the strategic vision of the organisation. In order to address the issue of managing projects effectively, developed an SPM framework using Stanleigh's (2006) strategy.	• Views SPM as a process of executing project management principles, organisational goals and objectives by the leaders. • Identified the importance of project leaders in project execution. • Developed an SPM framework that could be adapted in project execution.
Heerkens (2007)	Identified the core elements associated with the concept of SPM and the relationship between project management and strategic business objectives. Heerkens (2007) identified that SPM is made up of four main aspects of higher-level project management practices. These include: strategic alignment of projects, project portfolio management, programme management and the business results of projects.	• Believes also that the organisational strategy, project strategy and project portfolio management are key to the implementation of SPM but did not include the importance of project leaders.
Wessels (2007)	Wessels (2007) identified the following key characteristics of SPM: • Alignment of key business processes viz: strategic planning, strategic goal setting, and enterprise project management; • Functions as a well-managed portfolio of investments as it: (a) allows for the most effective use of constrained resources; (b) ensures a high return on investment since projects are managed collectively; (c) maintains alignment between the projects and the organisation's short, medium and long-term goals and a new management process embedded between strategic planning and project execution that manages project investments strategically and combines business planning and management with project management best practices.	• Believes also that the organisational strategy, project strategy and project profile management are key to the implementation of SPM and that the project leaders are important in the execution of SPM. • Believes that SPM is the alignment of organisation's strategy, project strategy, project portfolio management in the management of projects. • Also believes that project leaders are important in the execution of projects.
Quadri (2010)	Identified SPM as a method of applying soft skill-set of project management body of knowledge (leadership, team management, complexity and ambiguity management, political and diplomatic management) to develop capacity, competency and tacit knowledge necessary to ensure successful prioritisation, management, implementation and procedural closeout of projects.	• The application of (soft skill-set) project management tools and techniques would enhance the competence of project leaders and ensure prioritisation of projects for an enhanced project success.

The review of Grundy and Brown (2002), Callahan and Brooks, (2004); Brown (2007); Green (2005); Heerkens (2007); Wessels (2007); and Naughton (2006) and Quadri (2010) on the theory of SPM revealed a common concept of SPM. This is based on the methodology of aligning projects' strategy with the business-level strategic plans and the organisational strategic goals and objectives, the need to adopt project portfolio management, the application of project management principles and the need for strategic project leadership. Although not all the authors identified the important role of the project leaders, when viewed collectively, they presented a larger construct for SPM that is based on a methodology of aligning projects with business-level strategic plans, which includes these core elements (DyReyes, 2008):

- Formally defining, articulating, managing and aligning project strategy with business strategy;
- Adopting project portfolio management to maximise the value of the total collection of an organisation's projects and programmes to ensure that projects and programmes selected for execution align with the business-level strategies; and
- Developing strategic project leadership via project management competencies and capabilities that contribute to an organisation's sustainable competitive advantage.

It could be deduced therefore that SPM is simply the process of aligning project strategy, organisational strategy or their goals and objectives with the project management principles by project leaders for effective implementation of projects.

3.3 THE RESEARCH STRATEGY FOR SPM FRAMEWORK

SPM has been a term used recently by researchers and practitioners of project and programme management to refer to the effective and efficient management of project-based

organisations (Andreas *et al*., 2009). This research aimed to propose an integrated framework for senior project management practitioners working in PROs in Nigeria. The framework developed is a holistic framework of integration, which was conceptualised as an "SPM framework for R and D projects". The development of this SPM framework involved the integration of the existing concepts of strategic management, project management principles and that of SPM. From the verification and validation results, participants noted that the framework will assist PROs to address the barriers affecting project execution, by eliminating bureaucracy and refocusing the project life cycle, thereby enhancing the successful implementation of R and D projects in PROs in Nigeria.

As shown in the literature reviewed, PROs are involved in the management of multiple projects, ranging from very simple to complex, thus the need for improved management processes that would maximise performance and ensure success. According to Stanleigh (2006), the frequency of project failures has had a large impact on most organisations. Research has shown that one of the reasons why projects fail is that projects are not aligned with organisational goals (Stanleigh, 2006; Brown, 2007). Even when some organisations establish a project management office (PMO) to enhance project success (Stanleigh, 2006), it has not been found to yield the much-expected result. In PROs, the case is the same. PROs, due to their unique environment, carry out too many projects at the same time and therefore require a standard framework that will enhance project success.

Project management frameworks generally are designed to help users to plan and implement projects in a disciplined way so that all the stages of the project life cycle are addressed, thereby maximising the chances of successful outcomes and eliminating compromise. As mentioned before, this research was aimed at developing an SPM framework for R and D projects that will help eliminate factors affecting the effective execution of R and D projects. The framework is based on the concept of SPM, strategic management and the principles of project management; as such it is not a methodology, but

rather the development of concepts and principles of SPM in the form of a framework that is based on theory and empirical data. According to the Oxford dictionary, "A framework is a basic structure underlying a system, concept or text" (Oxford Dictionary and Thesaurus, 2001). If a framework is known as a basic structure, then it should be presented in such a way that it will have a logical and coherent process.

The SPM framework consists of processes that will enhance the prioritisation of R and D projects in PROs, eliminate waste and bureaucracy through improved internal processes, resulting in an enhanced SPM process and a flexible channel that will enable project officers to handle change during project execution. Several research studies (Shenhar, 1999; Grundy and Brown, 2002; Green, 2005; Stanleigh, 2006; Brown, 2007; Heerkens, 2007; Wessels, 2007; and Tolk *et al*., 2009) have suggested ways of minimising the rate of project failure in the field of project management by applying the principles of SPM. An example can be seen in the research carried out by Stanleigh (2006) and Brown (2007). Stanleigh (2006) suggested four strategies that will help organisations to overcome the ills found to affect the successful implementation of projects. These are:

- Ensuring that all projects are strategically aligned;
- Creating a culture that supports a project management environment;
- Implementation of SPM best practices and
- Creating a strategic project measurement system.

Building on Stanleigh's strategies, Brown (2007) developed a basic framework for implementing SPM methodologies within an organisation. This framework, along with the basic project management methodologies, is to assist an organisation with successfully selecting and implementing projects (Brown, 2007). The SPM framework outlined by Brown (2007) is as follows:

1. Strategic alignment of projects - organisation are to ensure that any project undertaken is aligned with their goals and objectives. In order to do this, the executive leadership team needs to be intimately involved in the prioritisation and selection of projects, as well as the definition of the project outcome.

2. Cultivate a project management culture – an organisation should initiate training sessions to train personnel about the importance of project management, and the tools and methodologies used to manage projects. This project management culture would help to create a sense of teamwork, responsibility, understanding and accountability within the organisation.

3. Create best practices – each organisation needs to create a project management 'best practices' document to outline the methodologies used in selecting and managing projects. This document should not only outline the procedures to be used to manage projects, but also the information to be gathered during and after the project to ensure that the knowledge gained during the project is passed along.

4. Track and measure projects and outcomes – the processes used to control a project should be very well-defined, as should the monitoring and reporting mechanisms for projects. Some of the measuring metrics such as Return On Investment (ROI), Return On Capital (ROC), Key Performance Indicators (KPIs) and other value-based measurements need to be improved so as to help the organisation measure and report on the value that the project has brought.

5. Create open channels of communication – This is key to successful implementation and the practice of SPM and project management. Without open and honest communication throughout the organisation, projects would not be as successful as they could be, and could quite possibly fail completely.

To be able to develop the SPM framework for R and D projects, the concept of project management and strategic project management needed to be understood. The strengths

and weaknesses have to be identified and this was carried out by reviewing the literature. According to Bryman (2012), the review of literature ensures the awareness of existing publications in the area of research. This would enable the researcher to identify and analyse their theoretical contributions to knowledge (Saunders *et al*., 2009). To achieve a holistic understanding of the different management models for executing R and D projects, the perceptions among PROs were explored. This addressed the objective of establishing the relationship between theory and practice and enabled the author to understand how and why R and D projects were executed.

To achieve this, the research employed a mixed method of quantitative and qualitative approaches. The first involved the use of a quantitative data collection technique (semi-structured questionnaire). The semi-structured questions dwelt on project management practices as recommended by the PMI body of knowledge and the factors affecting the application of SPM in research organisations. The director of studies and project officers in selected PROs validated the questionnaire. This ensured that the results obtained would not be regarded as unreliable, impressionistic and not objective (Denzin and Lincoln, 2005). To further ensure that the primary data that would be used for the development of the SPM framework is rich and realistic, a semi-structured interview was conducted to reinforce the results from the semi-structured questionnaire. According to Ritchie and Lewis (2003), face-to-face interviewing may be appropriate where depth of meaning is important and the research is primarily focused in gaining insight and understanding (p.138).

The questions for the interviews were formulated based on the findings from the questionnaires and contained the major assumptions made that could be used in the development of the SPM framework for R and D projects. This research therefore employed a mixed approach of sequential exploratory and explanatory approaches (Creswell, 2009) that consisted of a first stage of quantitative data collection and analysis, followed by qualitative data collection and analysis. The choice of a mixed-method strategy for this

research was deemed appropriate by the researcher, because all methods, according to Creswell (2003), have limitations. By using a mixed-method approach, any biases inherent in any single method could be neutralised or cancelled by the biases of other methods. Furthermore, research in project management usually focuses both on the specific as well as the general area of study (Morris, 2010). Being a project management study, it required in-depth information on the subject area that was used in the development of the SPM framework for R and D projects. With the result of the mixed method, the research explored the different project management principles, strategic management methods, and also interpreted the quantitative and qualitative findings, thereby evolving a holistic SPM framework for R and D projects. The next section looks at the different processes involved in the management of projects. This helps with the identification of the SPM process used in the application of the framework.

3.4 OVERVIEW OF PROJECT MANAGEMENT PROCESSES

An overview of the processes involved in the management of projects requires a review of the basic elements of the main guidelines for international standards and methodologies (methods) used in project management such as: the PMBOK Guide, the PRINCE 2 method and the ISO 21500:2012 standard (Lin Drop, 2013). The PMBOK® Guide/standard provides guidelines, rules and characteristics for project management (PMBOK Guide and Standard, 2013). The PMBOK® Guide is considered to be the American national standard for project management and it presents basic practices and key tools and techniques that can be applied for the good management of a project. The PRINCE2 (Projects In Controlled Environment) is a de facto process-based method for effective project management that is used extensively by the UK Government, while the ISO 21500:2012 guidance on project management is an international standard developed by the International Organisation for Standardisation, intended to provide generic guidance, explain core principles and what constitutes good practice in project management (Lin Drop, 2013). Comparing the main

guidelines, standards and methods/methodologies of these organisations regarding project management, it can be seen that there are many common elements and also some differences in terms of their approach to the processes of project management that can be identified. These have been highlighted in Table 3.2 (Lin Drob, 2013).

Table 3.2: The process groups/processes of project management

	PMBOK 2012	ISO 21500: 2012	PRINCE2 2009
Process groups/processes	Initiating	Initiating	Starting up a project, Initiating a project
	Planning	Planning	Managing product delivery, Managing stage boundaries
	Executing	Implementation	Directing a project, Managing product delivery, Managing stage boundaries
	Monitoring and controlling	Controlling	Controlling a stage
	Closing	Closing	Closing a project

Source: Lin Drob (2013)

A review of the project management processes shows that projects are divided into several project phases, as can be seen in Table 3.2. This is to ensure better management, control and linking of the various on-going project activities. There are five basic project management phases for project management processes - initiating, planning, executing, monitoring and controlling and then closing. The review also revealed that all the other processes identified by different organisations are aligned to the five phases of project management processes, as can be seen in Table 3.2.

3.5 STRATEGIC MANAGEMENT PROCESS

Currently, there have been emphases in the strategic literature on understanding the strategic process and each of its major steps, not as a given phenomenon in an organisation, but rather as a result of daily activities (Rasch and Chia, 2009). Although in the literature there is no consensus on the determination of the exact external or internal factors that affect the strategic process, the importance of the process is that it ensure that the organisation has sufficient financial and human resources (Barney Hesterly and Hesterly,

2012; Lynch, 2012,), and skills (Bogner, Thomas and McGee, 1999).It emphasises the capacity to develop competences to evaluate and control the organisation in order to find new efficient ways to function.

The development of strategies to meet the needs and goals of an organisation answers the question, “What do we need to do to achieve these goals?” and it determines what is required in order to carry out an analysis of the internal and external environments (ESI International Inc, 2006). In order to achieve strategies to meet the needs and goals, the organisation is analysed based on a political, economic, social, and technological analysis (PEST). The external environment is analysed to identify opportunities and threats, and the internal environment will be analysed for strengths and weaknesses such as management, facilities, core competencies, product quality, technology, and financial resources (ESI International Inc., 2006). The possible outcome of this analysis is a set of strategies designed to best meet the needs of the customers. The implementation of these strategies requires dedication, and action that aims to realise the strategic intent of the organisations. To achieve this, the following need to be considered (ESI International Inc., 2006):

- The organisational resources are limited, and therefore there is the need to prioritise the allocation of resources such as funds, people, and equipment. For example in PROs, multiple goals frequently impose conflicting demands on resources. This requires a mechanism for allocating resources based on organisational priorities;
- There is the need to establish an organisational structure that supports projects;
- Project management processes for planning, executing, and controlling are essential to ensure that strategies are implemented effectively and efficiently;
- Organisations need a project selection and priority system that will ensure strong linkages between projects and the strategic plan. The strategic management process and its relationship to project management are shown in Figure 3.1.

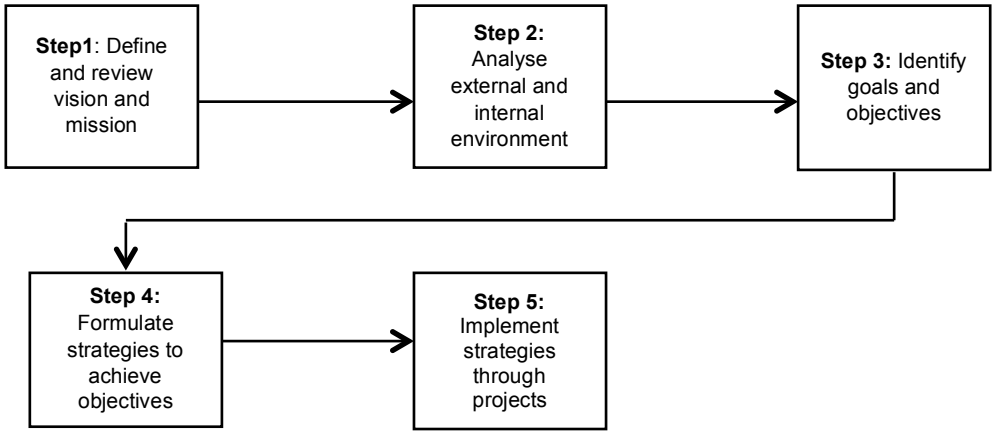

Figure 3.1: The strategic management process and its relationship with projects
Source: ESI International Inc (2006)

The strategic management process starts with the definition and review of the organisation's mission statement or the mandate. This is followed by analysing the external environments to identify the opportunities and threats, and the internal environment to identify the strengths and weaknesses that can affect the organisation. The goals and objectives are identified and then the strategies are formulated to enable the organisation to achieve its goals and objectives during project implementation.

The process of project selection and prioritising is an attribute of SPM and as such will help in the development of the SPM framework for PROs. This is because PROs frequently pursue many projects simultaneously and usually, the number of small and large projects in a portfolio exceeds the available resources such as funds, equipment, and competencies. Furthermore, considering that the Federal Government owns PROs in Nigeria, political interference can have a significant impact on project selection. Some projects within the organisation are called "sacred cows", a term often used to describe a project sponsored by a high-ranking executive. In view of this, without an effective SPM framework incorporating project selection and a priority system, the capacity overload coupled with project politics would further lead to frustration, confusion, and an inefficient use of resources.

3.5.1 Conceptual assertions on strategic management and its stages

According to Covin and Slevin (1991) in Cristiana and Anca (2013), strategic management can be seen as a process through which any organisation can adapt its operations in line its development goals. The main steps of the strategic management process are the formulation, implementation and evaluation of the strategy (Barney *et al*., 2010). Agreed as a process, strategic management can be described as a series of steps; these steps do not necessarily present a linear sequence but rather point out certain interdependences between steps, which according to Japanese models also overlap (Raps, 2008). These stages start from the formulation of strategy, and include all the concrete actions required to realise and develop the strategy until its final evaluation.

Even when the outcome of this process is considered excellent, it is still important for organisations to continuously strive to improve themselves rather than being satisfied with the status quo (David, 2010). The evaluation phase is the end of the strategic management process and also represents the foundation for what the next stage is (Barney *et al*., 2010). The distinction between these stages should be seen in didactic and analytical terms (Raps, 2008). The evaluation consists of questioning all the decisions at all levels within the organisation before a formal closure or project handover. Having looked at the project management processes and the strategic management processes, the SPM processes can now be reviewed to identify the relationship that exists between them and also to formulate an SPM process with improved practical application in R and D projects.

3.6 STRATEGIC PROJECT MANAGEMENT PROCESS

SPM which focuses on the best utilisation and alignment of the resources of the project-based organisation to meet its vision and goals (Wessels, 2007; Naughton, 2006) could be said to have been developed from the project management phases and the strategic management process. SPM also focuses on equipping the management with tools that

would enable them provide guidance for more than one project at a time in such a way that the strategic intent of the project-based organisation is met (Tolk *et al*., 2009). The SPM process identified by Grundy and Brown (2002) involved five stages as shown in Figure 3.2, starting from the definition of the project, creating the strategy, planning the project, implementation and control, to the project review and documentation of lessons learned.

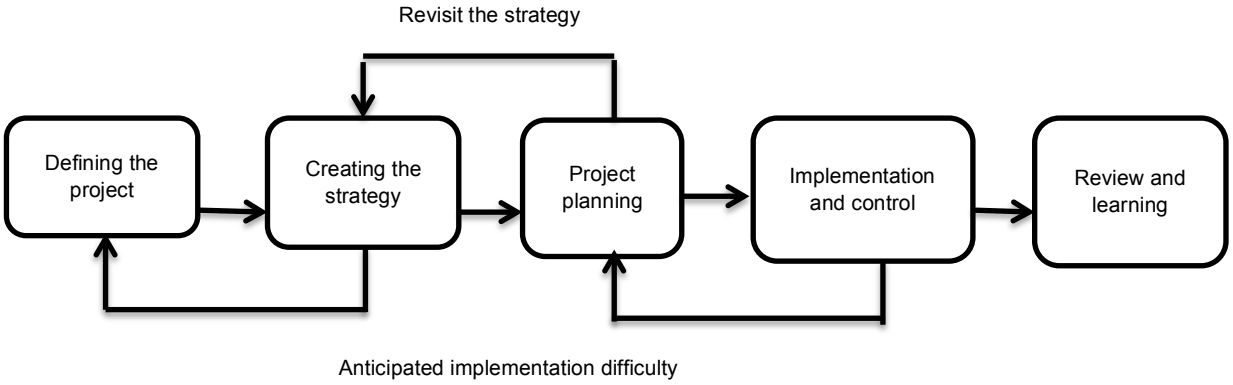

Figure 3.2: SPM process
Source: Grundy and Brown (2002)

The Grundy and Brown SPM process could be related to the five stages of the project management processes. However, Amram and Kulatilaka (1999) in Asrilhant *et al*. (2004) identified that SPM consists of two main stages: evaluation and control. Evaluation involves framing (i.e. drawing up a strategic project after its inception), planning, valuing a strategic project and authorising the project. The control stage involves the management review and redesign of a strategic project through to its completion.

On the other hand, Tolk *et al*. (2009) evaluated the traditional project management methodologies and tools such as statement of work (SOW), work breakdown structure (WBS) etc., and identified three core phases that are linked to SPM processes. These phases, according to *Tolk et al*. (2009) open the way for reusability or replication of resources of one project in another project, and as such enables the project-based organisations to become more effective and efficient over time. It could therefore be deduced that the three core phases of SPM allow organisations with multiple projects (such

as PROs) to execute their projects by re-using the same process to enhance project success. The three core phases are initial planning, refining and implementation, with each phase requiring supporting documentation and sub-processes to deliver a product (Tolk *et al.*, 2009). At each phase of the process, different products are delivered for each project, implying that although the same process is used for different projects, the product output will differ. This is highlighted in Table 3.3, where the planning phase is expected to produce a project proposal. The next phase of refining the plan will produce a work plan, and the implementation, which is the final core phase of SPM, will produce the final product.

Table 3.3: The core phases of SPM process and the product output

Core Phase	Product Output
Initial planning	Project proposal
Refining project	Work plan
Implementation	Final product

Source: Tolk *et al*. (2009)

Comparing the project management processes, strategic management process and SPM processes identified (Table 3.4), it could be said that the strategic management processes only occur in the three stages of the project management phases, namely, formulation, implementation and evaluation of the strategy (Ugonna *et al*., 2015). This also indicates that the SPM core phases identified by Tolk *et al*. (2006) were derived from the strategic management process. Table 3.4 also shows that both the strategic management process and the SPM are formed from the project management processes.

Table 3.4: Comparing project management processes

Project management process	Strategic management process	SPM process
Initiation	Formulation	Initial Planning
Planning	Implementation	Refining project
Execution		Implementation
Monitoring and Control	Evaluation	
Closure		

Source: Ugonna *et al*. (2015)

Having reviewed all the processes, the SPM core phases identified by Tolk *et al*. (2006) seem incomplete. This is because strategic projects are considered to be successful when they are successfully completed, financially successful and successful for strategic (i.e. non-financial) reasons (Asrilhant *et al*., 2004). The researcher is of the opinion that the three core phases should include the strategic initiation of a project and the closure of the strategic project. On noting this gap, from the concept of SPM, which is simply the process of selecting, managing and measuring project outcomes as stated by Grundy and Brown (2002), the following process is proposed for SPM, and is illustrated in Figure 3.3.

The proposed SPM process involved the definition of the organisation's strategic needs before project initiation, as this will enable the organisation to identify and select projects that will address the strategic intent of the organisation and the environment. The next step would be the creation of a project strategy aligned with the organisation's strategy, followed by planning for the project, implementation and control, and review and closure of the project, including the documentation of lessons learned from the project (Ugonna *et al*., 2015). This if implemented would enhance the successful execution of projects in PROs.

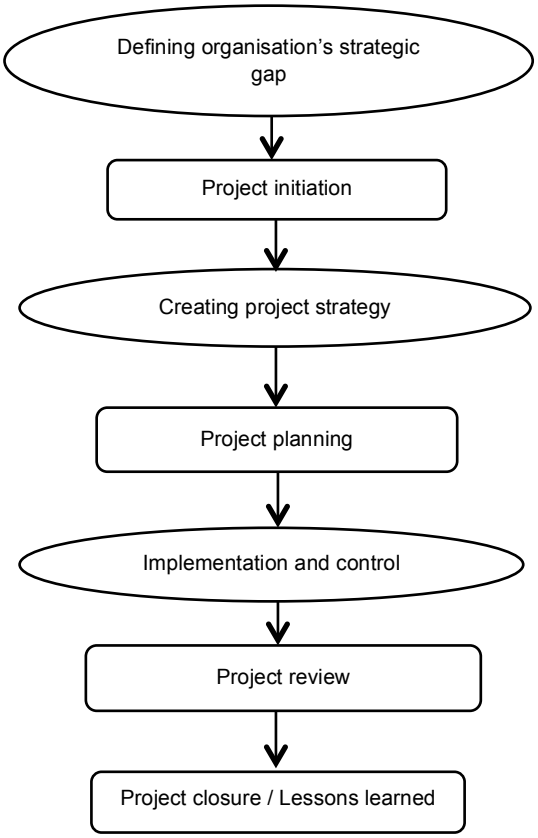

Figure 3.3: Proposed SPM Process
Source: Ugonna *et al*. (2015)

3.7 CHAPTER SUMMARY

This chapter reviewed the theoretical and conceptual view of the SPM framework and the processes involved in its application. It reviewed and compared the concept and theories of SPM by different authors and identified common determinants based on the project management methodologies. The project management processes, strategic management processes and the SPM core phases in the project life cycle were identified and compared. The project management approach to business problems and opportunities is becoming the norm rather than the exception. Projects are the tools for implementing the strategy of the organisation. For an effective SPM implementation, there is the need for the development of a holistic framework that will enhance the selection, prioritisation and alignment of projects

with the organisational mission and strategy. This would be achieved through a mixed method approach. The SPM core phases that have been reviewed by the researcher would enhance the implementation of an SPM framework for effective project execution. The next chapter will discuss the research methodology and the methods employed to achieve the aim of developing an SPM framework to address the identified barriers in PROs in Nigeria.

CHAPTER FOUR: RESEARCH METHODOLOGY

4.1 INTRODUCTION

This chapter reviews the research methodology employed for this research study and the selected method used to assess the application of SPM in PROs in Nigeria. The literature review provided the theoretical background and concept of SPM knowledge. In this chapter, the required information on the terminology of theory and research, including the philosophical worldview proposed (Creswell, 2014) for this research, are discussed. This enables the researcher to identify the philosophical position, the research design (procedures of inquiry) and the specific methods of data collection, analysis, interpretation and validation for this research work.

This chapter therefore describes the various theoretical research methodologies used in carrying out this research, methods adopted and the justification for their adoption. The different social research strategies used in carrying out the research are also discussed. The research approaches, sampling strategies and data collection techniques (semi-structured questionnaires and semi-structured interviews) that were applied in handling the broad issues of a mixed method (mixture of quantitative and qualitative methods) using a case study approach are also addressed. Furthermore, the chapter discusses the participants, data analysis details, and validation and verification of the research. Ethical issues, confidentiality of the research and the methodological limitations in carrying out this research work are also discussed.

4.2 RESEARCH APPROACH

Research approaches are regarded as plans, procedures and techniques for research, and are used in the collection, analysis and interpretation of data and also the validation of results (Bryman and Bell, 2011; Bryman, 2012; Creswell, 2014). This means that the plans and

methods employed in collecting and analysing research data addressed the research questions for this study. The research approaches involved the identification of the approach most suitable to study the research topic. There are different research approaches that are used for different research work: quantitative, qualitative and mixed methods (Bryman, 2012; Creswell, 2014). Quantitative, qualitative and mixed methods approaches are known to differ in the research methods they apply (Bryman, 2012).

The differences between the quantitative and qualitative approaches were described with reference to data sampling, collection, analysis, and interpretation, and have recently been a subject of debate (Gelo *et al*., 2008). Mixed-methods research resides in the middle of this continuum because it incorporates elements of both quantitative and qualitative approaches (Creswell, 2014). For the purpose of this research, the researcher reviewed the mixed-research method and deemed it appropriate for this study. The three components involved in research approaches – research philosophy and paradigm, research design and the research methods are addressed in the next section.

4.3 RESEARCH PHILOSOPHIES AND PARADIGM

In carrying out this research study, the researcher considered the different research philosophies and paradigms involved in other research work so as to select the most appropriate methodology to address the aim of this study. According to Slife and Williams (1995), cited by Creswell (2014), philosophical ideas influence the practice of research. This helps researchers to explain the reasons for choosing quantitative, qualitative or mixed methods approaches for their research work (Cresswell, 2014). Research has also shown that the use of a paradigm can help create a bridge between research aims and the methods that could be used to achieve the aims (Denzin and Lincoln, 2005). Using a paradigm can be beneficial for ensuring harmony in the philosophical and ontological stance of the research (Joseph *et al*., 2013). Thus, there was a need for the researcher to ensure that the research

aims, the paradigms and methods adopted for the research were also epistemologically and ontologically integrated. The research philosophy is discussed in the next section.

4.3.1 Research philosophy

According to Mkansi and Acheampong (2012), research philosophies can be classified into four groups: ontological, epistemological, axiological, and doxological. Many researchers have used different descriptions, categorisations and classifications to define the theory of research paradigms and philosophies with reference to research methods (Saunders et al., 2009; Ritchie and Lewis, 2003; Guba, 1990; Guba and Lincoln, 1989). Although their definitions of ontology, epistemology, and axiology have a common theme, they lack agreement in the classification and categorisation of these paradigms. However, the comments of Saunders *et al*. (2009) and Will *et al*. (1997) on philosophies and research methods reveal an overlapping process. This includes the original presentation, description and categorisation outlined by other major philosophical advocates (Burrell and Morgan, 1992; Guba and Lincolm, 1989; Guba, 1990) and recent philosophical scholars (Saunders *et al.*, 2009; Ritchie and Lewis, 2003).

For example, Ritchie and Lewis's (2003) ontological perspective included realism, materialism, critical realism, idealism and relativism, and their epistemological perspective included positivism and interpretivism. Saunders *et al*. (2009) viewed research philosophies as including positivism, realism, interpretivism and pragmatism, from an ontological, epistemological and axiological stance. Guba and Lincoln (1989), however, had an overlapping classification of these philosophies that linked positivism, post-positivism, and constructivism to critical realism. These research philosophies are not entirely different but are rather explained in different ways. Although they share a common set of assumptions, they place emphasis on different implications of those assumptions. This is because they all focus on explaining the methodological differences in the research methods adopted, and

also the different categorisations and classifications of the research being carried out (Mkansi and Acheampong, 2012).

The ontological and epistemological considerations explain the perceptions, beliefs, assumptions and the knowledge of reality that influenced the way in which the research was undertaken, from the research design through to the conclusion. They informed the need to understand and discuss these parameters so as to approach the research aims and objective with an appropriate method, one that would address the research questions and ensure that the researcher was not biased. Although James and Vinnicombe (2002) cautioned that we all have inherent preferences that are likely to shape our research designs, Blaikie (2000) also described these aspects as part of a series of choices that the researcher must consider, so as to align the choice of philosophical methodology to the research problem.

4.3.2 Philosophical consideration

The philosophical consideration for this research was based on the implicit and explicit philosophical perspectives, because ignoring these perspectives could have a negative impact on the quality of the research. Easterby-Smith *et al*. (2008) argued that it is very important to have a good understanding of the philosophical positioning of research because this can help in better understanding the different research designs and methodologies that could be used for a particular piece of research, as well as ultimately identifying the best design and method to be applied to that research. Also, as argued by Wing *et al*. (1998), different research approaches support different ways of proceeding with the pursuit of knowledge. Generally, there are two main philosophical considerations that differentiate the research paradigm – ontology and epistemology – which are known to relate to the nature of knowledge and the development of knowledge (Laughlin, 1995; Kalof *et al*., 2008; Saunders *et al*., 2009).

Ontology is the view of how one perceives reality. In social research, ontologically one can perceive that the existence of reality is external and independent of social actors and their interpretations of it, termed objectivist (Saunders *et al*., 2009) or realist (Neuman, 2011). However, subjectivists or nominalists believe that reality is dependent on social actors and assume that individuals contribute to social phenomena (Neuman, 2011). Epistemology, which is the second paradigm, views research as a way to generate, understand and use knowledge that is deemed to be acceptable and valid. In addition to these two fundamental philosophies, there are two basic beliefs that affect the way reality is investigated, and they are axiology and methodology (Saunders *et al*., 2009). Axiology is concerned with ethics, encompassing the roles of values in research and the researcher's stance as it relates the subject area (Saunders *et al*., 2009). The methodology refers to a model for undertaking a research process in the context of a particular paradigm, and the ontological, epistemological, axiological and methodological beliefs as they relate to research paradigms. These are outlined in Table 4.1 (Wahyuni, 2012).

Table 4.1: Fundamental beliefs of research paradigms in social sciences

	Research Paradigms			
Fundamental Beliefs	**Positivism (Naïve realism)**	**Post-positivism (Critical realism)**	**Interpretivism (Constructivism)**	**Pragmatism**
Ontology: the position on the nature of reality	External, objective and independent of social actors	Objective. Exist independently of human thoughts and beliefs or knowledge of their existence, but are interpreted through social conditioning (Critical realist)	Socially constructed, subjective, may change, multiple	External and multiple view chosen to best achieve an answer to the research question
Epistemology: the view on what constitutes acceptable knowledge	Only observable phenomena can provide credible data and facts. Positive epistemology focuses on causality and law-like generalisations, reducing phenomena to simplest elements	Only observable phenomena can provide credible data and facts. Focus on explaining within a context or contexts	Subjective meanings and social phenomena. Focus upon the details of situation, the reality behind these details, subjective meanings and motivating actions	Either or both observable phenomena and subjective meanings can provide acceptable knowledge dependent upon the research question. Focus on practical applied research, integrating different perspectives to help interpret the data
Axiology: the role of values in research and the researcher's stance	Value-free: research is undertaken in a value-free way, the researcher is independent of the data and maintains an objective stance	Value-laden: research is value-laden when the researcher is biased by world views, cultural experiences and upbringing	Value-bound: research is value-bound when the researcher is part of what is being researched, cannot be separated and so will be subjective	Value-bound: values play a large role in interpreting the results, the researcher adopting both objective and subjective points of view
Research Methodology: the model behind the research process	Quantitative	Quantitative or qualitative	Qualitative	Quantitative and qualitative (mixed or multi-method design)

Source: Saunders *et al*. (2009); Guba and Lincoln (20050; Hallebone and Priest (2009)

4.3.3 Ontology consideration

The term “ontology” derives from a combination of two Greek words, namely “ontos” and “logos”. As “ontos” refers to “being” and “logos” meaning “knowledge” (Gill and Johnson, 2010), together they mean knowledge of being. Ontology is concerned with the nature of social entities and whether or not they can be considered objective entities that are real to social actors or as social constructions built up from the perception and actions of social actors (Bryman and Bell, 2011). Ontology is defined as ‘the science or study of being’ and develops the claims of what exists, what it looks like, what units make it up and how these units interact with each other’ (Blaikie, 1993). This means that ontology describes the researcher’s view of the nature of reality. According to Bryman and Bell (2011), this form of reality can be considered from two positions: objectivism and constructivism. Objectivism here is the ontological position that the social phenomena and their meanings exist independently of social actors, while the constructivist position is that both social phenomena and their meanings are accomplished by social actors (Bryman and Bell, 2011; Bryman, 2012). This means that reality, or a subjective reality, is created in our minds.

Hatch and Cunliffe (2006) use both an everyday example and a social science example to illustrate the point. An example of an everyday reality could be found in the office. Ontology would seek to determine if the study describes what is really going on, or only what the author thinks is going on. Ontology also considers phenomena such as culture, power and control, and whether they really exist or are simply an illusion (Hatch and Cunliffe, 2006). In this study, the researcher applied ontological assumptions so as to have a clear view of the essence of the research area, what needs to be addressed and also the purpose of investigating the activities of PROs with regards to the application of SPM. This includes how individuals or groups view these realities; if the reality exists only through experience of it, known as constructivism, or whether it exists independently of those who live it, known as objectivism (Bryman and Bell, 2011).

Therefore, we all have deeply embedded ontological assumptions that affect our view on what is real or not, and if we have a preference for a particular thing over another. Where these assumptions are not identified and considered, the researcher may be limited by an aspect of the research or a certain phenomenon which is indirectly assumed and taken for granted, and as such may not be open to questions, consideration or discussion. Considering that there are different views of what constitutes reality, one would wish to ask how this reality is measured, and what constitutes knowledge of reality. This led to the considerations of epistemology.

4.3.4 Epistemology considerations

The epistemological issues are "concerned with the question of what is regarded as an acceptable knowledge in a discipline" (Bryman and Bell, 2011, p.15). In particular, the question of whether the social world should be studied according to the same principles, procedures and ethos as natural science (Bryman and Bell, 2011). This means that epistemology needs to address the following types of questions:

- What is knowledge?
- How is knowledge acquired?
- What do people know?
- How do we know what we know?
- How can we judge what is true and false?

Therefore, as presented by Burrell and Morgan (1992), such epistemology questions should determine if knowledge is acquired or personally experienced. Furthermore, the position that promotes the application of natural science methods to the study of social reality and beyond is associated with the epistemological position known as positivism (Bryman, 2012; Bryman and Bell, 2011). Positivism, also known as the natural science of epistemology, could be seen as (Bryman, 2012):

- **Phenomenalism:** this is where only phenomena and knowledge that are confirmed can be regarded as knowledge.
- **Deductivism:** where the aim of a theory is to generate a hypothesis that can be tested, allowing the explanations of laws to be accessed.
- **Inductivism:** this is where knowledge is achieved through the gathering of facts that provide the basis for laws.
- **Objective:** this is where science must be conducted in a way that is value-free.

An alternative to positivism is interpretivism. The interpretivist view is that the strategy required acknowledges that there are differences between the people, their institutions and the natural sciences. The study of the social world thus requires a different logic of research procedure, one that distinguishes the uniqueness of humans against the natural order (Bryman and Bell, 2011). The researcher's understanding, perspective and interpretation of research findings become the point of reference. As such, it is not possible for the researcher to be strictly neutral when adopting an interpretivist epistemological position in research. For example, researchers become totally involved in their research, and their values and beliefs likewise become the driving force in interpreting their research findings (Bryman, 2008; Fitzgerald and Howcroft, 1998).

Moreover, when researchers adopt an interpretive approach they begin their research with the assumption that access to reality is only through social constructions such as language, consciousness and shared meanings. Researchers must try to understand phenomena through the meanings that people place on them, because interpretive research focuses on the holistic complexity of decision making as situations evolve rather than placing pre-ordained definitions upon dependent and independent variables (Easterby-Smith *et al*., 2008; Remenyi *et al*., 1998). Table 4.2 highlights the distinctions between positivist and interpretivist perspectives discussed in this section. While the positivist approach is a quantitative approach, the interpretive approach is a qualitative approach based on the

understanding that reality is holistic, rather than being objectively determined as socially constructed. Section 4.5 discusses the quantitative and qualitative research approaches.

Table 4.2: Distinctions between positivist and interpretive perspectives

	Positivist Perspectives	Interpretivist Perspectives
Basic beliefs:	• The world is external and objective • Observer is independent • Science is value-free	• The world is socially constructed and subjective • Observer is part of what is observed • Science is driven by human interests
Researcher should:	• Focus on facts • Look for connections and fundamental principles • Reduce phenomena to simplest elements	• Focus on meaning and try to understand what is happening • Look at the totality of each organisation • Develop ideas through induction from data
Performed methods include:	• Operationalising concepts so that they can be measured • Taking large samples	• Using multiple methods to establish different views of phenomena • Small samples investigated in-depth

Source: Easterby-Smith *et al*. (2008)

Realism is another philosophical position that makes an effort to provide an account of scientific practice (Bryman and Bell, 2011). Realism was found to share two features with positivism. It believes that natural science and social science can use the same methods in the collection of data and also in explanation, and is also committed to the view that there is an external reality where researchers direct their attention (Bryman and Bell, 2011). There are two forms of realism, and the first is empirical realism, which supports the views the realism. The second form is critical realism, which reorganises the reality of the natural order, events and discourses of the social world but believes that we will only be able to understand and change the social world if we identify the structures at work and generate those events (Bryman, 2012).

4.3.5 Axiology consideration

As highlighted earlier in this section, the two main philosophical positions of social research are ontological and epistemological considerations. Fitzgerald and Howcroft (1998) included philosophical consideration, which is termed axiological consideration. Axiology is the third consideration in the field of philosophy, and is the philosophical study of value (Sang Hun

Lee, 1984). The theory of axiology is built on the foundation of ontology, which attempts to clarify the existence of the purpose of creation and the essence of value created through the give-and-take action between relative elements. Axiology is the philosophical field that deals generally with the problems of value: how to judge, evaluate and recognise value (Sang Hun Lee, 1984).

According to George Howard (1985) and cited by Miller (2002), value is categorised as epistemic or non-epistemic. Epistemic values provide guidelines for scholars by assessing the strengths and weaknesses of theories (Miller 2002). They help to ascertain a theory's reliability and validity. This author would contend that epistemic values are quantifiable, while non-epistemic values are vague and unquantifiable in that they are very human centred, involving emotions, ethics, morals, spirituality and the like. Having distinguished one from the other, Howard posits that one should not allow non-epistemic values to influence learning (Miller, 2002).

Siswomihardjo (2007), cited in Handiriana and Dharmmesta (2013), explained that in axiology, ethics imply that science is applied to enhance human dignity. Not that man is modified by science but on the contrary, man modifies science. The nature of ethics requires the application of science in a responsible manner, because ethics involve critical and fundamental thinking about teachings and moral views (Handiriana and Dharmmesta, 2013). The word ethics derived from the Greek word 'ethos', which means customs or habits, and relates to directing people's behaviour towards integrity and benefits of others. Without ethics, it is possible that people would justify obtaining benefits for themselves by any means necessary, even if they were harmful to others (Hill and Fout, 2005).

4.3.6 Methodology consideration

Two main methodological positions exist in research – quantitative (epistemological) and qualitative (ontological) methods. Quantitative methods are numerical in their methodological

positions and are mainly employed by positivists (Bryman, 2012). They aim to produce explanations or scientific laws that not only refer to the notion of natural science in their ontology and epistemology, but also employ the same methods (Bryman, 2012). The end results are in the form of numbers, which are then analysed for a final result. The great advantage of this approach is that the data are usually easy to replicate, which is also a very important factor for researchers in natural science. Typical methods of quantitative research are surveys or statistics (Bryman and Bell, 2011).

However, with regard to the general criticisms of positivism, the problem with the quantitative approach is that it is never clear what the answers, for example in polls, actually mean. Although it is clear that this is a very scientific approach, the notion of "objectivity" is no longer valid, rather the notion of positivist objectivity criteria is by now generally accepted (Hansen *et al*., 1998).

Qualitative methods, on the other hand, are research methods used in the measurement of theories. Their ontological and epistemological position is that the world is only socially constructed and is subject to interpretation. Interviews and other qualitative methods are used to gain an in-depth view of a field with a richness of description not obtainable by quantitative research (Merriam, 2009).

4.3.7 Philosophical position of research

The philosophical position of this research was based on the two main philosophical positions of social research. These are the philosophical considerations of ontology and epistemology, which are summarised in Table 4.3.

At the ontological level, the research adopted held a realist position because the SPM process employed by different PROs for the execution of R and D projects in Nigeria had a structure that was independent of the individuals and could vary considerably. Also, the

research considered conducting the investigation in a practical rather than an abstract way.

Table 4.3: Summary of philosophical considerations

Ontological considerations	
Realist	**Relativist**
External world comprises pre-existing hard and tangible structures that exist independent of individual's ability to acquire knowledge	Existence of multiple realities as subjective construction of the mind . Perception of reality is directed by varying socially transmitted terms
Epistemology consideration	
Positivist	**Interpretivist**
Applications of natural science methods to the study of social reality and beyond . World conforms to the laws of causation and complex issues can be resolved by reductionism	Absence of universal truth and emphasis on realism of context. Understanding and interpretation that come from researcher's own frame of reference

Source: Baiden (2006)

At the epistemological level, the research adopted the interpretivist position because the nature of the research problem was focused on the development of SPM frameworks to be used as a guide to minimise barriers and enhance SPM practices in the execution of R and D projects in Nigeria. According to Ritchie and Lewis (2003), the interpretive approach is valuable for identifying problems, and in this research it enabled the researcher to recognise the differing viewpoints of various people in the organisations.

4.4 RESEARCH PARADIGM

A research paradigm is defined as a set of fundamental assumptions and beliefs as to how the world is perceived which then serves as a thinking framework that guides the behaviour of the researcher (Jonker and Pennink, 2010). Generally, it is regarded as a way of explaining the basic set of beliefs held and how this influence the way research is carried out. There are four paradigms in research philosophy, and these assisted the researcher in evaluating different methodologies and methods in order to avoid inappropriate use by identifying the limitations of a particular approach at an early stage (Easterby-Smith *et al*., 2002; Sobh and Perry, 2006). The research paradigms, as shown in Figure 4.1, were viewed

as positivism, constructivism or interpretative, transformative or critical theory and pragmatic or realism paradigm.

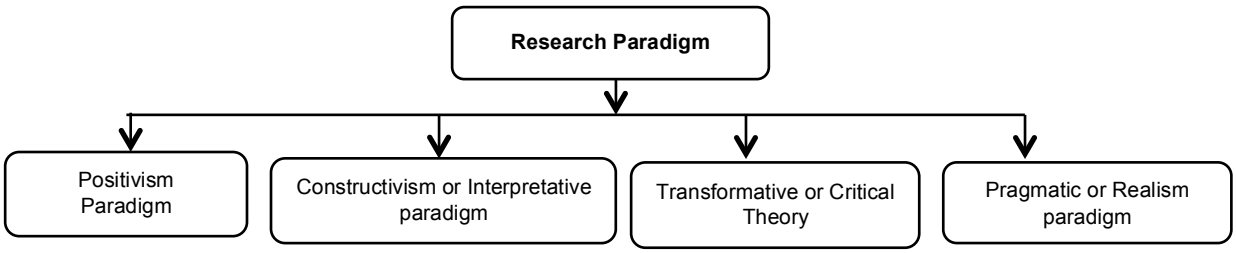

Figure 4.1: The key research paradigm
Source: Based on Easterby-Smith *et al.* (2002); Saunders *et al*. (2007); Perry *et al*. (1999); Creswell (2014)

In order to understand the different perspectives of research philosophy, it is necessary to explain the meaning of the term paradigm. A paradigm is a philosophical position, which defines reality and is acceptable to a defined group of people at a specific time (Saunders *et al*., 2007). Kuhn (1962), cited by Easterby-Smith *et al*. (2002), described a paradigm as the progress of scientific discoveries in practice, rather than how they are subsequently reconstructed within textbooks and academic journals. Weaver and Olson (2006) perceived a paradigm as a way of linking the need for knowledge (aims) with the means of producing that knowledge (methods), and Creswell (2009) argued that the “bridge” between methods and aims represents the researcher's worldview and in turn shapes the methods used in research. There are numerous sources that define paradigms and their components (Parahoo, 2006, Denzin and Lincoli, 2008, Creswell, 2009).

However, understanding the process of choosing a paradigm, along with the differences and any similarities between paradigms, is important if the researcher is to define and justify his or her approach to any given piece of research (Weaver and Olson, 2006). This means that paradigms are the conceptual framework within which the researcher carries out his or her work. Different names have often been used to describe apparently similar paradigms; in part

this was a result of similar approaches being developed in parallel across different branches of the social sciences (Williams, 2000). Before adopting a paradigm for this research, different types of paradigms were examined so as to have an insight into the philosophical assumptions that support them. The different types of research paradigms are discussed in the following sections.

4.4.1 Positivism paradigm

The positivism paradigm is concerned with the testing of theories and the verification of hypotheses that have been developed from existing theories through the measurement of observable social realities (Flowers, 2009; Sobh and Perry, 2006). Positivism is based upon values of reason, truth and validity, focused directly on facts that are gathered through surveys, direct observation and experience, and measured empirically using quantitative methods and statistical analysis (Blaikie, 1993; Saunders *et al*., 2007; Eriksson and Kovalainen, 2008; Easterby-Smith *et al*., 2008; Hatch and Cunliffe, 2006). Furthermore, in an organisational context, Hatch and Cunliffe (2006) stated that positivists assume that what truly happens in organisations can only be discovered through classification and scientific measurement of people's behaviour and systems with a language that is truly representative of the reality. The positivist responds to the need to identify and assess causes that influence outcomes, such as those found in experiments (Creswell, 2014).

4.4.2 Constructivism paradigm

Constructivism was described by Hatch and Cunliffe (2006) as anti-positivist, and by Blaikie (1993) as post-positivist. In the social world, it is argued that individuals and groups express their views based on their individual experiences, memories and expectations. This means that the views they hold are gathered and created over time through experiences with differing interpretations. These different interpretations which different researchers create from experiences make up the social reality in which people act. The constructivist

researcher is interested in understanding the meanings and interpretations of "social actors" and understanding their world from their point of view, which is highly contextual and hence is not widely generalisable (Saunders *et al*., 2007). The goal of the constructivist researcher is to rely on the participant's views of the situation being studied (Creswell, 2014). However, understanding what people are thinking and feeling, as well as how they communicate both verbally and non-verbally, is considered important (Easterby-Smith *et al*., 2008). Considering the subjective nature of the constructivist paradigm, and the emphasis on language, their common methodology is associated with in-depth interviews, participant observations, action research and grounded theory research in data gathering (Sobh and Perry, 2006; Eriksson and Kovalainen, 2008).

4.4.3 Transformative or critical theory paradigm

The transformative, or critical, theory and constructivism are major alternatives to the positivism paradigm. Due to the similarities between constructivism and critical theory most academic researchers view the two paradigms as the same (Sobh and Perry, 2006), although there are slight differences. The transformative, or critical, theory holds the view that research need to be shaped by social, economic, ethnic, political, cultural, and gender values formed over time (Creswell, 2014). Critical theory researchers are transformative intellectuals who change the social world within which participants live. Their research is methodologically carried out through action research and participant observation (Sobh and Perry, 2006).

4.4.4 Pragmatic or realism paradigm

The pragmatic paradigm arises from actions, situations and consequences, rather than antecedent conditions (Creswell, 2014). It is an increasingly useful worldview for some social scientists (Sobh and Perry, 2006) that was born from a frustration that positivism was over-deterministic and that constructivism was entirely relativist (Flowers, 2009), and therefore

realism is a combination of both positivist and interpretivist positions. Realist researchers acknowledge the differences that exist between the real world and their particular view of it, and try to construct various views of this reality relevant to a particular time and place (Riege, 2003). According to Blaikie (1993), whilst realism, or pragmatism, is concerned with what types of things exist how these things behave, it accepts that reality may exist in spite of science or observation, and so there is validity in recognising realities that are simply claimed to exist or act, whether proven or not.

From an organisational perspective, Hatch and Cunliffe (2006) describe the realist researcher as one who enquires into the mechanisms and structures that underlie institutional forms and practices, how these emerge over time, how they might empower and constrain social actors, and how such forms may be critiqued and changed. Realists take the view that researching from different angles and at multiple levels contributes to understanding since reality can exist on multiple levels (Chia, 2002), and hence realism may be seen as inductive or theory building. For the purpose of this research, selecting a research philosophy involved combining the two primary alternatives: positivist and constructivist/interpretivist philosophies (Figure 4.2). Saunders *et al*. (2007) argued that the research philosophy that the researcher adopts contains important assumptions about the way in which the researcher views the world and that these assumptions will underpin the research strategy and the methods adopted. Considering the research problems outlined in Chapter One, the best fit for this study therefore the one adopted was the pragmatic, or realist, paradigm.

4.5 RESEARCH DESIGN

Research design relates to the type of inquiry within qualitative, quantitative and mixed-methods approaches that provide specific direction for procedures in a research (Creswell, 2014). Research design could also be said to be the process of turning the research questions into a testing project, and also a "blueprint" for research, dealing with at least four

problems: what questions to study, what data are relevant, what data to collect, and how to analyse the results (Yin, 2009). Bryman and Bell (2011), in support of this concept, described research design as a framework that connects the study questions to the data collection and analysis of data. Furthermore, the choice of research design has been found to affect the decisions of researchers as to the research process to be used (Bryman and Bell, 2011). Research design is therefore an important step in carrying out social research as it connects the research methodology and the set of research methods, so as to address the research questions. It could therefore be deduced that the overall decision involves identifying which design is appropriate and which should be used to carry out a research work. There are three different research designs that could be applied for different research methods and these have been highlighted in Table 4.4.

Table 4.4: Different types of research designs

Quantitative	Qualitative	Mixed methods
• Experimental designs • Non-experimental designs, such as survey	• Narrative research • Phenomenology • Grounded theory • Ethnographies • Case study	• Convergent • Explanatory sequential • Exploratory sequential • Transformative, embedded, or multiphase

Source: Creswell (2014)

As shown above, there are different types of research designs that could be applied for different research methods (Table 4.4). However, in order to choose the appropriate research design for this study, a brief discussion of the research designs was carried out so as to enable the researcher to understand what each of the different types of research design involves.

4.5.1 Experimental research

Experimental research seeks to determine if a specific treatment influences an outcome (Creswell, 2014). However, this is not common in business and management research due to the inability to carry out experimental control when dealing with organisational behaviour

(Bryman and Bell, 2011). According to Bryman and Bell (2011), true experiment can be regarded as a strong research design with regards to the internal validity. However, the aim of introducing experimental design, according to Bryman (2012), was so that it could be used as a yardstick against which quantitative research could be judged. This is because a true experiment will clear any doubts over internal validity by reflecting the considerable emphasis placed on quantitative research.

4.5.2 Survey research

Survey research provides numeric descriptions of trends and attitudes of a population by studying a sample of that population (Creswell, 2014). Survey research or cross-sectional research design can also be defined as the collection of data from more than one case and at a single point in time (Bryman and Bell, 2011). This ensures that quantifiable data is collected for two or more variables that are analysed to find patterns of association. The process of collecting data for more than one case at a single point in time, and also the need for quantifiable data, indicates that a cross-sectional design research is interested in variation that should be collected simultaneously as well as having a systematic and standardised method for observing the variables (Bryman and Bell, 2011). This research employed mixed methods of quantitative and qualitative research methods; as such the survey research design was adopted as the quantitative research method.

4.5.3 Narrative research

Narrative research design investigates the lives of individuals, which involves asking one or more individuals to provide stories about their lives (Riessman, 2008). The information retrieved is narrated along with the researcher's own views (Creswell, 2014).

4.5.4 Grounded theory

Grounded theory research aims to move beyond description and to generate or discover a theory, a unified theoretical explanation for a process or an action (Creswell, 2014). That is to say that the approach emphasises the generation of a theory from data, rather than a theory being decided before the study. This approach seeks to challenge research approaches where the researcher looks for evidence in data and seeks to confirm or deny established theories or practices. The reason being that you will often find in research what you are looking for, but with an open-minded approach to carrying out research, new ideas and ways of carrying out the research may be discovered. The aim of grounded theory is therefore to approach research with no preconceived ideas of what might be discovered or learned (Creswell, 2014). However, Silverman (1993) summarises the main features and stages of grounded theory as:

- An attempt to develop categories which are derived from the data;
- Attempting to give as many examples as possible in the categories developed in order to demonstrate their importance; and
- Developing the categories into more general and broader analytical frameworks (or theories) with relevance to other situations outside the research subject.

4.5.5 Ethnographic

An ethnographic approach involves the researcher being involved in the day-to-day running of an organisation, so that the researcher can understand it from an insider's point of view (Bryman, 2012). In order to be part of the organisation or establishment, the ethnographic researcher would engage in fieldwork over a period of time so as to draw attention to the similarities between the ethnography and the participant's observations (Bryman, 2012). Unlike the grounded theory that develops a theory from examining many individuals that share in the same process, ethnography involves the study of a culture that focuses on the

entire sharing group and also the final written product of that research (Creswell, 2011). The aim is to understand the situation from the inside: from the viewpoints of the people in the situation. The researcher shares the same experiences as the subjects, and this form of research can be particularly effective in the study of small groups/firms.

4.5.6 Longitudinal design

Longitudinal design is used to map changes in business and management research (Bryman and Bell, 2011). Pettigrew (1990), cited by Bryman and Bell (2011), argued that the importance of longitudinal design is to help in the study of understanding an organisation, so as to provide or retrieve data on the process through which change can take place. However, this research design is rarely used as the process is very expensive (Bryman and Bell, 2011), and as such was not adopted for this research.

4.5.7 Case study design

The case study design involves the study of a case within a real-life contemporary context or setting (Yin, 2009). This involves a detailed and intensive analysis of single or multiple cases. It is a very popular and widely used research design in business and management research (Eisenhardt and Graebner, 2007). A case study can be a single organisation or a single location such as a factory, production site or office building, and involves an intensive examination of settings (Bryman and Bell, 2011). Although Stake (2005) argued that case study research is not a methodology but the choice of what is to be studied, other researchers present it as a strategy of inquiry, a methodology, or a comprehensive research strategy (Denzin and Lincon, 2005; Merriam, 2009; Yin, 2009; Cresswell, 2013). The researcher sees case study research as a methodology and a type of design in quantitative and qualitative research that may be an object of study and inquiry. A detailed view of the term case study can be seen in Merriam-Webster's dictionary (2009), where it is defined as "an intensive analysis of an individual unit (as a person or community) stressing

developmental factors in relation to environment". This definition identifies four key aspects of case studies that make them a good methodological choice. These are that case studies focus on an intensive analysis, an individual unit, developmental factors and the relation to the environment. According to Flyvbjerg (2011) the decisive factor in defining a study as a case study is the choice of the individual unit of study and the setting of its boundaries, or its "casing" to use Ragin's (1992) apt term.

The focus on an individual unit indicates that the research could be carried out in a number of ways, for instance qualitatively or quantitatively, analytically or hermeneutically, or by mixed methods (Flyvbjerg, 2011). The intensive nature of the study shows that as case studies are made up of detailed, rich, complete, and variable information, that is, dip for the unit of study under investigation. The stress on developmental factors means that a case typically evolves over time, often as a string of concrete and interrelated events that occur at a particular time in a given place and are regarded as constituting the case when seen as a whole. Finally, "in relation to environment" indicates that case studies put into consideration the environment by deciding what counts as a case and what becomes a context to the case under investigation (Flyvbjerg, 2011).

For this research work, the case study focused on PROs in Nigeria. First, the researcher identified the specific case by selecting four out of eight PROs in Nigeria under the Federal Ministry of Science and Technology (FMST) that are project based and are involved in research that contributes to industrial growth. The case selection enabled the researcher to understand the application of SPM, problems and concerns in PROs. To achieve this, the research employed a mixed method of quantitative (semi-structured questionnaire) and qualitative (face-to-face semi-structured interview) research methods for the analysis of SPM practices in the different PROs. This aided the retrieval of detailed information on SPM application and the identification of developmental factors and barriers that affect the

application of SPM in PROs, putting into consideration the unique environment of research organisations.

4.5.7.1 Rationale for case study design

Case studies have a long, distinguished history across many disciplines, and today they account for a large proportion of books and articles in psychology, anthropology, sociology, history and politics (Cresswell, 2013). According to George and Bennett (2005), most of what we know about the empirical world was produced by case study research, and many of the most treasured classics in each discipline are case studies.

Although case studies are widely used, it has been observed that case study as a methodology is generally held in low regard, or is simply ignored, within academia (Flyvbjerg, 2011). For example, only 2 of the 30 top-ranked U.S. graduate programmes in social science require a dedicated graduate course in case study or qualitative methods, and a full third of these programmes do not even offer such a course. In contrast, all of the top 30 programmes offer courses in quantitative methods and almost all of them require training in such methods, often several courses (George and Bennett, 2005). In identifying this paradox of the case study's wide use and low regard, Gerring (2004) (in Flyvbjerg, 2011) observed that the case study survives in a "curious methodological limbo", and that the reason for this is that the method is poorly understood. Although Gerring (2004) observed that case study was poorly understood, Flyvbjerg (2011) identified that this was as a result of misunderstandings about case study that systematically undermine the credibility and use of the method.

However, for researchers, the closeness of the case study to real-life situations and its wealth of details are important in two respects. Firstly, they are important for the development of a detailed view of reality, including the view that human behaviour cannot be meaningfully understood as simply the rule-governed acts found at the lowest levels of the learning process and in much theory (Flyvbjerg, 2011). Secondly, cases are important for

researchers' own learning processes in developing the skills needed to carry out good research. Tangible experiences can only be achieved when there is close contact to the study of reality and also feedback from those under study, as distance from the object of study and lack of feedback easily lead to a stultified learning process. This, according to Flyvbjerg (2011), can lead to virtual academic blind alleys, where the effect and usefulness of research becomes unclear and untested. Thus, as a research method, the case study research design can be an effective approach for retrieving enhanced and rich data.

Furthermore, in terms of the learning process Flyvbjerg (2011) identified that there are no predictive theories in social science, and that social science has not succeeded in producing general, context-independent theories and thus has nothing to offer other than concrete, context-dependent knowledge. The case study is therefore especially well-suited to producing this knowledge (Flyvbjerg, 2011). Donald Campbell (1975), cited by Flyvbjerg (2011), in fierce criticism of case studies stated that "such studies have such a total absence of control as to be of almost no scientific value", but later countered that statement by stating that research work had undergone "an extreme oscillation away from the earlier dogmatic disparagement of case studies" (p. 303).

This could be regarded as a boost to the importance of using case studies in social research so as to obtain rich and detailed data of the study area. Campbell is not the only example of a researcher who has altered his views about the value of the case study. Eysenck (1976), cited by Flyvbjerg (2011), who originally saw the case study as nothing more than a method of producing anecdotes, later realised that "sometimes we simply have to keep our eyes open and look carefully at individual cases not in the hope of proving anything, but rather in the hope of learning something!" (p. 303). For this study, the researcher noted that according to Flyvbjerg (2011) final proof is hard to come by in social science because of the absence of "hard" theory, whereas learning is certainly possible. As for predictive theory, universals, and

scientism, so far social science has failed to deliver, but rather has only specific cases and context-dependent knowledge (Flyvbjerg, 2011).

The choice of a case study approach therefore assisted the researcher in identifying the current, real-life cases in progress so as to gather accurate information on the area of study. Case study enabled the researcher to understand specific issues, problems or concerns of SPM application; to gather an in-depth and rich understanding of the application of SPM in the execution of R and D projects; and enabled the selection of an appropriate data analysis method which involved the selection of multiple cases that were analysed and compared.
Although the use of case study has many advantages, there are also challenges associated with its use. These include the challenge of identifying the case, as the case selected may be broad or narrow in scope, and as such the researcher must decide which bounded system to study (Creswell, 2013). As already highlighted, the use of surveys seemed an appropriate method for obtaining data from different organisations. However, further richness was added to the data obtained from these different organisations through detailed studies of four selected organisational cases.

4.5.8 Convergent mixed-method design

This is a form of mixed-method design in which the researcher merges quantitative and qualitative data for a more comprehensive analysis of the research problem (Creswell, 2014). This design involves the researcher collecting both the quantitative and qualitative data at the same time before analysing the results. The findings of the research are explained and any contradictory findings could be investigated further (Creswell, 2014).

4.5.9 Exploratory sequential mixed method design

In an exploratory sequential method, the researcher starts with the qualitative research phase to collect the data before carrying out the quantitative research (Creswell, 2014). The

findings are analysed and the information retrieved informs subsequent quantitative data collection (Onwuegbuzie *et al*., 2010). The qualitative data may be used in the construction of the quantitative instrument to be used in the research or to specify the variables to be studied in the quantitative study (Creswell, 2014). The challenges of this research design are the necessity to focus on the required qualitative findings and also the selection of the samples to be used in the quantitative and qualitative phases (Creswell, 2014).

4.5.10 Explanatory sequential mixed method design

In the explanatory sequential design the researcher first collects and analyses quantitative data, and then the findings inform qualitative data collection and analysis (Ivankova *et al*., 2006). The quantitative findings may influence the direction and types of qualitative data collected, or vice versa (Creswell and Clark, 2011). However, in the more common and technically simpler variation, qualitative and quantitative data collection occurs in parallel, analysis for integration begins well after the data collection process has been completed, and the two forms of data are analysed separately and then merged (Creswell and Clark, 2011).

For this research work, the integration of quantitative and qualitative research methods at the design level of SPM application in PROs, and the conceptualisation of the research aim and objectives, were accomplished through the explanatory sequential design. The distribution and retrieval of the semi-structured questionnaires were first carried out and the preliminary analyses findings informed the semi-structured interview. This enhanced the information and data retrieved regarding the implementation of SPM in the selected PROs.

4.6 RESEARCH METHODS

The third major element in the research approach is the research method, which involves the procedures for data collection and analysis, and the researcher's interpretation of the data for the study (Creswell, 2014). The process of collecting and analysing survey data is used to

address the research questions Quantitative and qualitative approaches are regarded as different research methods and are known to differ in the research methods they apply (Bryman, 2012). The differences between quantitative and qualitative approaches, with reference to data sampling, collection, analysis, and interpretation, have lately been a subject of debate (Gelo *et al*., 2008).

Although quantitative and qualitative research methods differ in many ways, they can still work as complementary strategies (Neuman, 2005). However, the decision-making process to choose the most appropriate research method depends upon different variables, such as the purpose of the study and the type and availability of the required research information (Naoum, 2007). This research therefore employed a mixed method of quantitative and qualitative strategies. This was to facilitate the researcher in gaining an in-depth understanding of the research area (Creswell, 2013). The importance of this approach was also highlighted by Ghauri and Gronhaug (2002), who observed that the mixed-method approach produces a more complete, holistic and contextual portrait of the phenomena being studied. An investigation into the differences and similarities between the two methods, as well as a debate on the use of either or both quantitative and qualitative approaches, is included in the next section.

4.6.1 Quantitative research method

Quantitative research, according to Bryman (2012), had been dominant in the social research field, but its influence decreased in the 1970s when the qualitative research strategy came into existence. However, it is still the most widely adopted research strategy. Quantitative research strategy places emphasis on quantification in the collection and analysis of data, and also on processes where theories determine the research problem, presented in the form of research questions or a hypothesis (Bryman, 2012). This signifies a deductive approach to the relationship between the theory and research, in which the research questions or hypothesis are based on the testing of theories (Bryman, 2012).

Quantitative research is also based on the positivist belief, in which the researcher views the social world as an external reality and measurement is approached through objective methodologies (Bryman, 2012).

Sunders *et al*. (2009) stated that in quantitative research, the researcher asks specific questions. Thus, data from this type of research are usually structured, concise, explicit, and therefore quantitative in nature. This research used a semi-structured questionnaire that was concise and straight to the point. Due to the nature of the structure, more formally controlled research strategies, such as quantitative methods and statistical analysis techniques, can be used to improve study reliability and conclusion validity (Sunders *et al*., 2009). The outcome of these quantitative techniques is usually in the form of identifying the relationships between variables (Bryman and Bell, 2011). The positivist tradition of searching for relationships and empirically testing explanatory theories into which deductive quantitative methods fit, have earned it the label of being the traditional approach to research (Bryman, 2012).

The benefit of the concept and internal validity gained by the quantitative approach is that they are suitable for testing large populations where samples can be used to represent the whole population (Bryman and Bell, 2011). This research needed to test a large population, and as such quantitative research was the main research method used to address the research questions, while the qualitative research method was used to validate the findings from the quantitative method. Although quantitative research is known to have many advantages, it has also been the focus of a great deal of criticism. Thus, it can be difficult to distinguish between different kinds of criticism when reflecting on the different critical points that have been proffered (Bryman, 2012). However, some of the criticisms of quantitative research, according to Bryman (2012), are that:

- Quantitative research fails to distinguish people and social institutions from the world of nature;

- The measurement process possesses an artificial and spurious sense of precision and accuracy;
- The reliance on instruments and procedures hinders the connection between research and everyday life; and
- The analysis of relationships between variables creates a static view of social life that is independent of people's lives.

4.6.2 Qualitative research method

A qualitative research strategy emphasises words rather than quantification in the collection and analysis of data (Bryman, 2012). Qualitative research is known to have an inductive view of the relationships between theory and research, which is also constructive and interpretative in nature (Creswell, 2013). Merriam (2009) observed that qualitative researches are distinct research strategies, and are sometimes taken to be an approach to social research when quantitative data are not collected or generated. However, Richie and Lewis (2003) observed that qualitative researchers who do not acknowledge the variety of forms that the research strategy can assume, unless a degree of the nature of qualitative research is discussed, find it difficult to refer to qualitative research as a distinct research strategy. Notwithstanding, Bendassolli (2013) argued that the purpose of qualitative research is to generate new theories. To achieve this, a researcher must investigate outside of the existing theories that cover the research area.

The aim of this investigation is to identify new theories that may emerge from the abstract thinking processes during the personal experiences of the qualitative process (Bryman, 2012). Qualitative research thus represents a view of social reality as a multiple, socially and psychologically constructed phenomenon, where the unknown and the known are inextricably connected to each other (Gelo *et al*., 2008). The credibility of qualitative research depends on the skill, competence and rigour of the researcher (Patton, 2002).

Ultimately, as argued by Fitzgerald and Howcroft (1998), the qualitative research strategy is more responsive to the needs and nature of a research situation than is the quantitative research approach, because qualitative research data are soft, rich and deep, and determine what things exist rather than how many they are. The suitability of employing a qualitative research strategy requires the following type of research problem (Baiden: 2006):

- There is no existing research data on the topic and the most appropriate unit of measurement is not certain; and
- The concepts are to be researched and assessed on a nominal scale, with no clear demarcation, and involve exploring behaviours or attitudes.

However, Bryman (2008) highlighted that qualitative research has been the subject of criticisms from researchers and these critics have argued that such a research strategy:

- Is too impressionistic and subjective, and the findings rely too much on the researcher's often unsystematic views about what is insignificant and important;
- Is difficult to replicate because it is unstructured and often reliant upon the researcher's ingenuity;
- Has problems with generalisation because the scope of the findings of qualitative research is often restricted when unstructured interviews are conducted with a small number of individuals in a certain organisation or locality; and
- Lacks transparency due to difficulty, which sometimes arises from the establishment of what the researcher actually did and how the study's conclusions were arrived at.

Although there were many critics of qualitative research, Maxwell (1998) argued that the strengths of qualitative research were based on its:

- Inductive process;
- Focus on specific situations or people; and

- Emphasis on words rather than numbers.

4.6.3 The difference between quantitative and qualitative

In order to appreciate the differences between the approaches used in qualitative and quantitative research methods, it was necessary to understand the different research approaches applied in each method, and these have been highlighted in Table 4.5. Although many differences exist between quantitative and qualitative research, there are some similarities between the two methods. According to Hardy and Bryman (2004), the following similarities exist between quantitative and qualitative research methods. Both are concerned with the following:

- Data reduction. In both quantitative and qualitative research, large amounts of data are collected, and in both cases the researcher reduces the data so as to obtain accurate information. In quantitative research, the process of data reduction takes the form of statistical analysis, while qualitative researchers develop concepts out of their often-times rich data.
- Answering research questions about the nature of social reality.
- Relating data analysis to the research literature.
- The researchers seek to uncover variation and also represent that variation.
- Both treat frequency as a springboard for analysis: in quantitative research, it is a core outcome of collecting data, while in qualitative research, it comes from reports of publicised findings.
- Both seek to ensure that deliberate distortion does not occur.
- Both argue for the importance of transparency: the researchers seek to be clear about their research procedures and how findings were arrived at.
- Both must address the question of error.

Table 4.5: The differences between quantitative and qualitative methods

	Quantitative research method	Qualitative research method
1.	Numbers: quantitative research deals with applying measurement procedures to social life.	Words: qualitative research uses words in the presentation of analysis of society.
2.	Point of view of researcher: in this case it is the researcher's set of concerns that structure the investigation.	Point of view of participants: the perspective of the participants provides the point of orientation.
3.	The researcher is distant: in quantitative research, researchers are uninvolved with the subjects, as in the case of questionnaires that are distributed for the respondents to respond to without interference from the researcher.	The researcher is close: the researchers in this case seek close involvement with the people being investigated so as to understand the society through their eyes.
4.	The theory and concept are tested on quantitative research.	The theory and concepts emerge from data.
5.	Static: quantitative research is frequently depicted as presenting a static image of social reality with its emphasis on variables.	Process: qualitative research is known to be involved in the unfolding of events over time and connections between the actions of participants of social settings.
6.	Structured: these are highly structured; this is to help the researcher examine the precise concepts and issues that are the focus of the study.	Unstructured: these are invariably unstructured, so as to enhance finding the actors meanings and the concepts that would emerge out of data collection.
7.	Generalisation: quantitative researchers want their findings generalised to the relevant population.	Contextual understanding: here the researcher seeks an understanding of the behaviour, values and beliefs within the context of where the research is conducted.
8.	Hard, reliable data: quantitative data are known to be hard due to the robust and unambiguous data offered by measurement.	Rich, deep data: the contextual approach and prolonged involvement in a research makes the researchers claim that the data collected are rich and deep.
9.	Macro: this involves uncovering large-scale social trends and connections between variables.	Micro: these are concerned with small-scale aspects of social reality e.g. interaction.
10.	Behaviour: it is often reported that quantitative research is concerned with people's behaviour.	Meaning: qualitative researchers are concerned with the meaning of actions.
11.	Artificial settings: quantitative researches conduct research in a contrived context.	Natural settings: qualitative researchers investigate people in a natural environment. They are also affected by the emotions and perceptions of respondents to the issues investigated.

Source: Bryman (2012); Bryman and Bell (2011); Hardy and Bryman (2004)

4.6.4 The debate on quantitative and qualitative research

Research can be categorised according to a set of philosophical and meta-theoretical assumptions concerning the nature of reality (ontology), knowledge (epistemology), and the principles inspiring and governing scientific investigation (methodology), as well as by technical issues regarding the practical implementation of a study (research methods) (Gelo *et al*., 2008). The research methods could be regarded as being derived from the choice of a particular philosophical position, while the methodology leads to a preference for a particular research method based on its appropriateness within that specific philosophical and methodological orientation (Bryman and Bell, 2011). While philosophical and meta-theoretical assumptions underline the worldviews constraining the types of questions we try

to answer, and the principles governing our research approach, research methods specify the practical implementation of our scientific investigation in terms of data collection, analysis and interpretation (Bryman, 2012). The main features characterising quantitative and qualitative methods may be described with respective reference to their philosophical foundations, methodological assumptions, and to the research methods they employ (Gelo *et al*., 2008). Differences at each of these levels have led to the debate on qualitative and quantitative methods.

Over the years, the debate over the relative virtues of quantitative and qualitative methodology has gained considerable momentum (Gelo *et al*., 2008). Although the methods applied by the two methodologies vary, there is considerable agreement in the fundamental principles and their practical implications in conducting research (Bryman, 2012). To study human beings, psychologists have commonly followed either a quantitative or qualitative approach. From an etymological point of view, quantitative approaches determine how much of an entity exists, while qualitative approaches are involved in describing the constituent properties of an entity. Indeed, much psychological research reflects the essence of this distinction (Gelo *et al*., 2008). A great deal of quantitative research is concerned with counting occurrences, volumes, or the size of the relationships between entities, while qualitative research aims to provide rich or "thick" (Gelo *et al*., 2008) descriptive accounts of the phenomenon under investigation.

Quantitative and qualitative research methods clearly differ in terms of how data are collected and analysed. Quantitative research requires the reduction of phenomena to numerical values in order to carry out statistical analyses. Conversely, qualitative research involves the collection of data in a non-numerical form, for instance texts, pictures, videos, and so on (Bryman, 2012). However, quantitative and qualitative methods also differ with regard to the aims of scientific investigation as well as the underlying paradigms and meta-theoretical assumptions (Gelo *et al*., 2008). According to quantitative approaches,

psychological and social phenomena have an objective reality (Bryman, 2012). The relationships between these phenomena are investigated in terms of generalisable causal effects, which in turn allow predictions to be made. In contrast, qualitative approaches consider reality as socially and psychologically constructed. The aim of scientific investigation is to understand the behaviour and the culture of humans and their groups from the point of view of those being studied (Bryman, 2012). In carrying out this research an attempt was made to understand the participants' own frames of mind or worldviews, rather than trying to answer the research questions.

Bryman (2012) argued that quantitative methods have always dominated psychological research since the conception of psychology as a "science" in the nineteenth century. Danziger (1985), cited by Gelo *et al*. (2008), also stated that quantitative methods have become the "methodological imperative". However, since the 1960s various psychologists, especially those dealing with social phenomena, have begun to criticise such approaches to the investigation of human nature (Gelo *et al*., 2008). According to Patton (1988), cited by Gelo *et al*. (2008), psychologists proposed a naturalistic, contextually based and holistic understanding of the human being, which is now known as the qualitative approach. Considering that this approach has gained ground within psychology (Patton, 1988), it has sparked a debate about the appropriateness of either quantitative or qualitative approaches in psychological research (Smith, 2003). The two diverse approaches could "just" be viable options that could be adopted in research study, but instead they have become entrenched ideological positions (Todd *et al*., 2004).

The quantitative and qualitative debate has been sustained by several factors that can be mainly ascribed to the underlying philosophical and methodological assumptions and the related research methods (Gelo *et al*., 2008). Some authors emphasise the incompatibility of quantitative and qualitative approaches, their basic argument being that the meta-theoretical paradigms underlying the two approaches are so different that any reconciliation between

them would destroy the philosophical foundations of each (Lincoln and Guba, 1985; Noblitt and Hare, 1988; Rosenberg, 1988). As noted by Bryman (2012), the quantitative and qualitative debate is based to a large extent on epistemological issues, and questions relating to research techniques, which are systematically related to these issues.

Other authors, according to Gelo *et al*. (2008), assume a more pragmatic position that it is possible both to subscribe to the philosophy of one approach and employ the methods of the other. However, mixed-methods research (Tashakkori and Teddlie, 2003) has recently been developed, which aims to combine and to some extent integrate the different methodological and research method perspectives of both quantitative and qualitative approaches. Following these emergent trends, the current quantitative and qualitative debate can be re-defined with reference to both a methodologically integrated and an empirically grounded, practice-oriented set of investigations (Gelo *et al*., 2008). In this way, controversial philosophical issues may be seemingly bypassed (Krantz, 1995) or combined, and discussions may take place, at which point the research strategy is more likely to investigate specific phenomena.

4.6.5 Mixed methods

A mixed-method approach refers to the integration of quantitative and qualitative research within a single project (Bryman, 2012). Although some researchers combine structured interviews and structured observations or ethnographies with semi-structured interviews, the mixed method referred to in this case is the combination of quantitative and qualitative research methods associated with just one research strategy (Bryman, 2012). Mixed methods are applied to research questions so as to explore why or how a phenomenon occurs, to develop a theory, or to describe the nature of an individual's experience (Bryman, 2012). Mixed-methods research in this study employed the strengths of both quantitative and qualitative approaches to provide an innovative approach for addressing the SPM application in PROs.

4.6.6 Rationale for mixed method of quantitative and qualitative research

The integration of quantitative and qualitative data can dramatically enhance the value of research (Bryman, 2006; Creswell and Clark, 2011). Several advantages can arise from integrating the two forms of data. The qualitative data can be used to assess the validity of quantitative findings, while the quantitative data can also be used to help generate the qualitative sample or explain findings from the qualitative data. In this research, the qualitative data was used to validate the quantitative findings. Qualitative inquiry can also inform the development or refinement of quantitative instruments or interventions, or generate hypotheses in the qualitative component for testing in the quantitative component (O'Cathain *et al*., 2010). Although there are many advantages to data integration, the extent to which mixed methods studies implement integration remains limited (Bryman, 2006; Lewin *et al*., 2009). Nevertheless, there are specific approaches to combining qualitative and quantitative research procedures and data (O'Cathain *et al*., 2010; Creswell and Clark, 2011), and these approaches can be implemented at the design, method, and interpretation and reporting levels of research.

For the integration of quantitative and qualitative research methods at the design level, the conceptualisation of a study is accomplished through three basic designs and four advanced mixed methods frameworks that incorporate one of the basic designs. The basic designs include convergent, exploratory sequential and explanatory sequential designs (O'Cathain *et al.*, 2010; Creswell and Clark, 2014). In sequential designs, the intent is for one phase of the mixed methods study to build on the other, whereas in convergent designs the intent is to merge the phases in order that the quantitative and qualitative results can be compared (O'Cathain *et al*., 2010; Creswell and Clark, 2011).

4.6.7 Adopted research strategy

As per the explanations given in the previous sections, this research adopted a mixed method combining quantitative and qualitative research methods for the following reasons.

- Considering the nature of the research objectives, the mixed-method approach was deemed appropriate. This is because the information on SPM application in PROs was considered to be insufficient, thus the need for a general and in-depth inquiry. This enabled the researcher to obtain rich data from the research. According to Yin (2009), the less information there is available regarding any phenomena, the more the qualitative approach is suitable (Yin, 2009).
- The research is exploratory in nature with the aim being to establish an integrated SPM framework. The framework to be developed will aid the senior project management practitioners in PROs in Nigeria in the management of R and D projects so as to ensure improved project performance.
- The aim of this research was to propose an integrated framework for senior project management practitioners working in PROs in Nigeria. The framework will be used as a guide to minimise barriers and enhance the performance SPM practitioners in R and D projects in Nigeria. Therefore, it was necessary to focus on the views and perspectives of experienced project management practitioners in the context of the research problem so as to obtain in-depth information on the application of SPM in the execution of R and D projects.
- To identify the factors that hindered the application of SPM in the execution of R and D projects in Nigeria, the research explored the research problems in an in-depth and diverse manner and pursued holistic descriptions of the phenomena. This approach was considered essential to gain the necessary insight to properly appreciate and understand how R and D projects were carried out in the selected PROs.
- The mixed method was employed to enable the researcher to obtain detailed general

viewpoints from experienced project management practitioners in PROs, and also to obtain rich data that was analysed using statistical techniques involving the creation of themes and categories within themes, which was further developed by coding the data, as discussed by Fellows and Liu (2008).

4.7 REASONING METHODS

The process of carrying out research involves numerous stages and methods. Most often, we debate the thoughts of other researchers, criticising an incorrect approach or design, without considering whether the problem is in fact with our own thoughts or with the research itself. We tend to elevate our limited observations and our plausible opinions to the level of sure facts and infallible conclusions, when we may be on the wrong path. It is therefore necessary to identify the method of reasoning that will be used, and the limitations of that method of approach or reasoning. There are two types of approach or reasoning to research – the inductive and deductive approach – and these are discussed in the following sections.

4.7.1 Inductive methods

Joyce and Weil (2000) defined an inductive approach as one that proceeds from a specific case, or from cases, to the general. It gathers together particular observations in the form of premises then it reasons from these particular premises to a general conclusion. The most common form of inductive reasoning is when evidence of some observed phenomenon is collected, and then a general conclusion is drawn based on the collected evidence (Joyce and Weil, 2000). Inductive reasoning is very useful and it is commonly employed. However, there is a need to understand its limitations. Most inductive reasoning is not based upon exhaustive evidence, and therefore the form is incomplete (Saunders *et al*., 2009). Unless the evidence or observations are exhaustive, the conclusion is only a guess. The only real conclusion that can be drawn is that the evidence is actually representative of the conclusion.

4.7.2 Deductive methods

A deductive approach is designed to explain occurrences using existing theories (Saunders *et al*., 2007). Furthermore, the deductive approach allows the researcher to develop theory and test out the theories through empirical observation (Crowther and Lancaster, 2012). It is essentially the development of theory that is subjected to a rigorous test (Saunders *et al*., 2003). The content of the conclusion in a valid deductive argument must also be contained in the principles. Therefore all valid deductive reasoning is by its nature actually circular reasoning. That does not mean that the conclusion is worthless (Saunders *et al*., 2007). The conclusion is entirely contained in the principles, but the conclusion restates those principles in a way that leads us to understand the consequences more fully (Saunders *et al*., 2007; Bluedorn, 1995).

The aim of this research was to identify the barriers affecting the application of SPM, proffering frameworks for addressing barriers and improving the effectiveness of project implementation in PROs in Nigeria. Hence the researcher gathered data from the selected organisations with reference to existing theories on the concept of SPM. This involved an empirical investigation of a particular contemporary phenomenon within its real-life context, utilising several sources of evidence (Saunders *et al*., 2003). Moreover, this research approach was chosen to generate answers to the questions: “How?” “Why?” and “What?” For this study, the following questions needed to be answered:

- To what extent do the projects carried out by PROs focus on their strategic and business aspects during project execution?
- Does the SPM approach enhance the chances of project success?
- What are the project management tools and techniques adopted by PROs in Nigeria?
- What are the factors that hinder the application of SPM by PROs?
- Is there an existing standard SPM framework that could be adopted for the effective implementation of project management in PROs?

4.7.3 Adopted research design

In consideration of both the quantitative and qualitative philosophical perspectives, as described in the previous sections, and notwithstanding that case study research designs are criticised regarding their inability to generalise, this research design adopted a case study design and chose a multiple-case study version of this approach due to the highly exploratory and contextual nature of the research and the need to conduct in-depth investigations of the complex relationships among interdependent variables (Yin, 2009). Other deciding factors were the number of selected cases to study in PROs in Nigeria (Eisenhardt, 1989) and the large amount of quantitative and qualitative data required (Blismas, 2001). Eisenhardt (1989) argued that with fewer than four cases it is often difficult to generate theories with much complexity. However, the researcher considered that the case study approach enabled a holistic approach to be used in the pursuit of determining the variables necessary to develop an integrated framework, which in turn will enable project management practitioners in PROs to better manage R and D projects in Nigeria.

Moreover, Yin (2009, p.14) defined the case study method as an empirical inquiry that "investigates a contemporary phenomenon in-depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident"; where the case study inquiry "relies on multiple sources of evidence, with data needing to converge in a triangulating fashion". For example, the goal of the case study method is not to produce summary statistics about a set of observations but rather to explore and describe in-depth the meaning of a certain phenomenon in its environment (Eisenhardt, 1989). For this research, the case study was used to explore and describe in-depth how R and D projects were carried out in PROs in Nigeria. This was particularly important as the nature of R and D projects was different to other types of projects like construction, IT and engineering projects, and thus each project had distinct characteristics based on the type of research and the environment.

Consequently, it was considered appropriate to use a case study approach in determining the application of SPM by PROs. Furthermore, rather than adopting a purely one-dimensional approach to the research design, a pluralistic research design, advocating the use of multiple research methods within a single study, was adopted so as to benefit from the complementary strengths of the different research methods. The established research methods in both the quantitative and qualitative research strategies can provide healthy contributions at various points in the research process, depending upon the existing body of knowledge in the specific area studied, the objectives and perspectives of the research, and the quality of available data (Wing *et al*., 1998).

The research objectives, and the adoption of a mixed method approach, led to the adoption of more than one research method during the course of this research, as described in the following sections. Table 4.6 illustrates the link between the research objectives, the selected case study questions and the research methods used. For each set of research objectives, a primary research method was adopted to address the research objectives while other research methods, for instance either the quantitative or qualitative research strategies (survey research (SR) and case study (CS) data), were chosen to provide supporting information, which enabled the triangulation of results. The adoption of a mixed-methods of quantitative and qualitative approach eliminated the potential disadvantage of adopting a purely one-dimensional research approach, whilst gaining the advantages of each and of the combination – a multi-dimensional view of the subject, gained through synergy (Fellows and Liu, 2008).

Table 4. 6: Link between research objectives and the methods used

		Research methods		
Research objectives	**Selected case study questions**	LR	Quantitative (SR)	Qualitative (CS)
Objective one: - Establish the relationship that exists between theory and practice in relation to SPM	To what extent do the projects carried out by PROs focus on their strategic and business aspects during project execution?	PM	SM	SM
Objective two: - Appraise the key determinants associated with the SPM process and their importance in the effective implementation of projects in PROs	What are the project management tools and techniques adopted by PROs in Nigeria?	PM	SM	SM
Objective three: - Identify the key variables that inhibit SPM application in PROs	What are the factors that hinder the application of SPM in PROs	SM	PM	PM
Objective four: - Measure the impact of SPM initiatives in improving and enhancing project success in PROs	Does SPM approach enhance the chances of project success?	SM	PM	PM
Objective five: - To develop an SPM framework that will enhance the execution of R and D project in PROs in Nigeria	Is there a standard SPM framework that could be adopted for effective implementation of SPM in PROs?	SM	PM	PM

Key

LR – Literature review
SR – Survey research
CS – Case study
PM – Primary method
SM – Supporting method

4.7.4 The selected methods for the study

The primary aim of this study is to identify the barriers affecting the application of SPM in PROs in Nigeria and to proffer a framework that would address the identified barriers. Interpreting these findings in the context of academic literature on SPM, there is a small number of studies on SPM. However, in terms of SPM application in PROs, there is little or no literature to indicate previous research in this area. The study did not set out to test pre-existing theories such as hypotheses or experiments, but rather relied on the quantitative and qualitative data that yielded rich and comprehensive information on the application of SPM. The study also sought to identify the factors that affected the application of SPM. However, the emphasis in this study was not simply to identify the factors affecting SPM, but also to proffer a framework that would enhance the application of SPM by PROs in Nigeria.

For the purpose of carrying out this research, the research philosophy selected was the pragmatic worldview (Figure 4.2), which arises from actions, situations and consequences of situations, rather than antecedents of conditions (Creswell, 2014). This pragmatic and realistic paradigm was the philosophical stance underpinning the mixed-methods research, which is committed not just to one method of enquiry but rather draws information from both quantitative and qualitative assumptions when carrying out a research work (Creswell, 2014). Saunders *et al*. (2007) argued that the research philosophy that the researcher adopts contains important assumptions about the way in which the researcher views the world and that these assumptions will underpin the research strategy and the methods adopted. Considering the research problems outlined in Chapter One, the best fit for this study was the realist paradigm, and as such this was adopted.

The decision for the research design to be adopted was based on the nature of the problem or issue being addressed by the researcher, their experiences, and the area of study. The choice of research design, which connects the research methodology and the methods, was also guided by the worldview assumptions of the researcher in carrying out the study. Thus, the philosophical stance for this research is the realist epistemological stance. The research was therefore carried out using the case study design as shown in Figure 4.2. This was to help the researcher obtain in-depth information of the area being studied (Yin, 2009; Creswell, 2014). The procedures of inquiry, otherwise known as strategies, selected for this research were deductive and specific methods for data collection with mixed quantitative and qualitative methods, analysis and interpretation. This study therefore was deductive, as a framework will be an outcome of the research (Bryman and Bell, 2007; Fellows and Liu, 2008; Creswell, 2009; Saunders *et al*., 2009; Gill and Johnson, 2010; Bryman, 2012).

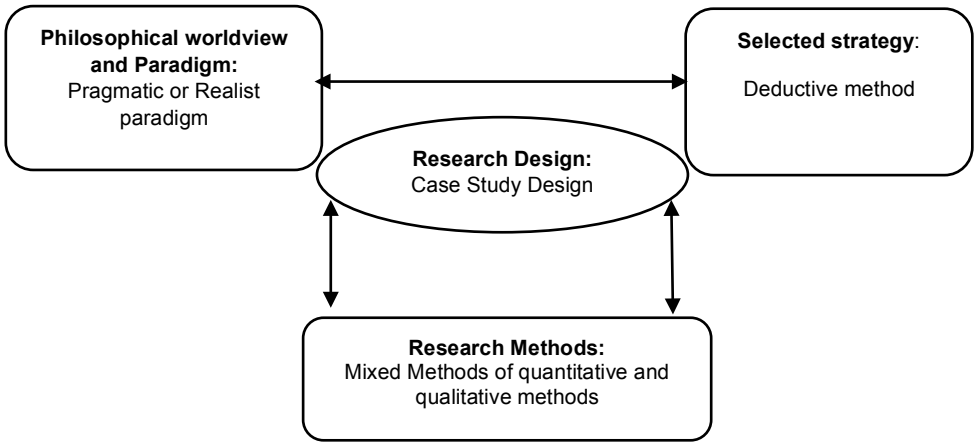

Figure 4.2: Research Design Framework

4.8 RESEARCH PROCESS

This section discusses the steps that were applied in handling the broad issues of the mixed method of quantitative and qualitative methods using a case study approach. The first phase of this research work examined the quantitative research method applied, the questionnaire design and structure, sample, profile of participants and data analysis. Phase two examined the qualitative research methods applied, interview, selection and sampling, and the data analysis.

4.8.1 Phase one - Quantitative research method

The first phase of this research work was based on the research questions formulated in Chapter One and the research strategies identified to address the research questions. For the survey research strategy, the semi-structured questionnaire, as stated earlier, was used to analyse the application of SPM by PROs in Nigeria. The design and structure of the questionnaire used in carrying out the study are discussed in the following sections.

4.8.1.1 Questionnaire design and structure

The semi-structured questionnaire was designed with regard to the type of research organisations to be investigated. Therefore, it was appropriate to refer back to the subject matter of the research as stated in Chapter One. The specific areas of investigation were grouped into three sections. The first section was general information about the organisation and the participants. The second section was the application of project management practices in PROs, which involves the project planning phase, the execution phase, and project closure. The third section was the factors that can affect the implementation of SPM.

The questionnaire was divided into three different sections (***see Appendix C***), and the first part identified the research sector of the respondents, their current job title, how long the respondents had worked and managed projects. This was to identify the level of experience in the execution of R and D projects and how it contributes to the effective application of project management practices in the execution of R and D projects. The second section identified whether the organisations were involved in the application of project management practices and their ability to strategically execute projects effectively. To achieve this, respondents were asked to state if the SPM processes following the project life cycle were applied in the execution of R and D projects, and if yes, to rate the level of implementation in the organisation.

The third section enabled the researcher to identify on a scale of importance those factors associated with the application of SPM that can enhance or affect the execution of R and D projects. Considering the aim of this research, which was to investigate the research questions in the statement of the problem, efforts were made to make the questions clear, brief, simple, and meaningful, in order to avoid ambiguity. The areas included in the questionnaire (***Appendix C***) were developed by considering the data required in relation to the subject areas of the research. The specific content of the questionnaire was designed to explore the application of SPM in the execution of R and D projects.

R and D projects are unique due to their long-term outcomes and the ultimate benefits that form the basis for future projects (Technology One, 2011), thus careful consideration of the areas for inclusion in the questionnaire contributed to the collection of valid data. The self-administered questionnaire was designed with regard to the six key areas of questionnaire design, identified by Moser and Kalton (1971), Dillman (1991), Gill and Johnson (1991) and Oppenheim (1992). These key areas are:

- Questionnaire focus;
- Questionnaire phraseology;
- Form of response;
- Question sequence;
- Overall presentation; and
- Introduction to respondents.

The questionnaire included a covering letter and a semi-structured questionnaire as shown in Appendices B and C. In order to validate the questionnaire, a pilot study was carried out. This was first given for review to the Director of studies, two project managers, and a Director in one of the selected PROs with a good knowledge of project management practices, so as to make sure that there were no ambiguities in the construction of the questionnaire. It was also submitted to the LJMU ethical committee and was approved. According to Oppenheim (2003), the reliability and validity of any data collected through surveys will depend in part on the rigour of the pilot testing of the questionnaire. A lack of reliability could occur if the response from a respondent was influenced by extraneous factors, such as the working environment or work load, and these were potential subject errors for this research. Thus, care was taken to avoid factors that could influence respondent responses. Furthermore, completing the questionnaire required time on the part of the participants, and if the participants felt completing the questionnaire was an unreasonable use of valuable time this may also have a negative effect on both the completeness and accuracy of the information

provided. In order to avoid this, the researcher made the questions clear and simple, and thus developed a focused semi-structured questionnaire. This was achieved after thorough reviews from the research supervisor and the project managers.

4.8.1.2 Self-administered questionnaire

This researcher employed a self-administered questionnaire in carrying out this work. Before the distribution of the questionnaire, the Director General of the organisations granted approval. This enabled officers to freely complete the questionnaire. The questionnaires was then distributed to the respondents who were asked to return the completed form in a box provided in general office of the secretary to the Director General. According to Bryman and Bell (2011), the use of a self-administered questionnaire is more inclusive than a postal questionnaire, even though researchers tend to use postal questionnaires more. The advantages are that in the self-administered questionnaire, there is a large social distance between the researcher and the person being interviewed that fosters the respondent's honesty, thus reducing the number of ''socially desirable'' answers (Holbrook *et al*., 2003). Self-administered questionnaires are cheap and quicker to administer, convenient for the respondents, and the absence of an interviewer helps the respondents to answer the questions without any influence and also means that there is no variability of information due to the interviewer (Bryman and Bell, 2011; Bryman, 2012).

The greater social distance characteristic of self-administered questionnaires varies depending on the medium used, for instance the questionnaire may be on paper or via an electronic medium. Self-administered questionnaires involve including a personalised letter of introduction, an envelope and the questionnaire, which could be regarded as bringing the relationship between the researcher and the respondent closer so as to enhance the response rate. According to Rada and Domınguez-Alvarez (2013), web surveys imply a greater social distance in that the respondent does not receive any ''physical object'' (personalised letter, etc.). This greater social distance reduces social desirability and could

encourage a more sincere response (Green *et al*., 2001; Johnson, Fendrich and Mackesy-Amiti, 2012; Kreuter *et al*., 2008), however, at the same time it reduces the link between the respondent and the researcher.

This link is reduced due to the extrinsic characteristics of the internet, such as multitasking (caused by having too many windows open) and the high speed of data processing (Rada and Domınguez-Alvarez, 2013). The greater social distance and the effects of the channel (the internet) lead to the hypothesis that less effort is employed by those interviewed via the internet to respond to a questionnaire, which would translate into a greater choice of first-option responses and a greater choice of affirmative answers (Rada and Domınguez-Alvarez, 2013).

Although they are known to be cheap and quicker to administer, this type of questionnaire is known to experience delays in return due to the absence of the researcher to explain any question that is not clear. Other disadvantages of using self-administered questionnaires are that they cannot be probed, there is a lower response rate, a high risk of missing data, not many questions can be asked, and the respondents are not known as such additional data cannot be collected where necessary (Bryman and Bell, 2011; Bryman, 2012). For this research work, the questionnaire was administered to four PROs (A, B, C, and D) in Nigeria, and in order to reduce the difficulties experienced in self-administered questionnaires, the researcher wrote a covering letter to explain the reasons for the research, the importance of the research, why the organisation was selected, the fact that completing the questionnaire was optional and also the guarantee of the respondents' confidentiality.

4.8.1.3 Sampling

The need for sampling is always encountered in quantitative research, and samples are selected based not on their representativeness but on their appropriateness to the purpose of the investigation (Bryman, 2012). As such, the knowledge gained can only be an estimate

of the characteristics of the whole population. The level of accuracy would also depend on the size of the sample, how it was selected, and the extent of variability within the population. The quantitative researcher uses statistical tools designed to provide a representative sample of a known population, although statistical sampling is subject to experimental error. However, according to Bryman (2012) surveys are concerned with the decision of what kind of population is suited to the investigation of the topic, and also providing all the data necessary for answering the research questions.

Bryman (2012) identified two major types of sampling: probability sampling and non-probability sampling. Probability sampling technique allow the researcher to employ tests of statistical significance that permit inferences to be made about the sample from which the sample was selected, which are divided into four types: “simple random sample; systematic sample; stratified random sample and multi-stage cluster sample” (Bryman, 2012, p. 190). Deciding which sample technique to use depends on ensuring that those who are participating in the research are representative of the subset of the research population, so the findings can be generalised to be a representative of the target population with confidence. Simple random sampling is the most basic form of probability sample (Bryman, 2012). With this technique, each unit of the population has an equal probability of inclusion in the sample, as employed in carrying out this research.

However, the researcher used stratified random sampling to categorise respondents who were to respond to the questionnaire in a stratified manner. The first phase of this method involved deciding on the research organisations, the category of respondents, and the selection of the list of participants from the research population, from which a random sample was drawn. However, the researcher was conscious of the fact that problems of discrepancy may arise between the research population and the sampling frame, bearing in mind that this is the key source of error, where the result of the entire target population could not be correctly represented. Oppenheim (2003) suggested that when a sampling technique is in

place and the population is accessible, a simple random sampling technique is employed. This will involve the completely random selection of population members so that each member has an equal chance of being selected for the sample. In this study, the focus was on obtaining information from participants involved in executing R and D projects in the selected research organisations.

4.8.1.4 Participants sample

In order to determine the appropriate sampling strategy and sampling size, it was necessary for the researcher to understand the terms “population” and “sample”. According to Easterby-Smith *et al*. (2012), population is defined as the whole set of entities that decisions relate to, and sample as “a subset of those entities from which evidence is gathered”. Bryman (2012) describes population as “basically, the universe of units from which the sample is to be selected” and sample is known as the segment which has been selected for investigation (Creswell, 2009; Saunders *et al*., 2009; Bryman, 2012; Easterby-Smith *et al*., 2012). In some cases, it could be possible to collect data from each single respondent, but this is not the situation in other cases (Easterby-Smith *et al*., 2012) because populations tend to be too large to be covered by one research project (Fellows and Liu, 2008).

However, with the population known, the samples were selected which enabled the researcher to draw generalisations regarding the identified sample. The participants were clearly defined to ensure that accurate, unambiguous, and reliable conclusions were obtained (Oppenheim, 2003). The ability to define the participants was crucial so that the research findings could be legitimately applied to the population studied. Information on the class of participants was easy to retrieve, as the project management practitioners in each organisation selected were involved in executing projects. This led to the researcher adopting simple and stratified random sampling so that each individual had an equal probability of being selected from the population. The list of the class of participants selected across the four selected organisations is presented in Table 4.7. These were mainly project

directors, deputy project directors, chief scientific officers otherwise known as project managers, assistant chief scientific officers, project planers and project engineers.

Table 4.7: Classes of participants

S/N	Organisations	Projects Managed	Participants
1	Organisation A	R and D	Project directors, deputy project directors, chief scientific officers otherwise known as project managers, assistant chief scientific officers
2	Organisation B	R and D	Project directors, deputy project directors, chief scientific officers otherwise known as project managers, assistant chief scientific officers, project engineers
3	Organisation C	R and D	Project directors, deputy project directors, chief scientific officers otherwise known as project managers, assistant chief scientific officers, project engineers, project planners
4	Organisation D	R and D	Project directors, deputy project directors, chief scientific officers otherwise known as project managers, assistant chief scientific officers

For this research work, the total number of staff in each organisation was considered before deciding on the number of questionnaires to be distributed. According to Creswell (2014), in survey research, researchers often choose a sample size based on the fraction of the population that is being studied. However, Fowler (2009) was of the opinion that this approach could be misguided and recommended that the sample size be determined based on the analysis plan of the study to avoid the margin of error. Fowler (2009) further suggested that determining a margin error of +/- 4% would show how accurately the answers to be retrieved would represent the entire population, provide a confidence level for the margin of error and estimate the percentage of the sample that would respond either positively or negatively, so as to determine the sample size needed for each group. In determining the sample size for this research work using Fowler's (2009) suggestion, each of the research organisations was found to have between 300 and 500 employed staff. The researcher decided to choose a total number of 300 samples for the selected research organisations.

4.8.1.5 Administration

After the design and the selection of the sample size to be used in determining the application of SPM in the PROs, the next step was administration of the questionnaires. This was the process used for the collection of the data for the research. This involved obtaining written approval from the Director General or the Chief Executive of each organisation. After approval was granted, the questionnaires were given to the organisation's secretary for distribution, then the participants could fill in the questionnaires in their own time and return them to a box provided in the office.

First, the potential categories of respondents were identified. This was to enhance the distribution of the questionnaires to the appropriate respondents. The questionnaire included a covering letter introducing the research area, stating why the organisation was selected, the importance of the survey, and then inviting the participant to take part in this study. Each potential respondent received an individual covering letter. This gave the survey a personal touch and also aided respondents that may not have understood the area of research to complete the questionnaire correctly. As stated earlier, a total of 300 questionnaires were distributed for this survey, and the distribution of the project staff and the staff strengths in the organisations were considered in terms of the number of questionnaires distributed.

However, only 213 questionnaires were retrieved and used for this research work. According to Bryman (2012), it is always difficult to retrieve 100 per cent of the questionnaires in survey research. The difficulty in retrieving all of the 300 questionnaires sent out was due to the general lack of interest of some people in completing the questionnaire and a lack of understanding of the subject area, and as such the participants could not complete the questionnaire and it was returned blank. In all, the questionnaire had a return rate of 71 per cent and a valid response rate of above 50 per cent. According to Easterby-Smith *et al.* (2002), a valid and good response rate for an industry research is in the range of

approximately 25 to 30 per cent. The response rate for this research was above 50 per cent and as such would be regarded as a good result.

4.8.1.6 Quantitative data analysis

Quantitative methods of data analysis have been found to be of great value in drawing meaningful results from large data sets, and also in allowing the reporting of summary results in numerical terms given with a specified degree of confidence (Bryman, 2012). The availability of computer software programmes such as the Statistical Package for Social Sciences (SPSS), which can be used to analyse data, has helped researchers in quantitative statistical analysis using manual calculation. SPSS is an important tool for any statistical analysis, and the http://www.tutorsindia.com/SPSS-SAS-help.htm website is growing because it is easy to use and also flexible for performing statistical tests. According to Bryman and Bell (2011), the use of SPSS helps researchers to analyse large data sets faster, thus eliminating the drudgery that may arise from long manual computation.

During the phase of analysing the retrieved data, various versions of SPSS for Windows (from 17 to 21) were reviewed, and SPSS for Windows 21 was chosen for use in this study. The most important reason for using SPSS is that it enables the researcher to analyse data very quickly and in many different ways (Bryman and Cromer, 2011). This means that it helps researchers to eliminate the long hours, which would have been spent in working out scores and carrying out tedious calculations, and also the inevitable mistakes that frequently occur during the analysis phase. Secondly, it also provided the researcher with the opportunity to carry out more complicated and more appropriate statistical techniques, which would not otherwise have been attempted. Although Bryman and Cromer (2011) failed to highlight that the researcher needs to learn how to use these programs, it is important for researchers to learn how to use the software. This is because the time spent in carrying out the analysis will be much less than if the same calculations were done by hand.

The first step before analysis was the quantification of the data so that it could be fed into the SPSS software. According to Bryman (2012), quantitative data are of two groups, indicators and measures. Measures are data or things that can unambiguously be counted (Saunders et al., 2009; Bryman, 2012). Thus, measures are those data that can be typed into SPSS as they are. By contrast, indicators are those types of data that cannot be measured numerically and as such must be categorised (Bryman, 2012). The designed questionnaire (***see Appendix C***) gathered the data and for the data to be analysed using statistical software it was necessary for it to be coded. The researcher therefore pre-coded the whole questionnaire by assigning numerical values to each answer option, with the best answer having the highest number and the worst having the lowest number. For sections two and three the Likert Scale was used, with coding from 1-5. Where, 1= unsatisfactory, 2= below average, 3= average, 4= above average and 5= excellent. The unanswered questions were coded as 99.

After coding the data, the next involved the identification of the variables. A variable, according to Saunders *et al*. (2009), is defined as an individual element or an attribute upon which data has been collected. This means that variables are data that can be measured and also controlled. The identification of the variables enabled the researcher to attach individual labels to each variable and the codes associated with each of them (Saunders *et al*., 2012). This research aimed to identify the barriers affecting the application of SPM, proffer frameworks for addressing those barriers, and improve the effectiveness of project implementation in PROs in Nigeria. In order to address these aims, SPSS version 21 was used to identify characteristics of the respondents, the implementation levels of SPM and the significant results.

A basic demographic analysis and exploratory analysis were carried out. The demographic analysis was to inform the reader regarding the subjects upon whom the results were based, and to do this a simple percentage using the frequency command was carried out.

Descriptive statistics were also carried out to measure the mean, median, reliability and variability of measurements. The exploratory analysis was carried out to measure the level of involvement of the organisations in the application of SPM so as to identify the gap and also the factors affecting the execution of R and D projects. The correlation technique was used for the exploratory analysis, and the decision to use correlation was made by considering the research aim and objectives, the type of scale and items included in the questionnaire, the nature of the data for each variable and the assumptions that must be met for each of the different statistical techniques.

For this study, the mean was calculated in a sequence, which was categorised as: unsatisfactory, below average, average, above average and excellent. Correlation analysis was employed to determine the effect of the variables on R and D project success. Bryman and Cramer (2011) identified that there are different types of correlation analysis techniques for carrying out research, such as Pearson's correlation coefficient, Spearman's correlation coefficient, partial correlation, linear regression and factor analysis. For this research work, Spearman's correlation coefficient was used to explore the relationship between the selected variables in the questionnaire in terms of the strength and direction of the relationship. This was to enable the researcher to identify if statistical relationships existed amongst the factors associated with SPM.

4.8.2 Phase two: Qualitative research

The second phase of this research reports on the methods used in the qualitative research. The aim was to validate the quantitative findings. There are different qualitative research data collection methods, and these are interview (semi-structured and structured), participant observation, focus group and analysis of documents and materials. However, the semi-structured interview was employed in validating the quantitative findings.

4.8.2.1 Semi-structured interviews

An interview is regarded as a managed verbal exchange (Ritchie and Lewis, 2003), which depends on how the interviewer manages the communication (Clough and Nutbrown, 2007). An interview can also be defined as a purposeful discussion between two or more people (Sunders *et al*., 2009). Three different types of interview can be used in qualitative research. These are the structured interview, the semi-structured interview and the unstructured interview (Bryman and Bell, 2007; Bryman, 2012; Sunders *et al*., 2009). The structured interview uses closed questions, while the unstructured interview uses no predefined questions and no detailed interview guideline (Bryman and Bell, 2007; Saunders *et al*., 2009; Bryman, 2012). For the unstructured interview, the interviewee is actually in control of the interview and not the interviewer.

Semi-structured interviews are more formal than unstructured interviews, but are also less structured than structured interviews (Saunders *et al*., 2009). In this case, the questions are predefined and prepared by the interviewer before the interview. The questions are also more general in their nature and the mode of the interview differs from one person to another and new questions may arise based on the discussion (Bryman, 2012). For this research work, the semi-structured interview was adopted and all interviews were conducted face-to-face. This was to enable the researcher to obtain robust information, and this was necessary due to the importance of the research area, which is primarily focused on gaining insight and understanding (Gillham, 2000; Ritchie and Lewis, 2003).

It could also be argued that the researcher who chooses to use face-to-face interviews recognises the potential significance of context. However, from a critical realist position, it is possible to recognise the collaborative qualities of research data while maintaining belief in its validity in revealing knowledge beyond itself of the social world within which the interview has occurred (Banfield, 2004). The semi-structured interview was therefore consistent with participatory and emancipatory models (Newton, 2010). This also enabled the

researcher to have more control over who took part during the interview (Bryman, 2012), which resulted in quality assurance. In this study, the process used in gathering and analysing the interview data had several components, which are discussed in the following sections.

4.8.2.2 Steps taken in carrying out the qualitative research

This research work was motivated by the high rate of project failure in PROs in Nigeria. The research questions looked at project management practices, tools, the factors affecting the application of SPM, and how the effective implementation of SPM could improve the rate of project success in PROs.

4.8.2.3 Interviewee selection

Denzin and Lincoln (1998) noted that interviewee variety is essential to the profundity and richness of data obtained in qualitative research. A variety of project officers were selected for interview across the board. This was so as to explore the expert views of experienced project officers at the management level and also the views of non-experienced lower level officers, who are often the ones who carry out the physical work. Thus, the researcher was able to retrieve in-depth data based on the experiences of each participant. All participants were staff from the selected research organisations in Nigeria who were considered to have good knowledge of managing research projects. The background information of the case studies used in this research is highlighted in the next section, and for the purposes of confidentiality the names of the four research organisations have been changed and they have instead been designated with the letters (A) to (D).

Organisation A

This is an agency of the Federal Ministry of Science and Technology. The organisation was the idea of an economic mission sent to Nigeria in 1953 by the World Bank. The mission's

observation was that industrial research activities in Nigeria were diffuse and uncoordinated with no definite direction. Consequently, a decision was reached to set up the organisation in 1956. The agency was set up to carry out R and D on food and agro–allied processing technologies, pulp and paper processing, packaging, product design and also design and fabrication of equipment prototypes.

The organisation's mandates are:

- To engage in R and D up to pilot plant stage.
- To conserve Nigeria's foreign exchange earnings by reducing dependence on foreign goods, through the development of local substitutes from locally available raw materials.
- To improve the nutritional quality of Nigerian foods, and their suitability for industrial processing.
- To improve the indigenous, traditional techniques of food production which are labour-intensive, time consuming and energy sapping.

Organisation B

Organisation B is a parastatal under the FMST. It was established to nurture an appropriate and dynamic science and engineering infrastructure base for achieving home initiated and sustained industrialisation through the development of relevant processes, capital goods and equipment necessary for job creation, national economic well-being and progress. Their mandate is specifically in the area of capital goods research, production, and reverse engineering, with respect to the following six broad areas:

- Engineering materials (notably irons, steels, non-ferrous metal and alloys, plastics, glass, ceramics, polymer electronics and nanotechnology); industrial and analytic chemical materials including industrial gases;

- Scientific equipment and components for education, research and industry; including measuring instruments, electronic components, communication equipment and computers;
- Engineering accessories (mechanical, hydraulic, pneumatic, electrical and electronic);
- Power equipment (generation, transmission, distribution, prime movers); and
- Mechanical Engineering tools (power tools, hand tools, cutting tools and machine tools).

Organisation B operates mainly through its development institutes. Each of the institutes has a unique mandate for engineering infrastructural development.

Organisation C

The background of this organisation was the situation prevailing in the industrial sector of the Nigerian economy in the 1980s. The over-reliance on the importation and supply of raw materials and spare parts became a source of concern for the industrial sector, necessitating a clarion call by the private sector for government intervention. It is a technical and project-based organisation with the following mandates:

- To draw up policy guidelines and action plans on raw material acquisition, exploitation and development;
- To periodically review raw material resource availability and utilisation with a view to advising the Federal Government on the strategic implication of depletion, conservation or stock-piling of such resources;
- To advise on the adaptation of machinery and processes for raw materials utilisation;
- To encourage publicity of research findings and other information relevant to local sourcing of industries.

Organisation D

Organisation D is a parastatal under the FMST and was established as a multi-disciplinary R and D Centre. The complex was established with the purpose of enabling institutions and individuals to undertake a wide range of R and D activities in a comprehensive and organised manner. The multidisciplinary nature of its activities creates a more conducive scientific environment, enhances collaboration and provides a multi-dimensional approach to the solution of developmental problems. The complex was created with the vision to "provide opportunities for utilising high technology to contribute to enhancing the standard of living of the Nigerian citizenry as well as guarantee a wholesome environment".

4.8.2.4 Sample and profile of interviewees

The advantage of a semi-structured interview is that the researcher can decide who should be involved in the research project and who should not (Bryman, 2012). There is also the need to determine the number of people to be interviewed. Qualitative semi-structured interviews have been identified for their inability to make statistical generalisations (Denzin and Lincoln, 2005; Bryman and Bell, 2007; Saunders *et al*., 2009; Bryman, 2012), and this is because it is difficult to find a small representative number of cases, which could be added to a whole sample in order to reflect a population. However, Bryman (2012) suggests that the minimum number of interviews should be between 20 and 30 if the research is to be published. This number is also important because the data provides insights into the different management methods from different perspectives and world views, but at the same time is not so large that it limits undertaking a deep and detailed interview analysis. Hence, twenty interviews were conducted in the four different PROs in Nigeria. The profiles of the interviewees, their years of experience and the date of the interview have been highlighted in Table 4.8.

Table 4.8: Profile of interviewees and date of interview

Name	Organisation	Position	Experience
Project officer 1	A	Deputy director	20 years
Project officer 2	A	Chief scientific officer	10 years
Project officer 3	A	Chief scientific officer	10 years
Project officer 4	A	Principal research officer	9 years
Project officer 5	A	Principal research officer	6 years
Project officer 6	B	Chief scientific officer	16 years
Project officer 7	B	Assistant chief scientific officer	5 years
Project officer 8	B	Principal scientific officer	8 years
Project officer 9	B	Principal scientific officer	4 years
Project officer 10	B	Scientific officer 1	2 years
Project officer 11	C	Deputy director	20 years
Project officer 12	C	Deputy director	22 years
Project officer 13	C	Chief scientific officer	12 years
Project officer 14	C	Assistant director	12 years
Project officer 15	C	Principal scientific officer	13 years
Project officer 16	D	Research fellow 1	7 years
Project officer 17	D	Senior research fellow	4 years
Project officer 18	D	Research fellow	4 years
Project officer 19	D	Assistant research fellow	4 years
Project officer 20	D	Assistant research fellow	4 years

Table 4.8 shows that a wide range of people from different hierarchical positions, and from different organisations, have been interviewed. This helped the researcher to gain a broad and deep picture of SPM implementation from different perspectives. The interviews with organisation A were carried out in Lagos, Nigeria, and interviews with organisations B and C were conducted in the Federal Capital Territory. Interviews with organisation D were conducted in Abaji, Kwali Area Council, on the outskirts of Abuja, Nigeria.

4.8.2.5 Data analysis

Creswell (2009) stated that data analysis is a process involved in collecting open-ended data, based on asking general questions and developing an analysis from the information supplied by the participants. Naoum (2007) also argued that the best way for analysing interview data is to code the information, because coding reduces the large amount of individual data to a few more general categories. In carrying out this research work, the interview analysis was carried out using Computer Assisted Qualitative Data Analysis Software (CAQDAS) known as NVivo. The use of CAQDAS helped the researcher with the physical task of making codes and copying them (Creswell, 2009; Bryman, 2012). NVivo was

used in carrying out the qualitative analysis, which enabled the researcher to review the data objectively, rather than analysing the data in a subjective manner.

4.9 VALIDATION, VERIFICATION AND RELIABILITY

In a research context, verification can be defined as the provision of a description of others' understandings and perceptions of the goodness of data. There are four established tests of research quality (Creswell, 2009). These are, construct validity: the application of an appropriate research approach; internal validity: the demonstration of cause and effect relationships; external validity: establishing the type of and extent to which the research findings are capable of generalisation beyond the realm of the study itself; and lastly, reliability: recording the methods and systems used in the research process to enable it to be respected. The validity and reliability of qualitative and quantitative findings involve assessing their plausibility and credibility along with that of any evidence provided in support of them; secondly, they involve assessing how convincing the relationship is between the variables and categories. Validity and reliability were achieved by first assessing the knowledge already existing on SPM in PROs and other public organisations. However, the verification was carried out after the data was analysed and interpreted. This involved the organisation of a seminar to present the findings to project officers for an objective critique of the study. It also involved the preparation of publishable briefs on aspects of the study and the publication of the research results in journals in order to fill knowledge gaps and disseminate the results to the academic and research communities. In this research, rigour was achieved by focusing on verification and validation; these included the responsiveness of the researcher during the survey, methodological coherence, sampling, and data analysis.

4.10 ETHICAL CONSIDERATIONS

Research efforts generally carried out in the social sciences involve obtaining reactions of individuals. Gill and Johnson (1997) defined ethics as the moral principles which determine

the rules and expectations of correct conduct in a given setting. In this study, consideration to ethics was observed in guiding the research to ensure that the best responses were extracted from respondents. The researcher obtained ethical consideration approval from the LJMU ethics committee before embarking on the research. This was to ensure that the ethical rules were not violated in carrying out the research work. Consideration to the emotions of staff members and related issues were noted. In this research work, the interviews were conducted in the participants' offices. It was necessary for the researcher to book appointments with the heads of department, bearing in mind the possibility of situations involving cancellations at short notice due to official assignments or the non-availability of the participants involved in the study. These difficulties were taken into consideration to reduce their effect on the data collected by allowing as much flexibility as possible. However, everyday life can never be pre-planned as such, and the researcher responded to all sorts of factors and considerations that arose from situations that were unforeseen.

The participants had the right to personal privacy, and this was adhered to by refraining from delving into issues, which would encroach on the privacy of the participant or the organisation. It was the researcher's responsibility to take into consideration the participants' need for privacy throughout the interview process. The right to privacy also included the right to confidentiality and anonymity. Bryman (2004) referred to confidentiality as the way in which data is handled. Anonymity in research means that collected data should not be associated with an individual or the individual's organisation in any way; as such it is safeguarded with coded names. In this research, therefore, the researcher was careful to protect the rights of the participants to privacy, confidentiality, and anonymity. Participants were not asked questions that infringed on their rights of privacy, confidentiality, and anonymity. The research involved participants explaining the processes of executing projects in their organisation and the application of SPM. The researcher assured the participants of confidentiality in cases where they felt that fellow staff was hindering the application of SPM.

They were advised not to mention names during the interviews, and for the semi-structured questionnaires they were asked not to add their names to ensure anonymity.

4.11 RESEARCH LIMITATIONS

Research efforts generally have limitations. This research experienced general limitations associated with most research, and also unique limitations, which apply to PROs. The general limitations associated with the research methodology had key characteristics. Qualitative research has been accused of having too much subjectivity because the researcher completes the processes of data collection and data interpretation (Richards, 2005). Qualitative research usually involves a relatively small sample of participants. This may be seen as a limitation in the world of quantitative inquiry, but it is a key part in the process of qualitative study. The essence of qualitative research is to develop an understanding of participants in their natural setting (Denzin and Lincoln, 2003). This in-depth data is most likely achieved through a small sample.

In this study, the participants were mostly project management practitioners involved in the day-to-day execution of R and D projects. This could be a limitation as other support staff may have useful information that might have been of use to the study. Another source of possible limitation is the data itself. Bryman (2004) discussed the complicated issue of “truth” in qualitative research. This served as a reminder for the researcher to observe areas where exaggerations and distortions from participants occurred. During the interviews, the researcher observed that some participants were resistant to some questions as they felt that the organisation was being portrayed in a negative way, and as such could not give enough information on the research area. Denzin and Lincoln (1998) stated that self-reporting depends on the co-operation of the participants. This relies on the participants’ honesty and requires them to understand when their feelings and thoughts are interfering. Richards (2005) also commented that it is necessary for the researcher to keep in mind that participants are always reporting selective perceptions.

Research sampling is an extremely difficult area. In this study, the sampling limitations were considered when the research findings were being interpreted. According to Bryman (2012), in order to address the sampling issue there was the need to select a method based on the number of organisations sampled, where each sample was representative of the entire population of the organisation it attempted to represent. This also provided comparable data across other organisations. Furthermore, the estimation of the sample size was important, but the application of traditional statistical procedures such as hypothesis testing was difficult in organisations with different mandates for operation, as they require precise estimates of the variance in the various populations that are being compared.

In this research, variance estimates were achieved by selecting a sample size of the four PROs that are project based, taking into consideration their respective peculiarities with reference to their mandates. The selected research organisations, being government PROs, had their projects scattered in every state of the federation. Therefore, obtaining first-hand information and data on some of the projects, and also access to some of the project officers, posed a challenge, and this may have affected the analysis as some critical information may not have been available. Another limitation was the limited research literature in the subject area. This was quite challenging and thus was a serious constraint in carrying out the research work, however, literature from related areas was used.

4.12 CHAPTER SUMMARY

This section reviewed the research methodology, design of data collection methods, research design, research process and the analysis that was used during the course of this study. The choice to adopt both quantitative and qualitative strategies for this study was justified. In terms of research approach and research method, the chapter highlighted the reasons for using a case study approach and a mixed methods approach of quantitative and qualitative research methods. In planning a research work, the researcher must identify the appropriate research method required to carry out the research and the worldview or

assumptions regarding the research. As such, the philosophical worldview or assumptions were also discussed. The chapter also provided details regarding the design of the questionnaire and the participants, in the context of obtaining valid and reliable data. The detailed design of the questionnaire was discussed and the chapter provided a rationale for including specific topics for data collection. A rationale for using simple random sampling was provided. The exploratory, descriptive, explanatory and research purposes were explained, as well as how the collected data was validated using different data sources. An interactive seminar was chosen to validate the data and provides a sense of framework ownership. The next two chapters present the results and discussion of the qualitative and quantitative findings on the SPM practices in PROs in Nigeria.

CHAPTER FIVE: QUANTITATIVE FINDINGS

5.1 INTRODUCTION

The previous chapter discussed the procedure that was employed in carrying out this research work. This chapter presents the findings from the quantitative survey carried out on the application of SPM practices in four PROs in Nigeria. The first part of this research employed the quantitative research approach (self-administered questionnaire), which was designed to provide the researcher with answers to the research questions one, two and three stipulated in Chapter One, and also to achieve the research's aim of identifying the barriers affecting the application of SPM, proffering a framework for addressing those barriers and enhance effective execution of R and D projects for senior project management practitioners working in PROs in Nigeria. Having carried out the survey and collected the data, the analysis of the data retrieved have been summarised, described, and presented in a way that is easy to understand and will facilitate answering the research questions. This chapter therefore presents the analysis of the survey findings that was performed using the descriptive statistics and non-parametric inferential statistics.

5.2 ADMINISTRATION

As already explained in the methodology chapter, the sample size was drawn from a population of senior project management practitioners from four PROs in Nigeria. The questionnaires were personally distributed through the office secretariat. Due to their roles in the execution of R and D projects, the following were selected to participate in the survey: project directors, deputy directors, chief scientific officers, assistant chief scientific officers, project engineers, research officers, planning officers and scientific officers. At the end of the survey, all the completed and returned questionnaires were held in accordance with the university's approved ethical standards.

5.3 ANALYSIS

The nature of the research questions and also the objective of the questionnaire required the use of a categorical and ordinal variable scale. In order to address the research questions, the quantitative analyses were carried out in two phases, namely the descriptive statistics and the non-parametric inferential statistics. The descriptive statistics were used to organise, summarise and interpret the data collected to represent the individual variables, while the non-parametric inferential statistics (correlation) were used to identify significant relationships between variables, and also to make generalisations about the population from which the sample was drawn.

5.4 MISSING VALUE ANALYSIS (MVA)

The responses from the questionnaire survey were filtered and only usable questionnaires were used in the data file, but there were some missing data values. Missing data arise when respondents fail to reply to a question, either by accident or because they don't want to answer the question (Bryman, 2012). According to Hair *et al*. (2006), the general impact of missing data (particularly in survey research) is that it may reduce the sample size available for analysis from an adequate sample to an inadequate sample, if remedies for missing data are not applied. Furthermore, any statistical results based on data created with a non-random missing data process could be biased because the missing data could lead to erroneous results. However in this case, the survey results, as shown in Table 5.1, showed that the missing data were randomly distributed and were therefore not significant enough to affect the result of the analysis.

5.5 DESCRIPTIVE STATISTICS FOR THE PROJECT MANAGEMENT PRACTICES IN THE ORGANISATIONS

The descriptive statistics for the project management activities carried out in the PROs are shown in Table 5.1.

Table 5.1: Descriptive statistics of project management practices

	N		Mean	Std. Deviation	Skewness	Kurtosis	Minimum	Maximum
	Valid	Missing						
How Effective is Application of Project Management	205	8	3.06	.935	-.564	-.780	1	4
Type of Projects Carried out in the Organisation	213	0						
Are Projects in Line with Organisation Strategy	211	2	3.46	.619	-.715	-.456	2	4
Organisation Undertaking Feasibility Study	213	0	2.98	1.368	-.905	.117	0	5
Carrying out Environmental Impact Assessment	213	0	1.93	1.747	.112	-1.497	0	5
Prepares the Sustainability of the Project	213	0	2.90	1.534	-.387	.507	0	9
Risk Assessment	213	0	2.38	1.764	-.185	-1.383	0	5
Appoint Project Team	213	0	3.48	1.223	-.919	.952	0	5
Setting Up of Job Description for Project Team	213	0	3.16	1.396	-.990	.364	0	5
Set up Project Office	213	0	2.27	1.767	-.198	-1.469	0	5
Prepare Project Charter	213	0	3.15	1.415	-.926	.123	0	5
Preparation of Project Plan	213	0	3.31	1.209	-1.029	1.020	0	5
Preparation of Financial Plan	213	0	3.33	1.261	-.983	.758	0	5
Development of Quality Plan	212	1	3.03	1.366	-.918	.254	0	5
Development of Procurement Plan	213	0	3.08	1.349	-.799	.265	0	5
Preparation of Risk Plan	213	0	1.70	1.708	.349	-1.367	0	5
Preparation of Communication Plan	213	0	2.78	1.409	-.675	-.299	0	5
Manage and Control Activities of the Project	213	0	3.23	1.192	-.731	.328	0	5
Management of Funds Not to Exceed Allocated Budget	213	0	2.83	1.460	-.511	-.546	0	5
Manage of Time Effectively	213	0	2.47	1.656	-.319	-1.134	0	5
Pass Through Due Process for Project Procurement	213	0	3.35	1.329	-.997	.625	0	5
Set Standards for Delivery of Project Output	213	0	3.06	1.505	-.901	-.032	0	5
Management of Risk, Issues and Other Problems	213	0	2.58	1.545	-.524	-.822	0	5
Management of Changes During Implementation	213	0	2.91	1.309	-.560	.092	0	5
Management of Communication Among Stakeholders	213	0	3.07	1.309	-.824	.273	0	5
Evaluation of Project After Closing to Determine the Level of Achievement	213	0	2.87	1.461	-.705	-.409	0	5
Dissemination of Lessons Learned from Finished Project	213	0	2.67	1.534	-.494	-.822	0	5
Documentation and Archiving of Project Documents	213	0	3.23	1.303	-.655	.024	0	5
Rating the Organisation's Performance with Regard to Managing Projects	212	1	3.29	.992	-.280	-.227	1	5

The result of the data showed that PROs implement project management standards. However, the level of implementation differed with the mean value ranging between 1.70 and 3.48, meaning that the level at which PROs in Nigeria implement project management practices was between below average and average. The skewness values were not larger than 1.0 and kurtosis was not larger than 2, meaning that the results of the investigation presented moderate skewness and moderate non-normality. Although the scores presented both positive and negative skewness and kurtosis, neither of them was extreme. Pallant (2005) indicates that many scales and measures used in social sciences have scores that are skewed either positively or negatively. This does not represent a problem with the scale but rather reflects the underlying nature of the construct being measured.

The appointment of a project team had the highest mean value while the preparation of a risk plan was found to have the lowest mean value, indicating that project risks were poorly assessed. According to Morris (2009), in many cases the successes or failures of projects depends on the way in which they are developed and defined, and this has to do with the goals and strategy, choice of technology, approach to risk and contracting policy. This means that the approach to risk is an important factor that can affect the effective execution of R and D projects.

5.6 RESPONDENTS' ORGANISATIONS

According to Easterby-Smith *et al*. (2012), the population in a survey is known as a whole set of entities that decisions relate to, and the sample is a subset of those entities from which evidence is gathered. For the purpose of this research, the selection of the sample from the four PROs (A. B, C, and D) took into consideration the entire population of senior project management practitioners in the different organisations. Thus the number of respondents drawn from each organisation differed. Table 5.2 shows the number and percentage distribution of respondents that participated in the survey from the selected PROs in Nigeria. Organisation A accounted for 14.1 per cent of the respondents. The percentage was small because the number of project management practitioners was small compared to the other organisations. Organisation B had the highest percentage of participants (30.5 per cent), while organisations C and D accounted for 28.2 per cent and 27.2 per cent of the survey respondents respectively.

Table 5.2: Profile of percentage distribution of respondents

Organisation	Number	Percentage
A	30	14.1
B	65	30.5
C	60	28.2
D	58	27.2
Total	213	100.0

5.7 RESPONDENTS' JOB TITLES/ROLES

The job title of an individual in an organisation helps to indicate the structure of the organisation and also the responsibility that is assigned to the person. In order to determine the respondents' job title in their organisations, the respondents indicated their job title at the time of the survey and a summary of the responses are shown in Table 5.3.

Table 5.3: Survey profile of respondents' current job title/roles

Job title/roles	Number	Valid percentage
Project director (directors and deputy directors)	16	7.6
Project manager (chief scientific officers, assistant chief scientific officers and project engineers)	73	34.8
Project planner (scientific officers, senior scientific officers, principal scientific officers and planning officers)	47	22.4
Client	2	1.0
Other (scientific officers and research officers)	72	34.3
Total	210	100.0

As highlighted in Table 5.3, there are different job titles and roles for project management practitioners in the PROs. Seven point six per cent of the respondents were directors and deputy directors, otherwise regarded as project directors. The project managers (i.e. chief scientific officers, assistant chief scientific officers, and project engineers) and other job titles (e.g. scientific officers and research officers) accounted for 34.8 per cent and 34.3 per cent of the sample respectively. The project planners represented 22.4 per cent, and only 1.0 per cent were clients that were on contract with the organisation. The job titles and roles of the respondents showed the richness and diversity of their roles and responsibilities, which contributed to the in-depth information retrieved on the application of SPM in PROs.

5.8 RESPONDENTS' EXPERIENCE IN PUBLIC RESEARCH ORGANISATIONS

On the subject of the experience of the respondents, they were requested to answer two different questions: the first was how long they have worked in PROs and the second was how long they have managed R and D projects. The respondent's years of experience at the

time of completing the survey questionnaire are summarised in Table 5.4, while the length of time they had managed R and D projects is shown in Table 5.5.

Table 5.4: Profile of survey respondents' length of service in the organisation

Length of service in the organisation	Number	Percentage
More than 20 years	24	11.3
16 – 20 years	24	11.3
11 – 15years	49	23.1
6 – 10 years	6	2.8
1 -5 years	90	42.5
Less than one year	19	9.0
Total	212	100.0

The result in Table 5.4 revealed that 42.5 per cent of the respondents had spent one to five years in the organisation, 23.1 per cent had spent between eleven and fifteen years, 11.3 per cent had been in the organisation for sixteen to twenty years and the same for more than twenty years, while 9.0 per cent had served for less than one year. The lowest percentage were respondents who had served the organisation between six to ten years, indicating that the majority of the project management practitioners in the organisation were relatively young.

Table 5.5 gives an overview of the respondents' experience of the management of projects in PROs.

Table 5.5: Profile of respondents' years of experience of managing projects

Years of experience in managing projects	Number	Percentage
More than 20 years	17	8.1
16 – 20 years	2	1.0
11 – 15years	2	1.0
6 – 10 years	83	39.7
1 -5 years	81	38.8
Less than one year	24	11.5
Total	209	100.0

The results presented in Table 5.5 indicate that most of the respondents had between five and ten years' experience of managing R and D projects in PROs. 39.7 per cent of the respondents had between six and ten years' experience, followed closely with 38.8 per cent

of respondents who had between one and five years' experience. Only 2.0 per cent total of the respondents had experience of between eleven and twenty years, while 8.1 per cent of the respondents have been managing projects for over twenty years. This indicates that employees with a long experience of the job carry out R and D projects in PROs. The experience and competence of a project manager, according to Green (2005), is an important aspect of SPM, as they affect the execution of projects. Competent project managers are referred to as star leaders, whose skill resides more in the soft skills set of project management (Green, 2005). The long experience of project managers in PROs was therefore seen as an advantage in the execution of R and D projects. But the question was, were the many years of experience of project management practitioners in PROs an advantage to the execution of R and D projects?

5.9 PROJECT MANAGEMENT APPLICATION

The emphasis in the project management discipline, according to Morris (2009), is on projects and whether they are successfully developed and delivered. This has a lot to do with the type of measures used in the execution of the project. The effective application of project management tools and techniques is a factor in the successful execution of projects. Table 5.6 shows the findings for the effective application of project management tools and techniques in executing R and D projects, from the point of view of the respondents.

Table 5.6: Profile of survey on organisations' application of project management

Effective application of project management	Number	Percentage
Very effect	84	41.0
Fairly effective	62	30.2
Less effective	47	22.9
Not been met	12	5.9
Total	205	100.0

205 respondents out of 213 answered this question. The data shows 41.0 per cent acknowledged that their organisations implemented project management techniques very effectively, and the majority of the respondents agreed that project management was

implemented effectively. However, 30.2 per cent of the respondents reported that the project management processes were only fairly effective, 22.9 per cent reported that it was less effective, and 5.9 per cent of the respondents were of the opinion that the effective application of project management processes was not achieved in their organisation.

Effective project management is known to aid project activities and increase the chances of meeting the project requirements (PMBOK, 2013). The majority of the respondents confirmed that project management was effectively applied in PROs, but how effective is it with regard to carrying out R and D projects? Although the findings revealed that project management principles were effectively implemented in the execution of R and D projects, the question still remains of whether or not the implementation of these principles increases the likelihood of project success, and whether or not the practical implementation of the principles has been fully applied. This will be discussed in the next section.

5.10 PROJECT MANAGEMENT PRACTICES

An analysis was carried out of the implementation of project management practices by the participating PROs in R and D projects. This was achieved by asking the respondents whether their organisation was involved in the different project management processes or not, and also the level of implementation of project management activities. Theoretically, SPM manages projects by combining the business or organisational strategy with project management techniques (Grundy and Brown, 2002). In order to ascertain practically whether R and D projects were aligned with the organisation's strategy for effective SPM, the participants were asked whether the projects implemented in their organisation were aligned with the organisational strategy; they could answer selecting 'strongly agree', 'agree' or 'disagree'. The results to this question are presented in Table 5.7a.

Table 5.7a: Profile of survey on projects' alignment with organisation's strategy

Project alignment with organisation's strategy	Number	Percentage
Strongly agree	112	53.1
Agree	85	40.3
Disagree	14	6.6
Total	211	100.0

Table 5.7a reveals that the majority of the respondents believe that the R and D projects carried out in their organisation are in line with the organisation's strategy, with 53.1 per cent strongly agreeing with this, and only 6.6 per cent disagreeing. An overall view shows that the projects carried out by PROs are aligned with the organisation's strategy. However, a few respondents did not agree with this, indicating that some R and D projects are not really aligned with the organisation's strategy, which could be due to political influences that usually occur in government-owned organisations (OECD, 2011).

On the practical implementation of project management practices, Table 5.7b shows an overview of the respondents' responses about the activities that are carried out during project execution. The respondents were asked to state if the SPM processes following the project life cycle were applied in the execution of R and D projects, and if yes, to rate the level of implementation in the organisation. The result for the level of implementation is a summary of the rating for the most implemented process in the organisation. This was to enable the researcher to interpret the findings with regard to how well these activities were carried out in the execution of R and D projects.

Table 5.7b: Survey of project management practices

Summary of Project management practices	Number	Yes (%)	No (%)	Level of implementation				
				Excellent (%)	Above Average (%)	Average (%)	Below Average (%)	Un-satisfactory (%)
Appointment of project team at project initiation	204	95.8	4.2	22.1	32.8	33.8	8.8	2.5
Preparation of project charter	192	91.0	9.0	13.5	42.2	28.1	12.0	4.2
Preparation of feasibility study	190	88.3	11.7	7.9	38.9	36.3	12.6	4.2
Environmental impact assessment	130	61.6	38.4	9.2	28.5	39.2	16.2	6.9
Preparation of project sustainability	184	87.3	12.7	10.9	34.2	35.9	13.6	4.9
Risk assessment	153	73.7	26.3	13.7	34.6	26.1	19.6	5.9
Job description for project team	191	77.5	22.5	13.6	41.4	31.4	11.5	2.1
Setting up of project office	144	80.7	19.3	10.4	36.1	36.8	12.5	4.2
Preparation of a detailed project plan	202	95.3	4.7	12.4	42.1	31.2	11.4	3.0
How well financial plan is prepared	202	95.3	4.7	15.3	38.6	33.2	7.4	5.4
Development of quality plan	189	88.3	11.7	9.5	39.2	34.4	15.3	1.6
Development of risk plan	121	56.5	43.5	8.3	25.6	34.7	20.7	10.7
The level organisations preparing procurement plan	194	92.0	8.0	13.4	31.4	38.1	13.9	3.1
The level of communication plan development	185	85.4	14.6	7.6	31.9	37.3	19.5	3.8
Organisation's ability to monitor and control project activities	205	95.3	4.7	11.2	38.5	28.3	18.0	3.9
Organisations managing communication with stakeholders	196	93.0	7.0	10.2	36.2	33.7	16.3	3.6
How well funds are managed	189	91.0	9.0	12.2	29.1	32.3	18.5	7.9
Management of project risk	171	81.5	18.5	8.2	30.4	40.4	17.0	4.1
Management of time during project execution	163	77.6	22.4	11.7	29.4	35.0	18.4	5.5
Pass through due process for project procurement	199	94.8	5.2	18.6	38.7	29.6	9.0	4.0
Set standards for delivery of project output	183	89.0	11.0	15.8	36.1	38.8	7.1	2.2
Management of changes during implementation	196	92.4	7.6	11.7	20.9	45.4	15.8	6.1
Organisation's carrying out project evaluation at closure	186	89.2	10.8	9.7	36.0	33.9	14.0	6.5
Organisations disseminating lessons learned from projects	179	84.0	16.0	9.5	32.4	33.0	16.8	8.4
Organisations documenting and archiving all project documents	203	95.3	4.7	17.2	31.0	31.0	14.8	5.9

The survey findings showed that project management practices were practised in the PROs, however regarding the level of implementation, not all the processes were implemented as required. The survey findings revealed that although 95.8 per cent of the participants agreed that project teams were appointed at the beginning of projects, 33.8 per cent, 8.8 per cent and 2.5 per cent of this 95.8 per cent stated that the level of implementation was average, below average and unsatisfactory respectively, indicating that the process was not adequately implemented.

The preparation of a project plan, financial plan and the organisation's ability to monitor and control project activities each had 95.3 per cent of the respondents agreeing that these

processes were carried out in their organisation. But then the level of implementation differed, with the majority of the respondents indicating that the level of implementation was average, below average and unsatisfactory. However, regarding project plans, although a small majority of the respondents stated that the level of implementation was above average and excellent, there were still a significant number of respondents who reported that the level of implementation was low.

It was deduced therefore that project plans were inadequately prepared which affected its implementation. The formulation of a strategic plan for the execution of projects in the organisation has no effect on the organisation's performance without proper implementation. According to Jooste and Fourie (2009), the best strategy formulation without implementation is just like a well-documented activities only, but strategy implementation is the key to better organisational performance. Furthermore, Dobni and Luffman (2003) also stated that for a strategic plan to be of benefit to an organisation, its implementation is key, yet it is one aspect that has been relatively neglected. This shows that a strategic plan is important and can enhance organisational performance only if it is implemented. According to Noble (1999), well-formulated strategies only produce superior performance for the firm when they are successfully implemented.

Regarding the preparation of a project charter, 91.0 per cent of the participants indicated that their organisation prepares a project charter, while on the level of implementation, 42.2 per cent and 13.5 per cent of the respondents reported that the process was above average and excellent respectively. Although some respondents reported otherwise, the result revealed that the activity was averagely implemented.

Concerning a feasibility study for the project, 88.3 per cent of the respondents agreed that project feasibility studies were carried out, while 11.7 per cent did not agree that this was the case. With regard to the level of implementation, although 38.9 per cent rated the process

above average, most of the respondents rated the process average, below average and unsatisfactory. Generally, when the number of respondents who rated the process from average to unsatisfactory was totalled, they number more than those who rated the process above average and excellent. This shows that there is a need for improvement in the preparation of feasibility studies for R and D projects.

Furthermore, for environmental impact assessment, risk assessment, job description for the project team, development of project risk and management of time, a significant number of participants reported that these activities were not carried out. On the environmental impact assessment of the projects, 38.4 per cent of the participants reported that the activity was not carried out. Although some of the participants reported that these activities were carried out, the number of participants reporting otherwise was significant. This signifies that project impact assessments were not adequately carried out before project execution. According to the UK Environmental Impact Assessment (EIA) campaigner guide (2005), this is a key aspect of the planning application that helps with understanding the potential environmental impact of any development project. This shows how important the EIA was for projects that were to be executed.

Just under a quarter (22.5 per cent) of the participants reported that the roles and responsibilities of project teams were not spelled out, and some rated the level of implementation as low. Comparing this response to that regarding the appointment of a project team, which had a good response, one would have expected the job description to receive the same response. But this was not the case, indicating that although the organisations appointed project teams for the project, the distribution of their roles and responsibility were neglected or inadequately implemented. This points to lack of project management skills in the execution of projects. The definition of the roles and responsibilities of the project team helps to provide the team with direction, instruction and guidance on the project to be executed. The inability to define these roles and responsibility

could cause a challenge in the execution of the project, as there will be clash of interests between the roles that each of the project team might want to carry out.

With regard to practices that were not carried out, the development of project risk and its assessment scored the highest, and even when they were carried out, the participants still rated the implementation low, meaning that the project risks were neglected. The development of project risk is a critical step towards project execution and needs to be discovered and managed before it develops into a loss (Ochieng *et al*., 2013). As shown in Table 5.5b, only 56.5 per cent of the respondents reported that risk plans were developed, while 43.5 per cent said that they were not developed, which is a significant number. The level of implementation was also low, with the majority agreeing that it was below average, below average or unsatisfactory. One of the causes of success or failure in the management of projects is the approach to risk (Morris, 2009), and this was observed to be neglected in PROs in Nigeria.

Concerning the management of time during project execution, 22.4 per cent of the respondents' said that time was not managed, while 77.6 per cent agreed that it was. However, regarding the level of implementation, the response varied with 35.0 per cent of respondents rating the level of implementation average, while 18.4 and 5.5 per cent of the respondents rated the process below average and unsatisfactory respectively. This showed that most of the respondents rated the process low, while only 29.4 and 11.7 per cent of the respondents rated the process to be above average and excellent. With this result it was evident that time was not adequately managed.

A high majority (87.3 per cent) of the respondents reported that the sustainability of the project was considered, while 12.7 per cent of the respondents said that it was not. Regarding implementation, the findings showed that 35.9 per cent, 34.2 per cent and 10.9 per cent of the respondents rated the process average, above average and excellent

respectively, indicating that most of the respondents acknowledged that the sustainability of projects was adequately implemented. Project offices were set up during project execution according to 80.7 per cent of the respondents, with 36.8, 36.1 and 10.4 per cent of the respondents agreeing that the implementation of this was average, above average and excellent respectively.

Regarding the management of communication with all stakeholders, the preparation of the procurement plan and the management of funds, the practices received an encouraging response with 93.0 per cent, 92.0 per cent and 91.0 per cent of the respondents agreeing that these activities were carried out. These positive results were also observed with the level of implementation, as most of the respondents acknowledged that these practices were implemented well. However, for the development of a communication plan, which should have also had a good response, similar to communication with the stakeholders, 85.4 per cent of the respondents reported that this was not done. This showed that these activities were not adequately carried out, and there were also contradictions regarding how well these activities were implemented during the execution of projects in the organisations.

The process of projects passing through due process for project procurement is a practice specific to Nigeria, where every project needs to be evaluated by the due process committee to confirm that the procurement act has not been violated and that the procurement of the project requirements were adequately handled by a good client. These were observed to receive a high response, with 94.8 per cent acknowledging that the process was carried out. Even on the level of implementation the result was rated high, showing that none of the organisations in this study violated the project procurement law being assessed by the due process committee.

Regarding the ability to set standards for the project output, 89.0 per cent of the participants agreed that standards were set for the project output, while a negligible number of 11.0 per cent disagreed and said that this was not the case. The level of implementation received high scores, as the majority of the respondents rated the process high with 38.8 per cent, 36.1 per cent and 15.8 per cent acknowledging that the process was well implemented. This showed that the organisations set standards for project output, but there could be room for improvement as a few respondents agreed that the process was carried out but rated the level of implementation as low. A vast majority (92.4 per cent) reported that changes were managed during the implementation of projects, meaning that only 7.6 per cent disagreed with this. The majority of the respondents reported that the process was very well implemented, indicating that changes were well handled during project execution.

During project closure, some of the activities expected to be carried out are evaluation of the project, dissemination of lessons learned and the documentation of all project documents. These were investigated to determine whether or not these activities were carried out in PROs. The respondents were asked to indicate whether these activities were carried out, and it emerged that 89.2 per cent of the respondents reported that projects were evaluated before closure, 84.0 per cent said that lessons learned from projects were disseminated, and 95.3 per cent of the respondents acknowledged that project documents were documented and archived. Generally, the findings showed that these activities were carried out, but regarding the level of implementation, the results showed that although most of the respondents rated the level of implementation to be average, above average and excellent, there were also some respondents who were of the opinion that these activities were not adequately carried out. An overall assessment showed that the project management practices in the PROs were inadequately or poorly implemented in the execution of projects.

5.11 ORGANISATIONS' PERFORMANCE

Together with the overall assessment of the implementation of project management processes in the organisation, the respondents were also asked to indicate the rate of satisfaction with the overall performance of the organisations in their execution of R and D projects. The respondents were asked to rate the organisations' performance in terms of unsatisfactory, below average, average, above average and excellent. Figure 5.1 presents the findings and shows that 37.70 per cent of the respondents rated the organisation's performance as average, 33.00 per cent of the respondents rated the organisation's performance as above average, and 9.90 per cent rated the organisation's performance as excellent. On the other hand, 14.60 and 4.70 per cent of respondents rated the organisation's performance as below average and unsatisfactory respectively. An overview of organisations' performance shows that the majority of the respondents rated the organisation as average. An average result does not show that the organisations have effectively implemented SPM in the execution of R and D projects.

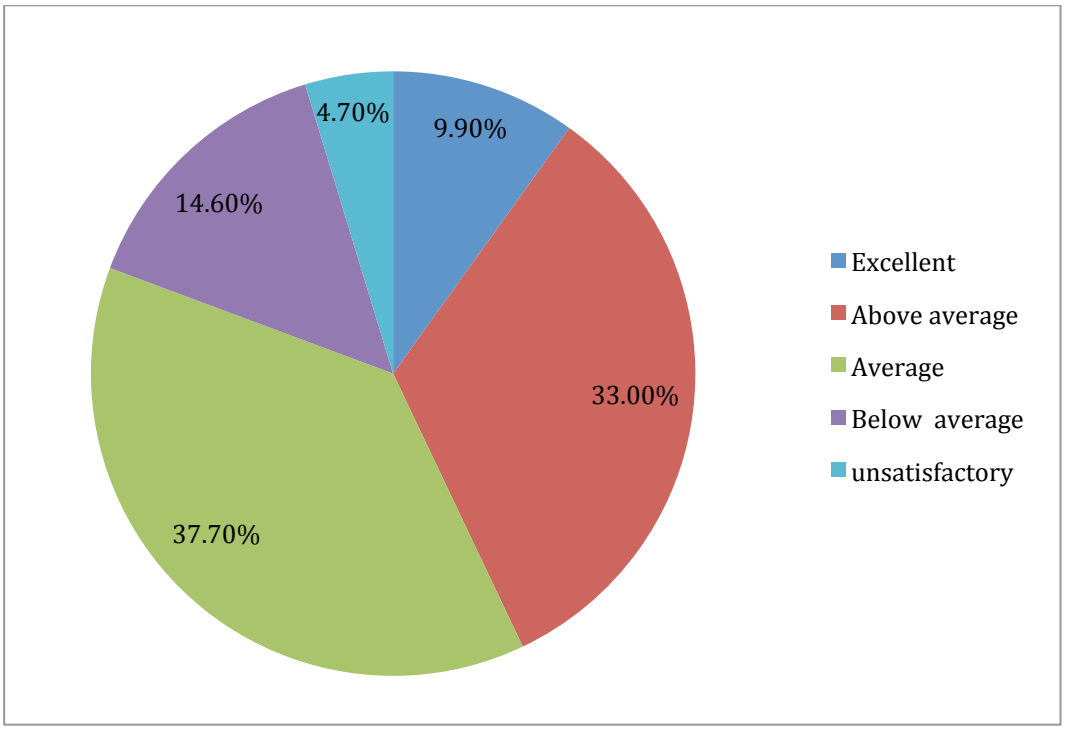

Figure 5.1: PROs Organisation's performance

5.12 FACTORS ASSOCIATED WITH THE APPLICATION OF STRATEGIC PROJECT MANAGEMENT

Having established the existence of SPM implementation in PROs, the respondents were required to grade the factors that can affect the effective application of SPM in executing R and D projects, in the order of importance. A summary of the findings is presented in Table 5.8. The rating of the factors associated with the application of SPM was in the order of "strongly important", "very important", "fairly important", "important" and "not important". However, for ease of analysis, the response rates have been merged to "very important", "important" and "not important". This was to assist with the correct identification of those factors that can affect the effective application of SPM in the execution of R and D projects in PROs in Nigeria.

Table 5.8: Factors associated with the application of SPM

SPM factors	Very important (percentage)	Important (percentage)	Not important (percentage)
Appointment of project team from the beginning	76.7	16.2	7.1
Experiences and competences of the project team related to the nature of the project	65.1	23.9	11.0
Understanding the principles of project management	50.7	34.8	14.4
Adoption of well-defined project management framework	47.1	37.3	15.7
Computing and software programs to manage projects effectively	35.4	34.9	29.7
Communication between project team and the management	61.8	28.5	8.7
Planning of the project	64.1	25.2	10.6
Feedback from previous projects	36.5	46.6	16.8
Standards and specifications for the elements of the project	56.5	34.4	9.1
Stimulation and motivation of employees	56.9	25.4	17.7
Organisations' routine procedures	29.1	44.0	26.8
Clear project management methodology	54.8	29.3	15.9
Team working between all team members of the project	63.2	24.6	12.0
The project funding	73.3	14.3	12.4

As shown in Table 5.8, the survey findings revealed that the appointment of a project team from the beginning of the project was associated with the application of SPM. This was observed with 76.7 per cent of the respondents stating that it was very important to appoint a project team from the beginning, while 16.2 per cent reported that it was just important, while only 7.1 per cent of the respondents stated that it was not important. Overall, the majority of

the respondents agreed that it was important to appoint a project team that would oversee the success of the project. Regarding the experiences and competences of the project team, 65.1 per cent reported that it was very important, 23.9 per cent recorded that it was important, and 11.0 per cent reported that the experience and competences of project teams were not important and as such need not be considered.

The understanding of the principles of project management also received a good response, with 50.7 per cent of the respondents stating that it was very important, 34.8 per cent reporting that it was important, while 14.4 per cent reported that it was not important. For this 14.4 per cent, the question is, how can projects be executed without an understanding of project management principles? The adoption of a well-defined project management framework was acknowledged to be very important by 47.1 per cent of the respondents, 37.3 per cent acknowledged that it was important, and 15.7 reported that it was not important. Generally, the respondents' view was that adopting a well-defined project management framework in the application of SPM is important.

The results revealed mixed feelings among the participants regarding project management using computer software programs. From the findings in Table 5.8, it can be seen that 29.7 per cent of the respondents did not agree with the use of computer software programs in SPM application, while 34.9 and 35.4 per cent of the respondents felt that the use of computer software programs was either an important or very important factor in the application of SPM respectively. The establishment of a good communication link between the project team and management, as shown in Table 5.8, scored highly with 61.8 per cent of the respondent agreeing that it was very important, while 28.5 per cent of the respondents felt that it was important. A small minority (8.5 per cent) reported that there was no need for an effective communication channel between the project team and management.

According to PMBOK (2013), a project plan provides a roadmap of key destinations (milestones) and a timeline to successfully complete the project. Concerning the level of its importance in the application of SPM in executing R and D projects, the response from the respondents was impressive as 64.1 per cent agreed that planning the project was a very important factor, and 25.2 per cent stated it was important. On the other hand, only 10.6 per cent stated that it was not important to plan for projects, therefore it could be observed that the negative response was very low, and as such planning for projects had a good response.

Feedback from previous projects (also known as lessons learned from previous projects) was considered to be one of the factors that can affect the application of SPM in the execution of R and D projects. Feedback from previous projects is regarded as an important part of SPM as it helps to eliminate repetition of the mistakes made in previous projects. The respondents were asked to state whether feedback from previous projects was an important factor. Table 5.8 shows that more respondents reported that it was an important factor, with 46.6 per cent of the respondents rating it as important, and 36.5 per cent rating it as very important; 16.8 per cent of the respondents said that it was not important.

With regard to the setting of standards and specifications for projects, 56.5 per cent of the respondents thought that it was a very important factor to consider in the application of SPM during project execution, while 34.4 per cent believed that it was important and 9.1 per cent thought that it was not important to set standards and specifications for projects to be executed.

The stimulation and motivation of employees in the organisation received a noticeable response. However, 17.7 per cent of the respondents reported that employees' motivation was not important, while 56.9 per cent of the respondents were of the opinion that the simulation and motivation of staff was a very important factor, and 25.4 per cent stated that it

was important to motivate staff in order to enhance the application of SPM in the execution of projects (Table 5.8). In every organisation, there are traditions or routines for carrying out duties that are unique and associated with just that organisation. The PROs have their own pattern of carrying out their duties, and the respondents were asked to state whether those routines associated with the organisation were an important factor in the application of SPM. Table 5.8 shows that 26.8 per cent of the respondents reported that it were not important. Although this is a small percentage, but it was a significant response showing that some people are of the opinion the organisation's routines need not be considered while 44.0 per cent reported that it is important, and 29.1 per cent stated that it was a very important factor to consider. However, in the application of SPM it is important to consider the organisation's culture in the execution of projects.

Project managers currently view project management methodology as impractical and bureaucratic, and as such rely on their gut instinct when it comes to managing projects (Charvat, 2003). However, according to Kezner (2013), the importance of project management methodology cannot be over-emphasised. The use of project management methodology is a business strategy that helps organisations to maximise projects' value to the organisation (Charvat, 2003). The findings from the survey revealed that 54.8 per cent of the respondents reported that project management methodology was a very important factor, and 29.3 per cent recorded it as important, while 15.9 per cent of the respondents recorded that it was not an important factor in the application of SPM in project execution.

With regard to the importance of project teams working together, 63.2 per cent of the respondents reported that it was a very important factor in the application of SPM, while 29.3 per cent responded that it was an important factor, and 12.0 per cent of the respondents recorded that it was not an important factor in project execution. This indicated that project teams have a very important role in the management of projects. Project funding had the

second highest response as one of the factors associated with the application of SPM in the execution of projects in PROs. Table 5.7 showed that 73.3 per cent of the respondents recorded that it was very important, while 14.3 recorded that it was important, and 12.4 per cent recorded that project funding was not important in the application of SPM for project execution.

5.13 EXPLORING THE RELATIONSHIPS BETWEEN VARIABLES

The previous sections dealt with the demographics and the measurement of the categorical data, which provided rich information on the practical implementation of project management practices and the factors associated with the application of SPM in the PROs in Nigeria. The analysis gave an insight into the application of the SPM process in the execution of R and D projects. The information highlighted the level of implementation and areas of similarities among the respondents from the participating organisations. For example, most of the respondents indicated that the factors associated with the application of SPM that could be a barrier to success were the appointment of a project team from the beginning of the project, project funding, the experience and competence of the project team, the planning of projects, and team working and communication management. In order to further confirm the findings and also to make a more valid claim regarding the factors associated with the application of SPM in PROs in Nigeria, it was necessary to further ascertain the relationship between the variables and their effect on the application of SPM in PROs in Nigeria. In order to achieve this, researcher carried out a statistical test to explore and establish the strength and direction of the relationships that exist between project management practices and the organisation's performance in the management of R and D projects, and also the factors associated with SPM.

There are different statistical tests that can be used to determine and establish the relationships among variables; these include Pearson correlation, non-parametric correlation (Spearman), partial correlation, multiple regression, logistics regression and factor analysis

(Bryman, 2012; Pallant, 2007). For the purpose of this research, the Spearman's correlation analysis technique was used to explore the relationship between the organisations' performance and the different project management practices in PROs. The Spearman's correlation was used because it is known to be suitable for ordinal or ranked data (Pallant, 2007), which is applicable in this research work. The variables were selected based on the key areas of the research aims and objectives and the research questions.

The correlation analysis was done using IBM SPSS version 21, but before the correlation analysis, preliminary analyses for correlation were carried out by generation scatterplot for the variables. This enabled the researcher to check for violation of the assumptions of linearity and homoscedasticity (Gravetter and Wallnau, 2004) and also to give a better idea of the nature of the relationship existing among the variables (Pallant, 2007). The following procedures were followed: **Graph – legacy dialog –** click on **simple scatter** and then **define** {click on the first variable and move it to the Y-axis and then the second variable to the X-axis} – **continue – ok**. The result of the preliminary analysis is attached in Appendix D. The scatterplot helped the researcher to check for the following:

- Outliers – that is data points that are out on their own from the main cluster points
- The distribution of the data point which reveals the strength of the relationships among the variables
- The direction of the relationship between the variables; that is if the relationship is positive or negative.

The correlation analysis was then carried out and the following procedure was followed: **Analyse – correlate – Bivariate …** {Move the organisation's performance and any of the project management practices into the variables box} **–** Open the option box and tick **Spearman – continue – ok.** Table 5.9 summarises the result of the correlation techniques generated from the SPSS analysis.

The result from the Spearman's correlation in Table 5.9 shows the correlation coefficient (rho), sig. (2-tailed) test and number of respondents N on the project management practices in PROs. According to Cohen (1988), when the correlation coefficient is from 0.10 to 0.20, the strength of the relationship is weak; when it is from 0.30 to 0.49 it is a moderate correlation but when it is 0.50 and above the relationship is strong. When $p < 0.05$, it shows that the relationships or correlation between the variables is statistically significant.

As demonstrated in Table 5.9, the management of risk and issues had the highest correlation coefficient of 0.573, meaning that it has a strong positive relationship between the organisation's performance with respect to the management of projects, while the job title and the years of experience had the lowest correlation coefficient (0.071 and – 0.094 respectively) meaning that it has a negative relationship with the organisation's performance that is not statistically significant. Ordinarily one would conclude that the project officer's years of experience will affect the organisation's performance with respect to managing projects, but the analysis showed that there are no statistical relationships. Although Green (2005) stated that project managers contribute to competitive advantage due to their skills in the management of relationships and projects, it could be that the project managers' skills were not only the result of years of experience but rather proper understanding and application of SPM.

Table 5.9: Project management practices

Summary of project management practices	Organisation's performance on managing projects		
	Correlation coefficient (rho)	Sig. (2-tailed)	N
Current job title	- 0.071	0.308	209
Length of service	-0.097	0.160	211
How long officer has managed projects	-0.094	0.177	208
How effective application of project management	0.238	0.001	204
Projects in line with organisation's strategy	0.194	0.005	210
Organisation undertaking feasibility study	0.389	0.000	212
Carry out environmental impact assessment	0.183	0.007	212
Preparation of project sustainability	0.439	0.000	212
Risk assessment	0.295	0.000	212
Appointment of project team	0.342	0.000	212
Setting up of job description for project team	0.389	0.000	212
Setting up of project office	0.215	0.002	212
Preparation of project charter	0.297	0.000	212
Preparation of project plan	0.307	0.000	212
Preparation of financial plan	0.438	0.000	212
Development of quality plan	0.450	0.000	211
Development of procurement plan	0.377	0.000	212
Preparation of risk plan	0.136	0.049	212
Communication plan	0.290	0.000	212
Managing and controlling project activities	0.515	0.000	212
Managing fund not to exceed allocated budget	0.377	0.000	212
Management of time effectively	0.473	0.000	212
Passing through due process for project procurement	0.337	0.000	212
Setting of standards for delivery of project output	0.441	0.000	212
Management of risk and issues	0.573	0.000	212
Management of changes during project implementation	0.484	0.000	212
Management of communication among stakeholders	0.396	0.000	212
Evaluation of projects after closing	0.448	0.000	212
Dissemination of lessons learned	0.514	0.000	212
Documentation and archiving of project documents	0.497	0.000	212

According to Grundy and Brown (2002), SPM is the process of managing complex projects by combining an organisation's strategy and project management techniques in order to achieve a competitive advantage. This is reflected in the results shown in Table 5.9, where project management practices, including the ability to prepare a feasibility study, preparation of project sustainability, appointment of a project team, job description for project teams, preparation of project plan, preparation of financial plan, development of quality plan and procurement plan, showed a positive and moderate correlation with the organisations' performance. This indicates that these practices could affect the organisations' performance if inadequately implemented.

The management of risk and issues, which had the highest rho of 0.573, indicated that it is a strong factor that can affect organisations' performance in the management of R and D projects. According to Lock (2007), risk can have such a large impact on a project that special crisis management contingency plans have to be made. There is therefore a need for PROs to consider risk management in the execution of R and D projects in order to avoid the effect of an adverse event near the end of a project, which can be more costly in terms of time and money than a similar event nearer the start of a project (Lock, 2007).

The monitoring and controlling of project activities and the dissemination of lessons learned were also found to have a positive strong correlation coefficient of 0.515 and 0.514 respectively, which means that they have a strong relationship with the organisation's performance in the management of R and D projects. This indicated that these two factors can affect the project success and the organisation's performance.

On the other hand, the effective application of project management, environmental impact assessment, setting up of a project office, preparation of a project charter and a communication plan, were found to have a positive correlation coefficient, but their relationship with the organisations' performance was weak. This weak relationship indicated that they are not factor that can adversely affect the organisations' performance. However, regarding the effective application of project management, this cannot be regarded as the true picture of its effect on the organisations' performance. Indeed, organisations now employ project management practices to enhance their performance. Many organisations set up a project management office as a tool to improve project management (Stanleigh, 2006), meaning that the application of project management is not enough to enhance project success which will in turn enhance the organisation's performance. This showed that there was a need to include a strategic approach to project implementation so as to enhance the organisations' performance.

5.14 EXPLORATION OF THE FACTORS ASSOCIATED WITH SPM

Regarding the factors associated with the application of SPM, the correlation analyses generated are shown in Table 5.10 (***see Appendix D***). The results of the analysis showed a positive correlation coefficient for all the variables but with different strengths of relationships. Exploring the relationships among the variables showed that project funding, appointment of a project team from the beginning of the project, and planning of projects had a rho of 0.481, 0.421, and 0.430 respectively, which means that there is a moderate relationship among the variables. Of all the variables, the use of computer and software programs to manage projects and also the use of organisations' routine procedures in the management of projects were found to have an insignificant correlation coefficient, with a rho of 0.084 and 0.023 respectively. This means that the use of computers and organisations' routines are not important in the application of SPM.

Table 5.10 (***see Appendix D***) shows that the appointment of a project team at the beginning of the project had a medium correlation coefficient relationship with experiences of the team, understanding the principles of project management, adoption of a project management framework, planning for the project, team working and project funding, with the correlation coefficients ranging from 0.316 to 0.481. The use of computer software and also the organisation's routine procedures showed a correlation coefficient of 0.084 and 0.023 respectively, which means that there is no relationship.

Among the variables, project planning has been identified as one of the most important critical success factors in project execution, because it describes the creation of the series of documents that facilitates a shared understanding among stakeholders and guides the execution and control of projects (Williams and Parr, 2006). In addition, Young (1993) described project planning as the function of establishing a predetermined course of action,

including policies and procedures to reach some specific corporate objectives. This confirms the importance of project planning, as indicated by the participants.

Regarding the experiences of the project team, the results showed a moderate correlation coefficient with appointment of a project team (rho=0.421), understanding of project management principles (rho= 0.347), adoption of a project management framework (rho = 0.300), planning for the project (rho = 0.306), and stimulation and motivation of employees and teamwork (rho = 0.344). The use of computer software and organisations' routine procedures did not show a significant relationship, with a rho of 0.058 and 0.038 respectively. The appointment of a project team at the beginning of any project is very important (Mastrogiacomo *et al*., 2014), as projects do not deliver themselves but rather are carried out by people. The experiences of the project team are key to the effective execution of projects; as stated by Muller and Tuner (2010) and Green (2005), the competencies and capabilities of project managers contribute to project success. The results of the findings show a positive and moderate relationship between project management principles, adoption of a framework and planning of projects, showing that the ability of the project team to understand the principles of project management, implement the framework and plan for their projects is important for effective execution of projects.

The understanding of the principles of project management, which is important in the execution of projects, had a medium correlation coefficient relationship with the experience of the project team, the adoption of a defined project management framework, and clear project management methodology, with a rho of 0.347, 0.428, and 0.309 respectively. On the other hand, all the other variables had a small correlation coefficient relationship with understanding the principles of project management. This showed a strong relationship between the project team and the understanding of the principles of project management, and the ability to adopt and use a project management framework and methodology.

Regarding the adoption of a well-defined project management framework, the results showed that it had a medium correlation coefficient (between 0.333 to 0.428) with all the variables, while communication between the project team members, the stimulation and motivation of employees, the organisations' routine procedures and project funding showed a small correlation coefficient (rho between 0.213 to 0.261).

The preparation of a project plan showed a correlation coefficient (rho) of 0.430 with the appointment of a project team, meaning that there is a medium relationship between them. It also showed a medium relationship with the experiences of the project team (rho= 0.300), the adoption of a project management framework (rho= 0.395), and the funding of projects (rho= 0.324). Other variables showed a low relationship with the preparation of a project plan, while there was no significant relationship associated with the stimulation and motivation of employees. Ordinarily, one would assume that stimulating and motivating staff would have a relationship with the effective preparation of a project plan, but this has not been shown statistically as the rho for stimulation and motivation of employees was 0.023.

The survey result in Table 5.10 showed that the use of project management methodology in the execution of R and D had a moderate correlation coefficient with understanding the principles of project management, the adoption of a project management framework, feedback from previous projects, setting of standards and specifications for projects, team working between all team members of the project and the funding of project. Meanwhile all the other variables had a small correlation coefficient with the use of project management methodology, meaning that the relationship among them was low.

In the field of project management, the project team makes a difference in the execution of projects, thus the ability for all the project team to work in harmony is crucial. The result of the survey thus showed that there are moderate relationships between the appointment of a project team (rho = 0.442), the experiences and competences of the project team (rho =

0.344), adoption of a project management framework (rho = 0.343), stimulation and motivation of employees (rho = 0.370), the use of project management methodology (rho = 0.341) and the funding of projects (rho = 0.476) and the ability of all team members to work in harmony.

The project funding in the application of SPM revealed that there are moderate relationships between all the variables that contribute to the strategic implementation of R and D projects. This can be explained, as projects cannot be executed without funds. Hence Table 5.10 showed that the appointment of project manager, planning of projects, setting of standards and specification for projects, stimulation and motivation of employees, the use of a project management methodology and team working had moderate correlation coefficients with the funding of projects. On the other hand, the stimulation and motivation of project staff had rho of 0.025, which means that there was no statistically significant correlation with project funding.

5.15 CHAPTER SUMMARY

The analysis of the quantitative findings showed that the project management practices were carried out in PROs. However, some gaps were identified in the level of implementation, the understanding of SPM, and also the application of SPM processes in order to enhance the organisations' performance. The ability to assess and manage project risks was identified as being poorly implemented in PROs in Nigeria. This showed that although the respondents rated the organisations' performance as average, there were gaps between what the theory says and the practical application of the theory. There is therefore a need for PROs in Nigeria to embrace project management practices and also implement them when carrying out their projects.

CHAPTER SIX: QUALITATIVE FINDINGS

6.1 INTRODUCTION

This chapter presents the results and discussion of the qualitative findings on SPM practices in Nigerian PROs. The qualitative research carried out by Denzin and Lincoln (2005) reflects an interpretive and naturalistic approach to the world. The researchers studied the environment in its natural setting and attempted to interpret phenomena in terms of the meanings people brought to them. In any qualitative research, data analysis becomes an on-going process (Bryman, 2012), as seen in this study in the thoughtful and informed decisions made by the researchers throughout the data collection procedure. A deductive approach that enabled the researchers to gather data from the selected project management practitioners was adopted, to examine existing and future SPM processes used in the execution of R and D projects. For this study, deductive procedures included the use of a dataset as a source of theory building and testing by means of theme matching and the generation of new themes.

This was achieved by ensuring that the interviews followed the same structure for all the participants and were consolidated into several headings based on the interview questions and the emergent teams that arose. The purpose of the interview was to explore expert views from experienced project management practitioners in PROs, so as to gain an in-depth knowledge of the practical application of SPM in PROs in Nigeria, and also address the research questions (one, three and four) stipulated in chapter one. The interviews lasted for one hour, and before the commencement of each interview, the researcher explained the purpose of the research and the voluntary nature of participation. The participants were then encouraged to sign the LJMU consent forms before the commencement of the interview. To comply with the organisations' policies (which placed restrictions on the use of recording device during interviews) the researcher took notes to record the interview content.

6.2 THE PROFILE OF THE PARTICIPANTS

Twenty participants were selected from four PROs. All the participants were senior project management practitioners and were chosen because of their experience in the execution of R and D projects, which was of great importance for this research. As mentioned in the methodology chapter, for ethical considerations of anonymity, and also for the purpose of classification, the participants were renamed 'project officer 1' through to 'project office 20'. The participants' profiles, as shown in Table 6.1, ranged from deputy directors (also designated as project directors), chief scientific officers, assistant chief scientific officers (also known as project managers), through to research fellows, who can be regarded as project planners in their respective research organisations.

The profile of the participants also showed that most of them had sufficient years of experience in the management of R and D projects in PROs to enable them to provide rich and in-depth information on the strategic management of R and D projects. Morris (2009) argued that, in spite of the long years of experience of project managers, projects still fail and do not achieve their objectives. On the other hand, Green (2005) emphasised that the experience and competence of a project manager is key to SPM and can also affect the execution of projects. From the views of Morris (2009) and Green (2005), it could be deduced that the experience of a project manager in the management of projects does not guarantee successful execution of projects. The findings of this research also showed that there was no statistical relationship between the years of experience of the project management practitioners and the organisation's performance with regards to project execution. This supports Morris's (2009) findings that projects still fail even with the years of experience of project managers. This suggests that having managed R and D projects for a long time will aid detailed information but does not determine the success of the project.

Table 6.1: The profile of participants

Name	Position	Experience
Project officer 1	Deputy director	20 years
Project officer 2	Chief scientific officer	10 years
Project officer 3	Chief scientific officer	10 years
Project officer 4	Principal research officer	9 years
Project officer 5	Principal research officer	6 years
Project officer 6	Chief scientific officer	16 years
Project officer 7	Assistant chief scientific officer	5 years
Project officer 8	Principal scientific officer	8 years
Project officer 9	Principal scientific officer	4 years
Project officer 10	Scientific officer 1	4 years
Project officer 11	Deputy director	20 years
Project officer 12	Deputy director	22 years
Project officer 13	Chief scientific officer	12 years
Project officer 14	Assistant director	12 years
Project officer 15	Principal scientific officer	13 years
Project officer 16	Research fellow 1	7 years
Project officer 17	Senior research fellow	4 years
Project officer 18	Research fellow	4 years
Project officer 19	Assistant research fellow	4 years
Project officer 20	Assistant research fellow	4 years

6.3 ANALYSIS OF FINDINGS

Although the data analysis was carried out after the discussions, some analysis was implemented as an on-going process during the exploratory meetings. The first phase of the analysis involved transcribing and typing the interview data into a Microsoft Word document, which helped the researcher to organise the data in a formal way, for ease of analysis and transfer into NVivo software. The second phase was the data analysis using NVivo qualitative data analysis software. In the data analysis approach, the interpretivist research paradigm was used due to the epistemological structure of the study. This holistic approach of data analysis, and a strategy that could be termed “reflective-interpretive”, fits well with the use of NVivo (Ozkan, 2004). One of the primary benefits of the software was the ability to add memos to sections of the data as thoughts and connections were made during all the phases of the data analysis. NVivo enabled the researcher to sort through the data and at the same time explore the process of executing R and D projects and the challenges facing the research organisations. Qualitative researchers (Bryman, 2012; Denzin and Lincoln, 1998; Huberman and Miles, 2002) stress the importance of recognising the continuous

interconnection of fieldwork and interpretation. Bryman (2012) characterised this as a spherical sequence whereby the researcher's original theoretical position is continuously altered or refocused by the fieldwork in a dynamic, dialectical method.

A codification system was first drawn from the interview questions, which was based on the appraisal of key issues arising from the discussions with the interview participants. The participants identified a number of key factors affecting the application of SPM in PROs in Nigeria. During the analysis four themes emerged, and these related to the theory and practices of SPM in the execution of R and D projects, the key determinants associated with the implementation of SPM, the factors affecting the implementation of SPM in the execution of R and D projects, and the impact of SPM initiatives on R and D projects. These were further sub-divided in to eight sub-themes, as shown in Table 6.2. The table highlights the link between the research objectives and the emerged themes.

Table 6.2: Strategic project management themes

Research objectives	Themes	Research method used
Objective 1: The relationship that exists between theory and practices of SPM	• SPM process • Project prioritisation and selection	Semi-structured interviews with project management practitioners in PROs in Nigeria and reviewed literature
Objective 2: The key determinants associated with SPM process and their importance in the effective implementation of projects in PROs	• Organisational structure • Management involvement	Semi-structured interviews with project management practitioners in PROs in Nigeria
Objective 3: The key variables that inhibit SPM application in PROs	• Factors affecting R and D projects • Challenges of SPM application	Semi-structured interviews with project management practitioners in PROs in Nigeria
Objective 4: The impact of SPM initiatives in improving and enhancing project success in PROs	• Success rate of R and D projects • Organisations' success with the application of SPM	Semi-structured interview with project management practitioners in PROs in Nigeria

In order to achieve the research objectives, the practical application of SPM was explored during the discussions. The use of a primary research method and a supporting method that provided supporting information enabled the triangulation of the research results (see section 4.7.3). The mixed-method approach served to reduce or eliminate the potential

disadvantage of adopting a purely one-dimensional research approach, whilst gaining the advantages of each and of the combination – a multi-dimensional view of the subject, gained through synergy (Fellows and Liu, 2008). This approach was chosen to enable the researcher to develop an SPM framework that will allow project management practitioners in PROs to execute R and D projects successfully.

6.4 OBJECTIVE 1: THE THEORY AND PRACTICE OF THE SPM CONCEPT

To establish the relationship between SPM practices in PROs and the theoretical concept, the process of SPM in the execution of R and D projects was examined. The process employed in the selection of projects was also assessed. The participants' views are highlighted in the following sections.

6.4.1 Project prioritisation and selection

In considering the process of project prioritisation and selection, the comments of most participants highlighted different ways of selecting R and D projects for execution in their organisations. The success of projects starts from the point of selecting the right project. When a wrong project or a project that is not viable are selected, they can automatically fail, even before the initial phase of the project. Project selection according to Dharmayanti *et al*. (2011) is a decision-making process that is not merely influenced by technical aspects but also by the people who are involved in the process. PROs face challenges during the process of project prioritisation and selection, resulting from both governmental influence, and the limited resources available for many R and D projects.

According to the participants, decisions were complicated by difficulties in assessing the probability of success of R and D projects with regard to their technical objectives. Even when the project management practitioners involved were certain that the proposed R and D project was viable, would achieve its technical objectives and produce the desired results,

the challenges of funding, and the lack of scientific and technological knowledge, were paramount. These factors made the successful selection of R and D projects a two-fold challenge: first, to select projects that would be technically successful, have significant impact, and bring sufficient organisational rewards, and secondly, to overcome problems with ensuring the availability of funding to execute the projects, and the tendency not to overlook this issue when projects are strategically aligned to the organisational strategy.

The process of project selection in the research organisations is a challenge faced by every decision maker who must allocate limited resources to a plethora of R and D projects. With the large number of R and D projects carried out by PROs at any one time, the participants were asked to describe the processes employed in selecting those projects, which were executed by the organisation. Although the majority of the participants provided differing responses, there were still some common issues. R and D projects are proactive in nature and hard to evaluate (Carlsson *et al*., 2007), and as such selection can be viable only when there is good support from the Chief Executive of the organisation. This factor was observed in several of the participants' responses. According to project officer 6, the projects that received attention were those, which had the support of the director general of the organisation. An example of this was seen in the response of project officer 11, stating that:

> *The project selection is based on the strategic goals for the year or goals set out at the beginning of the director general's tenure.*

This indicates that the budget of the director general for the year, and the goals set out to be achieved affects the number of projects selected for execution. In consequence, PROs require informed and systematic budgeting decisions to be made which correctly reflect the strategies of the organisation (López Irrarragorri, 2013). These may also have affected the way in which R and D projects were funded in government-owned organisations. The importance of project selection in organisations has been increasingly recognised during the

past decade (Coldrick *et al*., 2002), and also public research and development organisations have adopted the practice of project-based funding or R and D funding efforts (OECD, 2004) so as to enhance accountability and also to achieve competitive advantage. From the findings, the first factor that affected the selection of projects was the budget allocation from the government to the research organisations. Although this should not be the fundamental basis for project selection, most of the participants reported that funding was the main determinant of which projects were selected for execution. An example was seen in the response of project officer 1:

The selection of projects was based on the availability of funds, equipment and how viable the project was.

According to Carlsson *et al*. (2007), the decision to deny resources leads to the abandonment of the underlying investment, which can explain why funding was an important factor in the selection of R and D projects to be executed.

Other selection criteria that were used in PROs and reported by the participants were as follows:

- Projects were selected from the fall-out of industrial visits by the project management practitioners;
- Project proposals from project management practitioners;
- Projects were identified at the organisation's technology exposition workshops;
- Request from the industry;
- Annual focus as specified in the strategic plan;
- Projects that support the industry;
- Based on the needs of the environment and the country;
- Ideas generated from an industrial survey;
- From researchers in other institutions; and

- Other government agencies.

The process of project selection as explained by the participants was carried out based on the selection criteria set out in each of the organisations, which includes the organisation's goals, mandate, priorities and funding. R and D project selection is a critical area for organisations (Kaya *et al*., 2003). This is because project selection is the means by which technology strategies are actually implemented and the long-term success of an organisation is determined by the effectiveness of its project selection process (Schmidt and Freeland, 1992). Thus it is indicated that the project selection process of an organisation determines its effective delivery.

While some of the participants' responses were that the organisations depended on the availability of funds to select projects for execution, some participants reported that projects were selected based on the needs of the environment and/or the country. For example, although project officers 1, 11 and 12 argued that funding was the determining factor for project selection, it also emerged that the majority of the PROs carry out too many projects in a year and do not have enough funding to execute them. This leads to the question, 'Are all the projects selected successfully carried out and completed?'. This indicates that a major attribute of SPM – that projects should be prioritised before execution is not carried out.

From the findings it can be seen that the project selection process in PROs in Nigeria is a challenge due to the lack of standard procedures laid down for the selection of projects. Although generally R and D projects are unpredictable and involve large uncertainties with respect to both the development of opportunities in the existing product and those in the production process (Carlsson *et al*., 2007), the lack of selection standards makes dealing with this uncertainty more difficult. This could explain why research organisations carry out too many projects at a time without completing them; they have inadequate funds to execute all the R and D projects selected. Notwithstanding, the contribution from most participants

was that the projects executed were successful, even when most of the projects were not completed by the due date. Some were abandoned, while some were stopped due to the challenge of funding or environmental factors. Overall, the findings from this section of the interview do not fully reflect the true picture of R and D projects in PROs in Nigeria and also show that there is a gap between SPM theory and the practice occurring in PROs.

6.4.2 Strategic project management (SPM) process

Currently, the increase in competitive change has led to organisations shifting from relying primarily on the traditional project management process. This results from the challenges of inadequate resources, and inadequate project training and project team development, which cannot be addressed purely by the traditional project management approach (Grundy and Brown, 2002). Instead, strategic perspectives need to be integrated into the traditional project management process. This gave birth to the SPM process. The SPM process, according to Grundy and Brown (2002), contains five key stages: definition of the project, creating the project strategy, detailing project planning, implementation and control, and review and learning.

In relation to the practical application of SPM, the participants were requested to describe in their own words the processes used in the execution of R and D projects in their organisations, and their responses provided a variety of explanations of how projects were executed. The description of what was practised was found to vary from one organisation to another. For example, project officer 12's response was that:

The process starts with prioritisation of projects, planning, and then formation of project teams that will execute the project.

This response does not show that SPM processes were applied in the execution of R and D projects, rather it shows the implementation of the conventional project management

process. The main aspects of SPM are the definition of the project and the creation of a project strategy before planning. Although prioritisation of the project is important in the SPM process, the strategic perspective is what differentiates it from conventional project management (project initiation, planning, implementation and closure). Hence the process explained by project officer 12 was not an SPM process. Other participants gave varied and inconsistent description of processes, which were more indicative of the traditional project management process than the SPM process. For example, project officer 1 listed the following as an SPM process:

- Conception;
- Preparation of an action plan;
- Presentation of the project plan;
- Project execution;
- Defence of the project after execution;
- Transfer of project to a pilot plant;
- Project closed and moved to commercialisation; and
- Training programme created for those not yet commercialised.

This process was found to be a detailed R and D project management life cycle that can be grouped into conception, planning, execution and closure. Another participant explained that departments coordinate the process of executing their projects so that a project team formed would have the mandate to evaluate projects and, if viable, the projects are initiated for execution through to a pilot plant scheme. The inconsistency in the responses showed the lack of any standard process for the execution of R and D projects in PROs in Nigeria. While some of the participants were reporting a variety of processes used in the execution of their projects, which were of a more traditional project management process style, some other participants acknowledged a lack of understanding of the application of SPM in the execution of projects. In these cases the processes used were the processes compiled by

the organisation. An example was also seen in the responses of project officers 8 and 9. Project officer 8 stated that:

The process of managing projects was what is obtainable in the public service and the organisation follows the public service routines.

Project officer 6 responded that*:*

There is no clear cut process, each project follows the traditional project management process.

However, project officer 19 reported that the application of SPM had just been introduced in their organisation but the process was yet to be implemented. The use of a formal approach in the execution of R and D projects was also identified by the research carried out by Guldengerg and Leitner (2008) on the strategy process in research and development organisations. The findings revealed that the majority of research and development organisations follow a very rational, formal and inflexible strategic planning process (Guldengerg and Laitner, 2008). This confirms that the majority of research organisations were yet to adopt a different practice like SPM in the execution of R and D projects.

The concept of the SPM process, according to Heerkens (2007), first involves the definition of the strategic intent of an organisation, then the identification of the project, evaluation and prioritisation, and then execution of the project. Although there are different concepts of the SPM process from different authors, the general understanding of the concept is that the SPM process involves managing projects by combining project strategy, strategic management and project management principles (Grundy and Brown, 2002). To achieve this involves carrying out initial planning which defines and identifies the project's strategy, then the refining of the project, which has to do with aligning the project strategy with the organisational strategy in the project plan, and finally the implementation of the project. There was no reliable evidence from the participants, based on looking for evidence of

theoretical understanding, that SPM concepts were applied in the execution of R and D projects. From the various accounts provided by the participants it was revealed that SPM processes were not practised in PROs in Nigeria. It also emerged that even the traditional project management processes practised were inadequately implemented in the execution of R and D projects.

6.5 OBJECTIVE 2: THE DETERMINANTS ASSOCIATED WITH THE SPM PROCESS

During the research discussions, the key determinants for the effective implementation of the SPM process in PROs were the organisational structure employed and the management involvement in the execution of R and D projects. These findings are discussed in the following sections.

6.5.1 The structure of the organisations

The structure of an organisation helps to determine the manner in which it operates and performs. In order to find out the key determinants of effective implementation of SPM, the participants were requested to describe their organisation's structure as employed in carrying out their projects. The twenty participants' responses provided a uniform but slightly variable organisational structure. The general opinion of the participants was that their organisations use a functional structure in the execution of R and D projects. While some participants were not sure of the type of structure that was practised in the organisation, others reported that the organisations employed mixed organisational structures. For example, project officer 11's response was that:

> *There are no defined structures like in project management, what we have is the systemised structure that has been put in place by the colonial masters.*

A structure is a fundamental prerequisite for a thriving corporate organisation to achieve a maximal level of activity (Trier and Richter, 2014). This means that for an organisation to succeed in its activities, a good organisational structure is paramount, as it brings about a sense of purpose. The response of project officer 11 revealed that there was a structure in place, but perhaps not a project management organisational structure which would ensure improved project execution. Furthermore, other respondents, such as project officers 7, 12 and 13, also reported that their organisations used a combination of structures. For example, project officers 7 and 12 responses were that the organisation uses a matrix structure in projects, and functional structure in general administration.

The participants further explained that the reason for the use of a mixed structure was the appointment of project teams when concerned with project execution, while in terms of administration the functional approach was used. On the other hand, project officer 13 reported that:

The organisation's structure was between functional and project based.

A combination of functional and project-based structures, according to the Business Dictionary, is known as a matrix structure, meaning that the organisation may have been practising a matrix structure without the employees being aware of what type of structure was in place in the organisation. There are three project management structures: matrix structure, programmatic-based structure and project-based structure, with matrix structure being a combination of functional and project-based structures (PM4dv, 2007). The PROs in Nigeria are government owned, and from the researcher's experience, a combination of organisational structures is not common. Government-owned organisations operate based on the functions of the employees and as such are known for having functional structures. Project officer 5 had a different view, stating that the organisation uses structural management in the execution of their projects.

The organisation uses a structural management headed by a director general with six directors heading the department, followed by deputy directors that head the divisions and then the units are under the divisions

Although the participant claimed that this was a structural approach, it was observed to be an example of a functional structure, which was the general view of the majority of the participants. This method of arrangement in an organisation reveals a company's stance on decision making and also how they carry out their projects to achieve success. Despite the different views from the participants, based on the experience of the researcher, most of the PROs in Nigeria use a functional structure in their day-to-day activities and also in the execution of their projects. Although some of the participants reported that their organisation uses a mixture of structures, these have not been reflected in the manner in which R and D projects were carried out. It emerged that in Nigeria a director general/chief executive officer is in charge and gives directives to the directors of different departments. This showed that they operated a functional structure, but for effective R and D project execution there is a need for a better organisational structure than this, which will enhance the effective application of SPM in the execution of projects.

6.5.2 Management involvement in the application of SPM

Generally, for projects to be executed, they need to be approved by the management of the organisation. Thus management involvement in the effective application of SPM was assessed. The participants were asked to explain and rate the level at which management are involved in the application of SPM. A majority of the participants provided differing responses but generally agreed that the management of the organisations were involved in the application of SPM, but the level of involvement differed from one organisation to another. As mentioned earlier, Wessel (2007) argued that executive involvement in the application of SPM is an important factor and can affect the success of the project, suggesting that the success of SPM application depends greatly on management

involvement. The response from project officer 5 revealed that the level of management involvement was low, stating that:

The management of projects were carried out through a committee that was constituted to handle all the projects. The organisation used the research project management committee to monitor the projects.

The participants also explained that it was only at the initiation phase that management were involved, with control being handed over to the project management committee for execution and monitoring after the project had been approved. This was the same response as that given by project officer 8, who stated that:

At the conceptual stage, they were involved but during the management of the project they are not involved.

On the other hand, project officer 9 stated that:

The management level of involvement was high in running the affairs of the organisation but not on the management of projects and wishes that that level of involvement could be extended to projects.

According to Guldenberg and Leitner (2008), top management in public organisations are more engaged in external roles, such as attending formal meetings with external interest groups and governing boards, than in the management of projects. This supports the findings of this research, that top management of PROs had less time to be involved in the management of projects. The majority of the participants' responses were that management involvement was either low or average but their involvement in strategic management of projects was very low. In one response from project officer 11, the explanation was that:

They are not fully involved because they also lack the understanding of SPM. None of the management staff have practically implemented projects successfully

The project officer further explained that it was difficult for them to be involved in what they did not understand and were not ready to learn. Using several instances, the participant stated that although the organisation had prepared a strategic project plan, its implementation was yet to be achieved. This brought the issue of lack of SPM knowledge to the fore. Project officer 16, on the other hand, justified why the management were not involved in the management of projects:

The level of management's involvement
was based on the availability of funds.

Project officer 18's response was that:

The management level of involvement was high
but due to lack of funds they were handicapped.

The participants also suggested that if funds were available for the execution of their projects, management involvement would have been high, to enhance project success. Despite the varying accounts of the participants, it was observed that the management level of involvement had an effect on the application of SPM. Citing the literature on project success factors, it does not typically mention that management style or competence is a success factor for projects, which is in direct contrast to the general management literature (Turner and Müller, 2005) and also Wessel's (2007) conclusions on the effect of the executive's involvement in the application of SPM. The management literature rather viewed effective leadership as a critical success factor in the management of organisations, and has shown that an appropriate leadership style can lead to better performance (Turner and Müller, 2005). Lack of knowledge was also a factor in management involvement, as well as a general lack of interest by management in the implementation of strategic perspectives affecting the execution of R and D projects. However, from the evidence highlighted by the participants, despite management involvement being an important factor in the application of SPM, the level of involvement was not found to be encouraging.

6.6 OBJECTIVE 3: FACTORS AFFECTING R AND D PROJECTS IN PUBLIC RESEARCH ORGANISATIONS

This section describes participants' accounts of the factors affecting the execution of R and D projects in PROs. From the various accounts provided by the participants, it can be seen that there were several challenges that hindered the application of SPM in the execution of R and D projects. However, all the participants generally agreed that the lack of funds from the government and lack of professional personnel were the main challenges that hindered the application of SPM in the execution of R and D projects. The issue of inadequate funding for project execution has been a general concern in the management of projects and as such is not peculiar to PROs. The following sections detail this and other factors that affect the application of SPM, as identified by the participants.

6.6.1 Project funding

The value of project funding cannot be overstated, as no project can be executed without funds. The participants identified that the lack of project funding was the main factor affecting the execution of R and D projects. This also affected the lack of proper equipment required for executing the projects. An example was seen in the response of project officer 3:

The challenges of R and D projects were lack of funds from the government, lack of proper equipment to carry out the project and also interference from the government in the execution of their projects.

6.6.2 Formation of the project team

The majority of the participants listed the lack of a project team as one of the key factors affecting the execution of R and D projects. Apart from the funds required for the execution of the project, the project team and their competence dominated the discussions. While

some of the participants listed the factors, others described them, in order to drive their point home. For example, project officer 11 explained that:

> *The concept of project management were not properly defined in the organisation, there was the lack of team approach to the execution of projects, lack of monitoring and evaluation of projects and lack of experienced project management personnel to help in the execution of their projects.*

According to Vanhaverbeke *et al*. (2014), the project team affects R and D success as a result of it bringing different capabilities and incentives to collaborate, as well as enabling access through team members to the latest technologies, parts and components that are available. This is because technology-based partners are known to be experts in scientific research and provide project teams with knowledge of the latest scientific developments (Vanhaverbeke *et al*., 2014). This is to say that the lack of a project team approach is a factor that can affect R and D project success.

6.6.3 Lack of understanding of SPM and project management principles

Apart from funding issues, the lack of proper understanding of the SPM concept and project management principles in the execution of projects was one of the dominating factors in eventual success. Participants stressed that the lack of project management knowledge affected the execution of R and D projects adversely, as many project management practitioners do not understand or even know how to manage projects effectively. An example seen in project officer 13 and 12's responses was that projects were not properly assessed before implementation due to a lack of project management knowledge.

6.6.4 Lack of experienced professional personnel

The participants argued that the absence of professional personnel greatly affected how projects were executed. An example was seen in project officer 6's statement that the factors militating against project success were:

Lack of funds, lack of professional personnel
and frequent changes in the government.

To drive their point home, participants explained that most employees of the organisation cannot write project reports, or even monitor a project adequately, and such inadequacies had resulted in their making mistakes which were only identified well into project delivery. According to Dlakwa and Culpin (1990), this failure cannot be disconnected from the incompetency of project management practitioners to use proven principles and methodologies of project management to manage project activities.

6.6.5 Lack of project monitoring and evaluation

The participants argued that project monitoring and evaluation were not carried out and that this contributed to an ineffective execution of projects. The process of monitoring and evaluating project activities ensures that projects are executed within scope, time and budget, so that project execution is performed with minimal risk. This involves comparing the project plan with the actual performance of the project, to ensure that the project objectives are achieved. For example, project officer 11 explained that the concepts of project management were not properly defined in the organisation, and that there was also a lack of monitoring and evaluation of projects, which affected project success.

6.6.6 Poor project planning

It is often said that 'failing to plan is planning to fail'. The participants identified inadequate planning as one of the factors affecting the execution of R and D projects; it was not that projects were not planned, but rather that planning was not properly carried out. Inappropriate planning and scheduling has caused many 'supposed to be successful' projects to end up in a grey area. According to project officers 13 and 12, projects were not properly assessed before implementation: there was an absence of implementation strategy in the organisation, poor planning and researchers were handling too many projects which

contributed to project delay. Meredith and Mantel (2010) emphasised the need for planning and aligning the project objectives with the organisation's overall mission, goals and strategy, reinforcing proper scope definition, effective work breakdown structure, and scheduling and assignment of resources to various activities, as these activities are the basis for monitoring and control.

6.6.7 Absence of an R and D project implementation strategy

The participants argued that the absence of an implementation strategy in the organisation contributed to project delay. This is one of the important factors that will not just delay a project but also contribute to its failure. According to project officers 12, 13, and 1, projects were not properly assessed before implementation and the absence of a project implementation strategy affected the way that R and D projects were executed, thus leading to project delay and abandonment.

Pisano (2012) argued that research organisations, like other organisations, experience performance, which hinges on the coherence between components, thus the need for strategy, which is an essential ingredient for achieving superior R and D performance. He further stated that a good strategy provides consistency, coherence and alignment. The participants highlighted that there was no consistency in the management of R and D projects and suggested that there was the need to develop an R and D project strategy which would enable the organisation to consistently align projects to the organisation's mandate.

6.6.8 Lack of project assessment before execution

The participants revealed that the process of assessing projects before their execution was a challenge that was beyond them. Participants identified that projects were executed based on the instructions of the Chief Executive and no assessments of the projects, leading to the

execution of non-strategic projects. They explained that this contributed to research organisations having too many projects to execute at any time.

6.6.9 Government bureaucracy

Participants felt that other areas that affected project success were government bureaucracy, inadequate infrastructure, lack of continuity from one management to another, and lack of support from the industry and the entrepreneurs that were the primary beneficiaries of the research results. In general, the project management practitioners' lack of experience of project management principles and their failure to adopt a project team approach were the main factors that inhibited the effective implementation of R and D projects in PROs'. If addressed, these would aid the application of SPM, enhance performance and also create a sustainable competitive advantage in organisations.

6.7 CHALLENGES OF SPM APPLICATION IN PUBLIC RESEARCH ORGANISATIONS

Participants gave a number of related views on these issues:

6.7.1 Lack of SPM understanding

In the opinion of the interviewees, the concept of SPM was yet to be understood by project management practitioners in PROs. For example, project officer 13 stated that:

> *Project management practitioners do not understand the concept of managing projects coupled with inadequate funding for those projects, there were also lack of proper monitoring and evaluation, lack of competent and qualified project personnel, lack of commitment from staff and management and also non-implementation of the strategic plan that was developed.*

6.7.2 Employees' resistance

From the findings it can be seen that some of the organisations had made efforts to introduce the concept of strategy in the execution of R and D projects, but a general concern

was the negative perception and attitude of some employees to the application of SPM in the execution of R and D projects. The responses of the participants revealed that the attitude of some project practitioners were a challenge to the effective application of SPM. For example, project officers 1, 5, 9, 11 and 13, attested to this. Project officer 9's response was that:

Change is always difficult to accept, as such the introduction of SPM has not been fully accepted by some of the executives and some project management practitioners.

According to Wessel (2007), individuals who are new to the process of SPM may encounter challenges in executive championship, meaning that without buy-in from high decision-makers and their ability to give guidance and support to the project manager, SPM will fail. This is because even in a strategic environment, project managers sometimes succumb to the politics and temptations of selecting projects that are not strategically aligned to the organisation's strategic plan. This confirms the effect of employees' and executives' buy-in to the application of SPM.

6.7.3 Lack of qualified project management personnel

All the participants stressed that lack of qualified project management personnel was the main factor affecting SPM implementation, as many of the project management personnel did not understand the concept of SPM. According to project officer 5, the challenges affecting the implementation of SPM were:

Lack of qualified project management personnels, misconception of SPM and antagonistic personnel not willing to change from their usual routines.

On the other hand, project officer 11 categorically stated that:

There was lack of general understanding of the concept of SPM.

From the findings it can be seen that some of the challenges identified by the respondents correspond to the challenges identified by Wessel (2007). They stated that some of the challenges experienced by organisations new to SPM include: the need for the project managers to have more business acumen than just traditional project management knowledge; having a solid project management process; project management skills for the management of projects so as to ensure a value-added outcome that improves an organisation's bottom line; and the ability to maintain the vision and strategy and then allow the project manager to manage the projects for the best business value. From the challenges detailed by Wessel (2007), the lack of project management professionals is important, as this lack will adversely affect the execution of R and D projects.

6.7.4 Lack of training

The inability of research organisations to train their employees was, according to the participants, one of the factors inhibiting the application of SPM. An example was the response of project officer 1, stating that:

> *The absence of capacity building due to lack of funding, absence of team work and project personnel preferring to work alone have contributed to the non-implementation of SPM in the public research organisation.*

Furthermore, other areas identified to be challenging to the application of SPM that could be a pointer to lack of training came from project officer 14:

> *The distortion in the implementation of SPM process due to the introduction of new projects that were not originally in the strategic plan and the non-release of government approved budget which also affected the implementation of SPM (project officer 14).*

In conclusion, there were other challenges enumerated by the participants, including: lack of current information on project management practices; non-motivation of employees; the structure of the organisation; lack of conducive environment; non-availability of the required equipment; political influence in the functioning of the organisation; and improper decisions on the projects. Finally, it was obvious that the concepts of SPM were yet to be understood in public research organisations and because of this, their implementation remains a challenge.

The challenge of employees' motivation was another factor identified to be vital to the implementation of SPM, as evidenced by the antagonistic behaviour and attitudes of some project personnel. Project personnel seem to be used to the traditional routines found in the execution of R and D projects and as stated by project officer 9, change is always difficult and so lack of motivation could be one of the factors inhibiting the buy-in of employees to the implementation of SPM in the organisations researched. According to Wessel (2007), this indicates why strategy at the highest levels has to be paired with a consistent, repeatable process that ensures that practitioners at the project level are consistent and efficient, and also ensures that training and certification of project management staff will be a wise investment.

6.8 OBJECTIVE 4: A MEASURE OF SPM IMPACT IN PUBLIC RESEARCH ORGANISATIONS IN NIGERIA

6.8.1 The success rate of R and D projects

In this section of the interviews, the participants were asked to list how many R and D projects the organisation was able to execute in a year and the success rate of those projects. This information was sought in order to determine the impact of SPM initiatives in research organisations. The responses were interesting in that the number of projects executed ranged from 1 to 100, with most of them being on-going projects that had been in delivery for more than two to three years. Some of the participants explained that so many

projects were being carried out in a year because many had been delayed due to lack of funds to complete them. However, the findings revealed that projects were not prioritised and so some of them had lasted longer than necessary. Project officers 11 and 12's responses were that projects carried out in their organisations operated on a rolling budget, and so some of the projects not being completed in a year did not stop the addition of new ones. One of the outstanding responses was the response from project officer 14:

That the organisation carries out between 20 -100 projects in a year.

The question that needs to be addressed is whether all the projects were successfully completed in that same year. According to Investopedia dictionary, R and D projects is an investigative activity that an organisation chooses to conduct with the intention of making a discovery that can lead to the development of a new product or procedure or to improve an existing product or procedure. Furthermore, according to Porter (1985) R and D projects are tools for organisations to obtain new information about promising technologies and methods. With such new information organisations aim to defend and build sustainable competitive advantage. Although R and D project management is one of the most difficult areas in projects management, in today's world, precondition of surviving of a company in highly competitive environment is in conducting R and D projects (Tuzkaya and Yolver, 2015).

However, considering the issue of lack of adequate funds for the projects reported by the participants, this looks impossible. One major issue that dominated the participants' responses was the challenge of not receiving sufficient funds for the organisations to execute their projects. Therefore the viability of the execution of 100 projects was questionable. According to Yamazaki *et al*., (2012), there are various factors associated with success or failure of projects, such as maturity of technology, circumstances surrounding the R and D system within an organisation and commercialisation; however, it has been found

difficult to clarify what makes R and D projects successful, because such projects were imbued with the idea that they must succeed. This mind-set must have led to an increase in the number of project being executed, with the attitude that at the end they will succeed. Furthermore, project officer 15 also stated that projects were long-term ventures and as such would not end in a year:

> *A lot of projects were carried out but need a long time to be completed and about 50 projects were carried out in the organisation at a given time but they were all on-going projects.*

Project officer 19's view was:

> *I may not be able to say how many projects are carried out in a year because the projects starts but are hardly finished. However, every year about two new projects were added to the on-going projects making it about twenty-five or more in number.*

From the findings, it emerged that the number of projects carried out in a year by PROs was too numerous and so it was no wonder that most lasted longer than they should have, due to the fact that there were insufficient funds to complete them. Some of the participants, in defending the selection process, stated that projects were selected based on the availability of funds (project officer 1). But the response on the success rate of these projects further revealed that there were gaps in the management of R and D projects in PROs and that strategic perspectives of project execution were not applied. However, fourteen out of the twenty participants interviewed rated the projects executed by their organisations as successful, with a rating of between 50 and 100 per cent success.

One cannot confirm that these were the true pictures of the success rate, when due to lack of funds projects were rarely completed on time. Several studies investigating project successes have been carried out yet there are no definite definitions of what constitutes project success (Wit and Meyer, 2010). The concept of project success means different things to different people because of varying perceptions, and this leads to disagreement

regarding whether projects were successful or not (Wit and Meyer, 2010). Some of the responses from the participants varied based on the performance of the organisations. For example, project officer 14's view was that:

The success rate is very broad, from failed projects to successful ones and will put the success rate at about 50 per cent.

Furthermore, project officer 19's response was that:

The success rate depended on funds released by the government; as such rated the project success 20 per cent.

Project officer 5 reported that:

Project success rate was 80 per cent, but the commercialisation of those projects remained a challenge.

Reviewing the responses of the project officers showed different perceptions of project success. With regard to the response from project officer 5, how can an R and D project be rated 80 per cent successful, when the projects cannot be commercialised? This showed that the rating of project success was not a true picture and there were no criteria identified to determine when a project was successful or not. As stated by Yamazaki *et al*. (2012), it is difficult to clarify what makes R and D projects successful. In order to address this, Baccarini (1999) suggested that the criteria for measuring project success were set out at the beginning of the project to avoid different team members travelling in different directions regarding the success of a project, and in this regard, PROs need to set out criteria at the beginning of the project. This will enable them to determine when R and D projects can be regarded as successful, taking into account issues such as late delivery and even abandonment. In general it was observed that the impact of SPM was yet to be felt, as most of the projects regarded by the participants as successful were not actually successful, with some of the projects completed but not yet commercialised.

6.8.2 Organisation's success with the application of SPM

The interview inquired about different aspects of SPM and their implementation. In the concluding part of the interview, the participants were asked to generally rate the success of the SPM initiative in their organisation. Most of the participants rated SPM as very good, although in some of the organisations they had only recently introduced the strategic approach to the implementation of their projects. An example was seen in Project Officer 5's response:

The organisation's performance with the application of SPM was 50 per cent, because it was still coming up

Other project officers rated the success of SPM to be between 50 and 85 per cent. Project officer 19's response was noticeable in that the explanation of success was based on the efforts of the project management practitioners that were willing to work irrespective of the challenges surrounding them. The participant stated:

I will rate the success rate 100 per cent because everybody is trying to work even when there is no money.

The delivery of business outcomes is realised through the success of projects, and in essence that is the way that project management strategies drive organisational success," says Adrian McKnight, PMP, programme director at Suncorp-Metway Ltd., a financial services firm in Brisbane, Queensland, Australia (PMI White paper, 2010, p.1). In contrast to this description of project success, some of the participants rated the success of SPM in their organisation as very low because projects were executed using procedures and routines and SPM application was yet to be fully implemented in the execution of R and D projects. According to Project officer 12:

The planning of strategy is one thing but the implementation was yet to be achieved as such the success rate was low.

Similarly, project officer 14 stated that:

> *The new SPM had just taken off, a five year strategic plan had been prepared, but the implementation was yet to take off, as such the level of success was put at 15 per cent.*

Other participants also reiterated that SPM application was new to the organisation and as such could not be rated. The participants further explained that their departments were still executing projects using the approach known to them, and so they could only say that the success rate was very low based on how projects were actually carried out. This further stressed the need for the practical implementation of SPM in the execution of R and D projects. Finally, from the findings, participants acknowledged the lack of standard frameworks and the need for the application of the SPM concept in the execution of R and D projects.

6.9 CHAPTER SUMMARY

This chapter has summarised the responses of the interviews carried out in PROs in Nigeria. As stated earlier, the aim of carrying out the interviews was to gain in-depth information on the practical application of SPM in the execution of R and D projects in PROs in Nigeria. The findings revealed that the practical application of SPM in the execution of R and D projects had yet to be fully implemented, and so projects were still executed using traditional methods. Several factors that affected the implementation of SPM and the execution of R and D projects were identified during the course of the interviews. Although some of the challenges were attributed to the government, a number of the participants identified challenges that were common to organisations that were new to the application of SPM.

A lack of knowledge with respect to project management and strategic project management concepts was also identified as a major challenge to the application of SPM in the execution of R and D projects in PROs. However, through the interview findings, the objectives of

establishing the relationship that exists between theory and practice in relation to SPM, identifying variables that inhibit SPM application and measuring the impact of SPM on project success were addressed. The next chapter discusses the main objectives of this research as it relates to the findings from the quantitative and qualitative research. In addition, a framework will be developed out of the findings to achieve the objective of proposing an SPM framework.

CHAPTER SEVEN: DISCUSSION OF RESULTS

7.1 INTRODUCTION

The previous chapters of this thesis explored PROs in Nigeria and their strategic approach to the management of R and D projects. The literature review and research findings emphasised the poor implementation of strategic perspectives in the management of R and D projects, highlighting the need for PROs to adopt the application of SPM tools in the execution of R and D projects, so as to enable them to achieve sustainable competitive advantage. This chapter discusses the key findings from the quantitative and qualitative research: analysis of the key quantitative findings, analysis of qualitative findings, and the research objectives of the study. The final section provides an overview of implications drawn from the findings for both theory and practice, and concludes with recommendations for the way forward for Nigerian PROs.

7.2 OBJECTIVE 1: THE RELATIONSHIP BETWEEN SPM THEORY AND PRACTICE

SPM theory, and its practical application in the execution of R and D projects in PROs in Nigeria, remains an area that has not been fully explored. From the various accounts provided, the findings revealed that the majority of the participants acknowledged that SPM was not practised, although some of the participants did state that SPM processes were implemented in the execution of their projects. It was observed that some of the organisations had developed strategic plans for their projects but were yet to fully implement them. In consequence, conventional project management approaches were still used in the execution of R and D projects. The view of the participants regarding the practical implementation of SPM processes in the execution of R and D projects was that projects were selected based on directives from executives or from supervising government officials. As the process of prioritisation and selection of R and D projects that are aligned with an organisation's strategic objectives is one of the attributes of SPM, the directed approach to project selection identified is in direct opposition to SPM methods. The reality was that,

being government-sponsored organisations, projects were not adequately assessed but rather were selected based on the decisions of management, which led to the selection of non-strategic projects. Furthermore, it emerged that conventional project management processes were used instead of SPM processes, and that the quality of implementation of these conventional processes was also poor. Among the concerns raised by participants was the lack of adequate project planning, inadequate preparation and management of project risk, and lack of clearly defined project strategy that aligned with the organisation's strategic objectives.

The challenge of inadequate project prioritisation was reported by the participants as the main contributor to organisations having to execute too many projects at a time, leading to projects being abandoned. The findings of this research showed that there is a gap between the theoretical concept of SPM and the real practice being used in PROs in Nigeria. What the participants reported as being practised was quite different from processes indicated by SPM theory. Conventional project management processes were employed, and these processes themselves were poorly implemented.

7.3 OBJECTIVE 2: THE KEY DETERMINANTS ASSOCIATED WITH SPM

The research findings indicate that the key determinants associated with SPM are: the appointment of a project team from the outset; the experience and competence of the project team in relation to the nature of the project; understanding of the concept of SPM; the adoption of a well-defined project management framework; project planning; stimulation and motivation of employees; project management methodology and project funding. All the respondents acknowledged that the variables listed were associated with SPM but they varied in their interpretations of the level of importance of each. Overall, the participants suggested that the appointment of project teams at the beginning of the project was the most important variable associated with SPM, followed by project funding.

In contrast, an organisation's routine procedures, computing and software programs for managing projects, and feedback from previous projects, were not regarded as important variables in the application of SPM. With further statistical analysis of the key determinants, it emerged that all the variables showed a positive relationship, but with different strengths. The exception was the use of computer and software programs and the organisation's routine procedures, because they did not show any significant relationship with the SPM process. This corresponds with the participant's response that they were not important in SPM. The key variables associated with SPM are discussed in the following sub-sections.

7.3.1 Appointment of a project team

All the participants agreed that the appointment of project teams was of great importance for effective application of SPM in the execution of R and D projects. It also emerged in the literature that the first major step to be taken in planning for a project was the formation of a project team (Medinschi and Colta, 2009) to execute the project. The success of any project depends on the project team and its members, as they are the players who will execute the project.

7.3.2 Experiences and competences of the project team

All the participants agreed that the experience and competence of the project team were key determinants of SPM application in research organisations. The participants argued that the lack of project management professionals was one of the challenges that affected the effective execution of R and D projects. Although there were no statistical relationships between the experience and competence of project managers and project success, the competence of the project team is an important factor, as it will affect how projects are executed.

7.3.3 Understanding the concept of SPM

The findings revealed that all the participants acknowledged that the concept of SPM was important in the effective execution of R and D projects. The traditional project management practices which were employed in the execution of R and D projects had a lot of challenges that affected their effective execution. This led to some of the research organisations introducing the strategic perspective into the execution of their projects. It is evident from the findings that all the participants supported the application of SPM and were interested in its application in the execution of R and D projects.

7.3.4 Adoption of a well-defined project management framework

Participants' views were that the use of a project management framework was important but not compulsory in the application of the SPM process. Although the perception of some participants was that a project management framework was not very important, and SPM process could be carried out with or without such a framework, the importance of a project management framework in the execution of projects cannot be over-emphasised.

According to Dooley *et al*. (2005), in order to manage multiple projects successfully the organisation needs to maintain control over a varied range of projects, balance often-conflicting requirements with limited resources, and coordinate the project portfolio to ensure that optimum organisational outcome is achieved. This can only be achieved through the use of a well-defined framework, and for organisations like the PROs involved in the execution of a large number of innovative and high value R and D projects, the use of a well-defined framework is important in enabling them to accomplish their objectives and achieve success. It has also been proven in the literature that a framework ensures adequate control, provides a consistent approach across projects, and also ensures that best project management practices are employed (Project Management Framework for Cardiff, 2010).

Although the findings show that there is no standard SPM framework available in PROs in Nigeria, some participants acknowledged that the development of an SPM framework will enable their organisations and the project teams to achieve organisational breakthrough and achieve sustainable competitive advantage. According to Kerzner (2001), the management of projects in most successful organisations is no longer an operational tool or a method that the organisation uses internally to improve its own performance, but a strategic framework for achieving a competitive advantage in today's business environment. This supports the adoption of a well-defined SPM framework that will enhance the execution of R and D projects in PROs in Nigeria.

7.3.5 Project planning

The participants acknowledged that having a project plan in place was an important determinant of SPM in the execution of R and D projects. Although the result of the findings showed that project plans were not effectively carried out and may have contributed to the low level of success experienced in PROs in Nigeria, all the participants highlighted poor planning as one of the factors that affected the effective execution of R and D projects. According to the literature, project failure rates are extremely high, and these failure rates result, in a large part, from inadequate planning (Resch, 2011). This highlights the importance of project planning in the execution of projects.

7.3.6 Motivation of employees

Participants indicated that lack of motivation of employees was one of the factors that affected the application of SPM in the execution of R and D projects, thus suggesting that there was a need for project management practitioners in organisations to be motivated through training if the application of SPM was to be effective. As such employees are instrumental in project delivery, and motivation is an important factor.

7.3.7 Project management methodology

Most participants agreed that a clear project management methodology was required in the effective execution of R and D projects. The use of a project management methodology is a business strategy which allows organisations to maximise the project's value to the organisation (Charvat, 2003). The participants all agreed that the use of a clear project management methodology in the execution of R and D projects would enhance their success.

7.3.8 Project funding

All the participants acknowledged that project funding was the most important variable in the application of SPM for the execution of R and D projects. Projects cannot be executed without funds, and so funding was seen as the most important variable. The overall findings of this research showed that project funding was a major challenge in PROs in Nigeria. The participants argued that if funds were made available, the organisation's performance in the execution of R and D projects would be enhanced.

7.3.9 Lessons learned

The participants' responses regarding lessons learned or feedback from previous projects showed that project management practitioners do not keep account of how projects are executed in the organisation. Feedback from previous projects or lessons learned is part of the SPM approach, and is used to ensure that the mistakes made in previous projects are not repeated. The participants did not rate this as a very important variable associated with SPM. Not regarding this as an important variable in SPM process could lead to project teams repeating mistakes in future projects and could also lead to R and D projects not achieving their strategic objectives. However, with further statistical analysis, it was found that lessons learned was an important variable associated with the application of SPM.

7.4 OBJECTIVE 3: THE KEY VARIABLES THAT AFFECT THE APPLICATION OF SPM

On the issue of the key variables that can hinder the application of SPM in the execution of R and D projects in PROs, all the participants in one way or another stated that the primary challenge was the government's inability to provide enough funding for project execution. Although lack of adequate funding was generally observed as a challenge to the application of SPM, most of the participants also identified the following as factors that can affect SPM application:

- Lack of professional project management personnel;
- Lack of a project team approach for the execution of the R and D projects;
- Lack of monitoring and evaluation of projects;
- Projects not properly assessed before execution;
- Absence of project implementation strategy in the organisation;
- Poor project planning;
- Lack of general understanding of the concepts of SPM;
- Misconception of SPM;
- Handling of too many projects;
- Lack of proper understanding of project management principles;
- Motivation of employees; and
- The negative attitude of project management personnel towards the adoption of SPM.

Apart from the factors enumerated by the participants, there was a general concern about the perception and attitude of some employees to the implementation of SPM. According to Resch (2011) the resistance of employees, whether at the organisational or individual level, to any transformation that involves change, is experienced. The application of SPM in the execution of R and D projects required changes of procedure, and it is in this context that

such resistance can be understood. According to the participants, these factors, in addition to the bureaucratic nature of the government and political challenge, can inhibit the execution of R and D projects using SPM processes.

Another concern felt by the participants to be very important was the lack of understanding of the concept of SPM. Participants stated that lack of training was the reason behind the lack of understanding of the SPM concept and recommended that project management practitioners should be motivated through training, so as to positively affect their attitude towards work. The participants' general view was that if the application of SPM is to succeed, project employees should be taken care of, as projects do not execute themselves but rather are carried out by employees.

7.5 OBJECTIVE 4: THE IMPACT OF SPM INITIATIVES ON PROJECT SUCCESS

Most participants agreed that the introduction of a strategic approach in the organisation, although still very new and not fully implemented, had positively impacted on R and D projects. Other participants rated the impact of SPM as very low, their reasoning being that the process was very new and was as yet to be fully applied in the execution of R and D projects. However, it emerged that what some of the participants were reporting on was the impact of conventional project management practices and not the effect of SPM. For some of the organisations that had introduced the strategic perspective and had developed a strategic plan for R and D projects, the implementation plans were yet to be carried out. This indicates that the impact of the SPM with respect to project success could not be rated and some participants acknowledged this.

This confirmed the non-application of SPM for the execution of R and D projects in PROs in Nigeria. The general notion of all the participants was that the impact of SPM in the execution of successful R and D projects could not be ascertained. The concept of SPM was

still new in PROs and so the rating of the effect of SPM on project success was unavailable. In conclusion, most of the participants agreed that the introduction of SPM in the management of R and D projects had a positive outlook and was expected to enhance project success if effectively implemented.

7.6 OBJECTIVE 5: SPM FRAMEWORK DEVELOPMENT AND VALIDATION

This research proposed to develop an SPM framework for senior project management practitioners that would eliminate barriers and help in the execution of R and D projects in PROs in Nigeria. As discussed earlier, the development of an SPM framework is important in the execution of R and D projects and the theoretical concept of SPM has been discussed widely in previous chapters. The reviewed literature, the survey, and the interview findings revealed that PROs in Nigeria use conventional project management techniques in the execution of R and D projects, although often inadequately implemented. It was evident that there was a need for the inclusion of a strategic approach to the management of R and D projects. Although during the interview some participants reported that an SPM framework was used in their organisation, the explanations they gave, and also the general results of the findings, showed that what was actually in use were traditional routines and procedures. Most of the participants acknowledged that there was no form of framework in place but rather that the organisations used procedures outlined for government organisations. They felt that the development of an SPM framework would enhance the successful execution of R and D projects.

The participants suggested that for the formulation of project teams at the beginning of the project, an SPM process of project execution for R and D projects should be considered, and also that the framework should be simple and easy to understand by all project management practitioners. From the validation results, it emerged that the proposed framework can be effective in the execution of R and D projects. The personal experience of

the participants and the researcher indicates that the proposed SPM framework is important for project management practitioners and will enable them to execute R and D projects effectively, thus helping organisations to achieve sustainable competitive advantage.

An example of this can be seen in the responses from some of the participants indicating that the SPM framework was important and can be used as a structure for the application of the SPM process. According to Kerzner (2001), project management in most successful organisations is no longer an operational tool or method that the organisation uses internally to improve their own performance, but a strategic framework for achieving a competitive advantage in today's business environment. A framework has been found to be a tool in the project management field that can aid organisations achieve sustainable competitive advantage through effective management of projects, and when not achieved affects the organisation's output, However, the researcher is aware that the proposed SPM framework would not instantly change project management practitioners in PROs in Nigeria into high-performing managers, but would gradually aid them in successful execution of R and D projects. The proposed framework and its validation are discussed in the next chapter.

7.7 QUESTIONNAIRE FINDINGS

This section summarises the key themes that emerged from the quantitative findings. These have been summarised under the following headings: the SPM practices in PROs, appointment of project teams, experience and competence of the project team, project planning, project management techniques, communication between the project team and management, and alignment of projects with the organisation's strategy.

7.7.1 SPM practices in public research organisations

Most of the respondents said that SPM was practised in their organisation. However, the findings revealed that what was actually practised were traditional project management

practices which were poorly implemented, with only a maximum of 42.2 per cent of the participants rating the level of implementation to be above average. According to the PMI, application of effective project management aids project activity to meet the project requirements (PMBOK, 2013). The respondents were also in agreement that the success of any project depended on the level of effective application of project management practices. Thus poor implementation of project management practices and non-application of the strategic perspective was a challenge to effective execution of R and D projects. Meeting this challenge will enable research organisations in Nigeria to achieve a competitive advantage in the market place.

The general view of the respondents on project management was that it was a process used to coordinate project activities so as to achieve the desired results. According to Pisano (2012), the growth of organisations in a highly competitive world hinges on superior R and D performance. Thus organisations now employ project management practices in the execution of their projects as they have identified that no organisation can survive without successful projects (Shenhar and Dvir, 2007). Generally, project management is known as the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements (PMBOK® Guide). Projects are the drivers of innovation and change and also make organisations better, stronger and more efficient (Shenhar and Dvir, 2007).

The participants' responses regarding the practical implementation of the process revealed that the quality of project management practices differed between research organisations. This led to some of the respondents rating the level of implementing the processes below average and unacceptable (See Table 5.7b). However, a noticeable difference was observed regarding the ability of the organisations to carry out Environmental Impact Assessment (EIA) for their projects, descriptions of roles and responsibilities for the project team and the preparation and management of project risk. The participants' responses showed that these were not well-implemented in R and D projects, particularly regarding the

preparation and management of project risk. The respondents' low response on the implementation of these activities in their organisations showed that project management practices were not fully implemented.

Of the respondents, 43.5 per cent reported that the development of a project risk plan was not implemented. This has been identified as a critical step towards project execution (Ochieng *et al.*, 2013). This indicates that this critical step in the execution of R and D projects was neglected, and also showed that there is a gap in the implementation of project risk in PROs in Nigeria. However, it is essential to highlight that for effective execution of R and D projects, SPM practices need to be implemented.

7.7.2 Appointment of project teams

The survey findings revealed that the most important factor in the application of SPM was the appointment of project teams, with 76.7 per cent of the participants acknowledging this. This was closely followed by the issue of project funding, at 73.3 per cent (*see Table 5.8)*. This distinction in the level of importance confirmed Medinschi and Colta's (2009) findings that the appointment of project teams is one of the most important steps in the execution of a project. In consequence, the appointment of a project team in PROs will require objectivity, as well as keeping in mind the goal of the project, and considering people with leadership skills who are able to work in teams and withstand pressure. Teams should be made up of people with diverse technical abilities, innovative ideas and the ability to build cohesion and stability in the team. These attributes will enable the management of the organisation to structure the project execution in a way that it will be specific, measurable, attainable, realistic and time-constrained.

7.7.3 Experience and competence of the project team

In this category, the survey result indicated that 65.1 per cent of the participants were of the opinion that effective execution of R and D projects required experienced and competent team members to manage the project. The competence of the project team which will carry out the project skilfully, and with an acceptable level of risk, is an important factor to be considered in the execution of R and D projects. The need for experience and competence in the project team confirms the PMI's (2007) view that competence is important in project management because it represents a cluster of related knowledge, attitudes, skills, and other personal characteristics that affect a major part of job performance. Although competencies have different dimensions, they are known to assist workers in becoming more adept in managing different areas, for example, managing time or the management of risk in a project. There is no one-size-fits-all approach for the execution of R and D projects. According to the participants, the appointment of project teams with the required experience and competence needs to be considered to ensure that projects are successfully executed.

7.7.4 Planning of the project

The survey result showed that the ability to strategically plan for a project was considered important, with 64.1 per cent of the participants stating that project planning was a very important factor. Project planning provides the structure for effective execution of R and D projects. However, a key finding that emerged from this research was the gap in the implementation of project plans. Although participants acknowledged that planning was an important factor, implementation was found to be inadequately carried out in PROs in Nigeria, with only 12.4 per cent of the participants reporting that project plans were implemented to an excellent level.

Some PROs in Nigeria had developed strategic plans for the execution of R and D projects, but the implementation of these plans was yet to be fully achieved. The implementation of strategic plans requires "critical integrative links" to transform the strategic plan into specific,

integrated action steps and established processes that would enable the high-velocity strategic implementation needed for a sustainable competitive advantage (Patton and White, 2002). In order to enhance the preparation of a project plan and also the level of implementation so as to enable them to achieve their strategic project objectives, PROs need to pay attention to planning at an early stage of the project.

7.7.5 Project management methodology

In this category, 54.8 per cent of the participants acknowledged that project management methodology was a very important factor in the application of SPM in PROs in Nigeria. The participants' views confirmed that project management methodology is an important factor for an organisation's success, because it is used in the management of schedules where proper processes are applied to the resource at hand and with the proper people involved (Geraldi *et al*., 2010). According to Milosevic and Srivannaboon (2006), the essence of project management procedure is to support the execution of an organisation's competitive strategy to deliver the desired outcome (i.e. fast time-to-market, high-quality, low-cost products). From the survey findings, project management methodology was required to enable project management practitioners to define, document and discover a set of policies, practices, processes, tools, techniques and templates that provide guidance on how projects are run within an organisation.

7.7.6 Communication between the project team and management

The importance of effective communication between the project team and management was evident in the response of the participants, with 61.8 per cent of the participants acknowledging that good communication between the project team and senior management is an important factor in the application of SPM. This also indicated that the involvement of senior management in the organisation was necessary to ensure effective execution of R and D projects. Senior management involvement and support in projects is considered as

one of the critical success factors in project management, as it can significantly improve project success (Zwikael, 2008). The importance of management support, and effective communication with the project team in PROs, would encourage project management practitioners to actively engage with the execution of R and D projects. For example, Kerzner (2006) suggests that senior management should take action on request, assist in conflict resolution, and provide continuous feedback. Management involvement and support in research organisations in areas such as allocating resources, and fostering trust and commitment has also been emphasised in strategic management and marketing studies (McIvor and Humphreys, 2004; Chen *et al*., 2011).

7.7.7 Alignment of projects with the organisation's strategy

The survey findings revealed that 53.1 per cent of the respondents were of the opinion that the R and D projects implemented were in line with their organisation's strategy. The strategic alignment of projects is an important factor, and also the most difficult to implement (Brown, 2007). The findings from the research showed that the alignment of project strategy with corporate strategy was poorly carried out, highlighting the difficulty in its implementation. Shenhar (2000) identified the non-alignment of project strategy with organisational strategy as the missing link and the main cause of most project failure. In order to accomplish this task of strategically aligning R and D projects to the organisation's mandate, research organisations must review their R and D projects and ensure alignment with the organisational strategy to determine their value to the organisation and wider society. According to Morris (2005), project management must be about delivering business benefit through projects, and this involves managing the project definition as well as downstream implementation.

It is worth mentioning that the inability of PROs in Nigeria to align their R and D projects strategy with organisational strategy would affect them adversely in achieving their strategic

objectives, and also in attaining competitive advantage. In this study, the alignment of project strategy with the organisation's strategy, which is key to SPM, received an average response score from the respondents. On the other hand, 6.6 per cent of the participants were not in agreement, indicating that some of the R and D projects carried out were not strategically aligned with the organisation's strategy. Project strategy has been found to be a direction in a project that contributes to the success of the project in its environment (Artto, *et al.*, 2007), and its alignment with the organisation's objectives will enhance project success. Pisano (2012) also argued that R and D strategy is an essential ingredient for achieving superior performance.

The study highlighted the importance of R and D project strategy, which is key to SPM, and if implemented, would enhance the successful execution of R and D projects. Generally, the view of the respondents was that the lack of appropriate application of SPM in PROs was a concern. In order to address this, some organisations have introduced a strategic approach in the execution of R and D projects, developing a strategic plan that will enable them to achieve a competitive advantage and also contribute to the economic growth of Nigeria.

7.8 IMPLICATIONS FOR THE THEORY

This study explored the application of the SPM concept in the management of R and D projects in PROs. The research findings highlighted the poor implementation of project management practices in PROs in Nigeria, thus indicating the importance of further theoretical and empirical investigation of SPM practices in PROs. With global economic, social and environmental pressure, PROs need to understand that the application of the discipline of project management has changed dramatically, in response to the dynamic and competitive nature of today's environment, developing management processes, and ideas related to the implementation of organisational development and strategic change (Amarasmiya and Jayawadane, 2011).

SPM, which is a tool in the project management field, has been found to aid organisations to achieve sustainable competitive advantage through effective management of projects, which when not attained, affect the organisation's output. The factors that can affect the application of SPM, as earlier discussed in the qualitative findings in Chapter Six, are lack of proper understanding of project management principles and SPM concepts, lack of experienced project management personnel, lack of funds, lack of current information of project management practices, employees' resistance, lack of employee training, non-motivation of employees, lack of conducive environment and political interference.

7.9 IMPLICATIONS FOR PRACTICE

The emphasis of the project management discipline has recently been on information technology, construction, and engineering, with little or no attention to research and development projects. Yet one of the issues that organisations are striving to address is improving innovation performance, and innovations are hinged on R and D performance (Pisano, 2012). PROs are now under pressure to enhance their R and D performance. As discussed in this research, research organisations have come to understand that no organisation survives without successful projects, and therefore they have adopted the injection of the strategic perspective into the management of R and D projects so as to enhance their performance. Some of the key issues that affect the effective application of SPM in the execution of R and D projects have been identified and this research provides strategies to address them.

The SPM framework proposed, emerged from the existing practices employed in the research organisations, highlighting the views of the project management practitioners in PROs in Nigeria on the importance of SPM. This research also revealed the opinion of the project management practitioners about the importance of formulating a project team and

developing a project strategy at the initiation of a project. This gives PROs the opportunity to review the current structure employed in the execution of R and D projects and adopt a project-based structure that will enhance their performance. The application of SPM in the execution of R and D projects, if effectively implemented, will enhance successful execution and improve organisational performance.

7.10 THE WAY FORWARD

This study has demonstrated the importance of SPM application in the execution of R and D projects in PROs in Nigeria. As established in this research, PROs are known for executing R and D projects and have been found to have a wider role in innovation systems than just providing technologies to industrial sectors and individual businesses. From the literature reviewed, it emerged that organisations have found that the traditional project management method is not sufficient in the management and execution of projects, thus the focus is on the strategic perspective.

In this study, the findings revealed some of the challenges that hindered the implementation of strategy in the management of R and D projects. Furthermore, it also showed that lack of knowledge of project management principles and the SPM concept were a major challenge in the effective execution of R and D projects. In addressing the issues, strategies for enhancing the application of SPM in the execution of R and D projects need to consider the organisational structure practised by the PROs, management or leadership style, formulation of project teams, R and D strategy, employees' motivation, SPM process and the use of a standard SPM framework.

Organisations need to motivate and train their employees in the SPM concept, in order to aid the effective implementation of R and D projects. In addition, PROs need to pay attention to project planning at the initiation phase, ensure that strategic leaders and projects teams to

execute the projects are in place, and also create R and D project strategies which will enhance organisational performance. The evidence in this research has demonstrated that PROs have found that the development of project teams, and creating R and D project strategies, are essential ingredients in the successful execution of R and D projects.

It can be seen that there is a need for project management practitioners in PROs in Nigeria to adopt the SPM concept in the execution of R and D projects. For example, it has been suggested that the development of project teams competent and experienced in project management techniques at the beginning of the project will help in the planning and effective application of SPM for R and D projects. It was also acknowledged that project funding, alignment with organisational strategy, prioritisation and selection of projects, R and D project strategy, adoption of project management methodology, a strategic project leader, and motivation of employees depend on management involvement in project organisation.

On project funding, which is the most important aspect indicated by respondents, PROs should set aside funds for the prioritised and selected R and D projects at inception. This will ensure that there are adequate funds for project execution. The crucial point is that all the above variables mentioned must be considered at the initiation phase if the R and D project's chances of success are to be optimised. As recommended, the application of the proposed SPM framework will assist project management practitioners in the implementation and execution of R and D projects in PROs.

7.11 CHAPTER SUMMARY

This chapter discussed the findings of the quantitative and qualitative research carried out in this study. From the research findings, it could be see that there was a gap in the relationship between SPM theory and practice. The key determinants associated with the implementation of SPM were identified and the factors that affected the application of SPM

in PROs were also identified. The chapter also discussed the implications for theory and practice, and outlined the limitations of the study. Despite the limitations, a way forward for project management practitioners in PROs was proposed. A framework is proposed in the following chapter, which lays out the relationships among the key variables identified in Chapters Five and Six. The framework proposed provides a structured approach to the management of R and D projects in PROs in Nigeria.

CHAPTER EIGHT: FRAMEWORK DEVELOPMENT AND VERIFICATION

8.1 INTRODUCTION

This chapter provides a description of the proposed SPM framework for project management practitioners to use in the management of R and D projects. The purpose of developing an SPM framework is discussed and also the key factors to be considered in proposing the framework. In order to assess its practicality, suitability and effectiveness, the subsequent part of the chapter focuses on data verification and validation. The verification and validation exercise is important because it provides ways in which to measure the quality of knowledge in a knowledge base, and to indicate where work needs to be done to rectify anomalous knowledge (Preece, 2001).

8.2 THE PURPOSE OF SPM FRAMEWORK

For research organisations to create optimal value from their investment in R and D projects there must be a clear link between the outputs created by the projects and the requirements of the organisations' corporate strategies (Too and Weaver, 2014). This means that organisations require a standard framework in place that will enable them to deliver their projects effectively, realise their investment in the projects and also achieve the organisations' strategic aims. Currently, there is significant growth in the adoption of project management disciplines to achieve objectives in different sectors and organisations (Winter and Szczepanek, 2008), and the project management model has been found to be ineffective in handling projects (Grundy and Brown, 2002; Resch, 2011; Moore, 2010).

This is due to economic, social and environmental pressures and the need to reduce time-to-market. Projects rarely operate in isolation within an organisation; instead they are usually delivered to satisfy broader strategic priorities (Office of Government Commerce, 2007, 2009). These pressures have led to organisations increasing the number of projects conducted simultaneously, and consequently the complexity of managing their

interdependencies and multiple implementations (Platje *et al*., 1994; Turner and Speiser, 1992), necessitating a strategic perspective that will enable organisations to achieve a competitive advantage.

The management of multiple projects – including programme management and portfolio management – is now the dominant model in many organisations for strategy implementation, economic transformation, continuous improvement and new product development (Winter *et al*., 2006). As the use of R and D projects grows, the value created by these projects is subjected to greater scrutiny. For example, through action research Marnewick and Labuschagne (2008) found that many projects were not completed within the defined time and budget and did not deliver the expected benefits to the organisation. This appears to be largely due to the fact that projects are disconnected, managed as silos (Knodel, 2004), or are not managed within the necessary framework to deliver the desired result.

Although there are a number of frameworks used for strategic analysis and strategy development, there have been very few frameworks created for deployment that are widely accepted by project management practitioners (Saunders and Mann, 2006). Research has also shown that there has been no development of a generally accepted framework for implementing strategy at either corporate or operational level (Minarro-Viseras *et al.,* 2005; Noble, 1999; Okumus, 2003; Wilson, 1994; Saunders and Mann, 2006). This has revealed a gap within the project management discipline for the development of an acceptable framework for use in strategic analysis and project development.

The framework is developed using the key variables identified in the project management practices as shown in Table 5.7b, factors that can affect the application of SPM (see Table 5.8) and also the key themes that emerged from the qualitative analysis (see Table 6.2). The framework outlined precisely the variables that contributed to SPM application and how

project management practitioners in PROs can apply that framework for the effective execution of R and D projects. The framework is developed from the key variables associated with SPM, identified in the quantitative and qualitative analysis.

As discussed in Chapter Seven, the effective application of SPM in the execution of R and D projects in PROs depends on the establishment of identifiable SPM practices. As highlighted in Table 8.1, these have been regarded as the components of SPM and have been grouped under the following categories: organisational structure, management involvement and strategic project leadership style, appointment of project team and team competence, project alignment with organisational strategy, project prioritisation and selection, project management principles and a solid SPM process.

From the quantitative and qualitative findings of this research, for effective implementation of SPM in PROs in Nigeria, the evaluation and prioritisation of an organisation's R and D projects are required, together with an understanding of its overall corporate strategy. Lack of knowledge of project management principles and SPM concepts were observed, suggesting the need to train project management practitioners in order to achieve the effective execution of R and D projects. Participants further suggested that a lack of understanding of the practical application of the SPM concepts in the execution of R and D projects was a problem. To address this, there is the need to propose a framework that would:

- Assist project management practitioners in PROs in Nigeria to minimise barriers that affect the execution of R and D projects.
- Ensure that projects selected for execution align with the organisational strategy.
- Help to ensure uniformity of process in the organisation.
- Enhance successful execution of R and D projects.

Table 8.1: SPM application variables

Organisational Structure ▪ Optimal and flexible structure ▪ Adequate delegation of authority ▪ Open to innovation ▪ Establishment of a strategic project management office (SPMO)	**Top Management Involvement** ▪ Appoint committed executives ▪ Ensure good communication channels ▪ Formulate organisation's strategy ▪ Identify strategic projects ▪ Motivate employees ▪ Maintain a good working relationship between executives and staff
Strategic Project Leadership Style ▪ Dynamic adaptation leadership ▪ Motivational leadership ▪ Team building leader ▪ Visionary leadership ▪ Business-focus leadership	**Appointment of Project Team** ▪ Selection of project teams with leadership skills ▪ Ability to work in teams ▪ Ability to withstand pressures ▪ Appoint teams with diverse technical abilities ▪ Innovative project team ▪ Build cohesion and stability in team working Establish a cross-functional steering team
Project Team Competence ▪ Project management training ▪ Professional training based on the mandate of the organisation ▪ Training and retraining of employees ▪ Employment of professional project managers ▪ Project teams to have access to modern technology ▪ Build competencies for the future	**Project Alignment with Organisational Strategy** ▪ Identification of project strategy ▪ Identification of organisation's strategy ▪ Alignment of project strategy with the organisations strategy ▪ Ensure projects are achievable
Project Prioritisation and Selection ▪ Grouping of strategic projects into portfolios ▪ Prioritisation of strategic projects ▪ Selection of projects that will address the organisational strategic goals ▪ Systematic thoughts based on organisational needs ▪ Select projects to create new products that will address an economic need	**Project Management Processes** ▪ Provide proven processes and techniques ▪ Managing change, issues and risk ▪ Managing the project life cycle ▪ Managing the resources and communication aspects
Maximising R and D in the Organisation ▪ R&D culture ▪ R&D processes ▪ Resources (People) ▪ Information system ▪ R&D Key Performance Indicators (KPIs)	**An SPM Process** ▪ Defining the project ▪ Create project strategy ▪ Project planning ▪ Project implementation ▪ Monitoring and control ▪ Review and learning

8.3 KEY CONSIDERATIONS IN THE PROPOSED INTEGRATED SPM FRAMEWORK

A basic framework necessary for the implementation of SPM concepts in an organisation needs to combine strategic and project management principles with tactical project alignment (Brown, 2007), to adopt project portfolio management (Garfein, 2007) and to develop strategic project leadership (Green, 2005; Shenhar, 2012). This is to enable the organisations to successfully select and implement their projects. An example can be seen in the qualitative findings in Chapter Six, in which the project governance lies more with the Chief Executive of the research organisations. They decide on the key functions of the organisation, the R and D project that will be executed, funded and supported. To address

this, a standard model that ensures uniformity of process is required to ensure that selected projects align with the organisation's strategy and are executed successfully.

For a framework that can assist project management practitioners in PROs in Nigeria, the following components were considered and used to develop the SPM framework: strategic project leadership, appointment of project teams at the beginning of the project, project team competences, strategic alignment of projects, strategic project portfolio management and maximisation of R and D strategy in the organisation. The conventional tools of project management provide a universal formal part of the profession (Shenhar, 2012), but have been found to be insufficient in dealing with social, economic and environmental issues, or in addressing dynamic business requirements. Considering that R and D projects are risky by nature (OKLC, 2008), and are unpredictable, inconsistent and involve a great deal of uncertainty and complexity (Shenhar, 2012), a more strategic approach was required that, if correctly implemented, would ensure effective execution of the projects. Figure 8.1 highlights the key components of SPM framework in the execution of R and D projects in PROs in Nigeria.

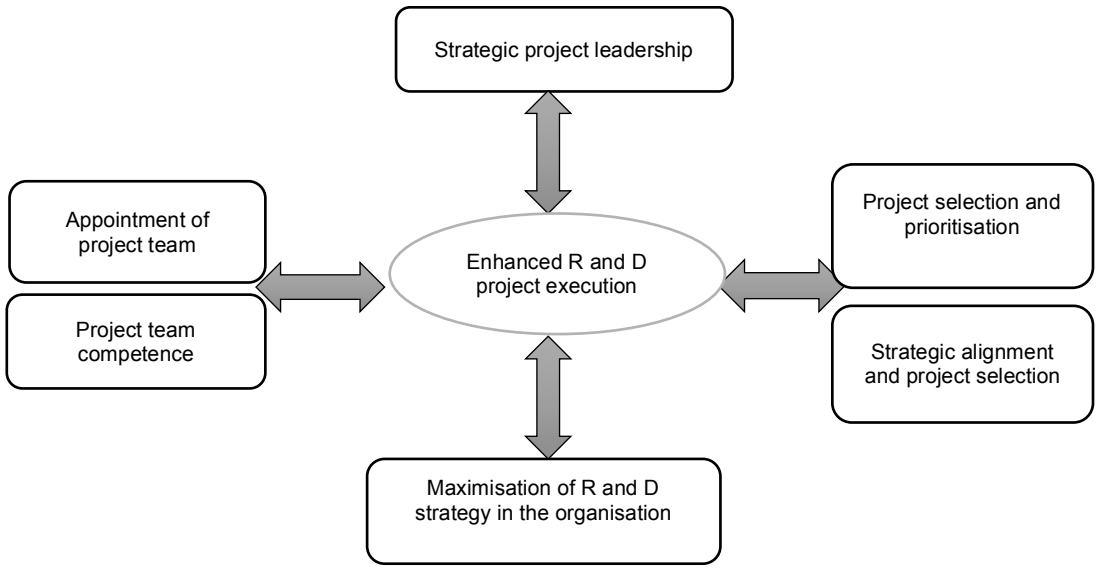

Figure 8.1: The key components of the SPM framework

The proposed framework considers the key components of SPM at the operational level for effective implementation. The components would help to enhance the SPM process and promote the successful execution of R and D projects in PROs in Nigeria. As discussed in the analysis chapters (Five and Six), for a research organisation to perform well there is the need for an optimal and flexible organisational structure that will enable it to respond to changes and attain a competitive advantage. Based on the quantitative and qualitative findings, the researcher was able to develop a detailed integrated SPM framework that is simple and easy to implement (*see Figure 8.2*). The key components of the proposed framework were identified and discussed in detail within the research findings (Chapters Five, Six and Seven), and the result revealed that a project-based organisational structure, coupled with management involvement, was very important and would serve as a platform for the successful implementation of SPM in R and D projects. The integration of project management techniques and SPM aimed to provide a comprehensive approach to the application of SPM in the execution of R and D projects. Although the framework was based on major findings from the survey, the need to validate the data was essential for the improvement of the framework and for the exploration of the opinions of experienced and skilled project management practitioners in PROs. The next section presents the verification and validation process and the results.

8.4 VERIFICATION AND VALIDATION OBJECTIVES

The verification and validation of the research findings was carried out to achieve the following objectives, which are in alignment with the key research objectives in Chapter One.

- To present all the information gathered from the research survey.
- To ensure that the proposed framework fulfils the requirements of PROs for which the study was originally conducted.
- To validate the applicability of the proposed framework in real-life situations.

- To achieve an agreement on framework requirements and ensure generic applicability.
- To verify the purpose for which the framework was developed.
- To confirm if the framework will be applicable to other research organisations.

8.5 VERIFICATION AND VALIDATION PROCESS

The process of verification and validation of the SPM framework was carried out in four stages as described below.

Stage 1

A phone call was made to the participants who were originally involved in this study to explain the purpose of the exercise and also to agree on a date for the framework verification workshop. The verification questionnaire was sent out in advance to each organisation for collection during the session.

Stage 2

The findings from both the quantitative and qualitative research on the application of SPM in PROs in Nigeria were compiled and presented to project management practitioners. A quantitative approach using a verification questionnaire was adopted to assess the project management practices and SPM application variables for the execution of R and D projects. This was presented to each of the main participants of the study (***see Appendix G***). The use of questionnaires aimed to measure the participants' level of agreement on the variables that were identified in the analysis. The verification process employed a psychometric scale known as a 'Likert Scale' to ensure that all the variables identified from the findings were measured. Participants were asked to indicate the level of agreement on each variable using a scale of 1-5 where 1 is for 'strongly disagree', 2 'disagree', 3 'uncertain', 4 'agree' and 5 'strongly agree'. The employment of the questionnaire ensured that participants expressed their opinions on the proposed framework freely and frankly.

Stage 3

The verification of the framework was accomplished through workshops with participants from the selected PROs in Nigeria. Those involved were the participants who took part in interviews carried out in this study and the details of their profiles are provided in Tables 4.7 and 4.8. The session involved a thirty-minute presentation by the researcher on the proposed framework. This was followed by a one-hour discussion, review, and critique of the framework. In the questionnaire (***see Appendix G***) used for the verification of the framework, the following issues were addressed:

- A project-based organisational structure.
- Management involvement.
- Appointment of project teams.
- The development of a project-based organisational structure through strategic project leadership.
- Strategic alignment of projects and project selection.
- R&D project strategy formulation.
- Strategic project portfolio management that will aid in the prioritisation and selection of R and D projects.
- Adoption of standard project management principles.
- R&D project implementation through SPM process.

Stage 4

The final stage of the research process is the validation of the framework. This session used a focus group, which involved a thirty-minute presentation given by the researcher to a group of project management practitioners that were not involved in the study. There were a total of twenty participants from the selected PROs that attended the session. The validation questionnaire assessing the proposed SPM framework was presented to the project directors and other project management practitioners. The Likert uni-dimensional scale was employed

in the validation questionnaire (***see Appendix H***) because it ensured that all items were of equal measure. The use of Likert Scale eliminated the need for judges by placing respondents on an attitude continuum for each statement running from 'strongly agree' to 'strongly disagree' as described by the following (Oppenheim, 2003):

Strongly agree – respondent had no doubt about the certainty of the question being asked.

Agree – respondent generally agreed with the issue or principle underlying the issue in question.

Uncertain – respondent was not sure but could not confirm or deny the certainty of the issue under discussion or in question.

Disagree – respondent did not agree with the issue or the principle underlining the issue being discussed or asked.

Strongly disagree – respondent was completely aware that the issue under consideration was not possible from his/her perspective.

Respondents

The validation of the framework was conducted through a focus group discussion and, using the questionnaire, the following variables were evaluated (***see Appendix H***) to assess the SPM framework and the means by which the content and design may be improved.

- The development of a project-based organisational structure.
- Management involvement in the execution of projects.
- Appointment of project teams at the beginning of the project.
- The appointment of a strategic project leadership.
- Strategic alignment of projects and project selection.
- Maximising R&D strategy in the organisation.
- Adoption of standard project management principles.
- R&D project implementation through SPM process.

- The factors identified enhancing the application of SPM in the execution of R and D projects.
- Readability and clarity of the SPM framework.
- Applicability of the framework.

The details of the participants who participated in the validation session are provided in Table 8.2 below.

Table 8.2: Profile of validation questionnaire respondents

Participants (Senior Project Management Practitioners)	Projects Carried Out by the Organisation
Organisation A	R and D on food and allied processing technology
Organisation B	R and D in capital goods research, production and reverse engineering
Organisation C	R and D of locally available raw materials in Nigeria
Organisation D	R and D activities involving the highest level of technologies available in the world with a view to strengthening the technological base of the Nigerian economy

8.6 VERIFICATION AND VALIDATION RESULTS

The verification and validation results as shown in Tables 8.3 and 8.4 revealed that the participants accepted the SPM framework. The participants also acknowledged that the SPM framework would be of value to research organisations, stating that the framework will enhance the execution of R and D projects, improve project monitoring and evaluation and enhance employee's competences and capabilities. However, there were some suggestions on how the SPM framework can be further improved. The participants suggested the following improvements:

- The need to select one project from each of the selected organisations and apply the framework from conception through to completion, on the grounds that it is only through the practical example of its implementation that the framework will be fully understood and areas of improvement highlighted if any.
- The framework should include the processes of monitoring and evaluation.
- To collapse the framework into a simpler structure for ease of understanding by the project management practitioners.

- The need for the framework to be sufficiently flexible to accommodate unforeseen changes that may occur during implementation.

Furthermore, the participants acknowledged that the aim of developing an SPM framework was to aid project management practitioners minimise barriers, manage and effectively execute R and D projects. The general response of the participants on the key components of the SPM framework was between strongly agree and agree, with an overall average score of 4.49, which equates to 89.7 per cent. The response on the validation of the SPM framework design was rated with a total score of 4.24, which is 84.7 per cent.

As argued in this study, factors identified as affecting the application of SPM in the execution of R and D projects can lead to poor project performance. Thus, the key elements that emerged from the verification process were sorted and grouped into nine main categories: project-based organisational structure, management involvement, strategic project leadership, appointment of project team, alignment of projects with organisational strategy, project selection and prioritisation, maximising R and D strategy in the organisation, project management principles and SPM process. These nine categories were found to be connected to each other and have been reported together. Table 8.3 (***See Appendix I)*** shows the responses of project management practitioners to the SPM key variables in PROs in Nigeria.

8.6.1 Project-based organisational structure

From the verification result shown in Table 8.3 (***Appendix I***), participants' responses to the need for a project-based organisational structure in PROs were to either strongly agree or agree, with a total score of 4.39, which is 87.5 per cent acceptance. However, of those variables that would enable the organisations to achieve a project-based structure, the need for an efficient communication structure and the organisations' openness to innovation had the highest rating. Suggestions for the establishment of a strategic project management

office (SPMO) that would ensure effective coordination and management of R and D projects also received a favourable response. Notwithstanding, the overall view of participants was that, for an effective execution of R and D projects, there was the need for a project-based structure.

During the discussion, although the majority of the participants favoured the establishment of an SPMO, the project directors specifically argued that the establishment of an SPMO was not required in a project-based organisational structure. Their justification was that its inclusion would distort the organisational structure, suggesting that a division within a planning department could carry out the functions of an SPMO. As discussed earlier in this study, there is a misconception among PROs in Nigeria regarding SPM techniques and their application. This could explain why, for those organisations that have initiated SPM for the effective execution of R and D projects, its implementation has remained a challenge.

8.6.2 Management involvement

On the subject of management involvement in the execution of R and D projects, the majority of participants affirmed that management involvement was an important factor in SPM. Although the widely held response was to either strongly agree or agree, participant 1 strongly disagreed with one of the variables, that of employee motivation being a factor within management involvement, stating that it was not required. The importance of management involvement cannot be overemphasised as some participants argued that, in areas where the management was not involved, executing the project would be difficult. During the discussion, two participants (1 and 10) suggested that management involvement would contribute to the effective execution of R and D projects. Furthermore, from the result of the workshop (Table 8.3), it could be observed that there was no significant difference, as all the participants acknowledged that management involvement was an important factor.

8.6.3 Strategic project leadership

From the verification results (Table 8.3), the participants' preferences for and reliance upon dynamic, motivational, team building, inspirational, visionary and business-focused leadership styles in PROs were evident. Although a large majority of the participants favoured dynamic, motivational, team building and inspirational leadership styles, interestingly, during the discussion some participants did not agree with the visionary and business-focused leadership styles. It would seem that the four styles were favoured by participants because these allowed them to gain a greater level of commitment and motivation from their project leader.

The PROs have been found to operate within a functional structure that has a long-standing reputation for being adversarial, as demonstrated by weak relationships between employees. This has led to numerous problems including poor project performance. However, participants' suggestions were that those factors that may influence the type of leadership style could depend upon relationships between project teams, the type of R and D project, the project duration, and the knowledge of both the leader and the team.

8.6.4 Appointment of project team

There was a consensus during the meeting that, in order to appoint a project team, the selection and composition of the teams should be based on leadership skills, an ability to innovate, and the ability to work in a team. From the verification findings, all the participants acknowledged that the appointment of project team was an important factor in SPM. This was reflected in the participants' response in the verification questionnaire, where 'the selection of project team with leadership skills', 'ability to work in teams' had the highest scores in the verification exercise followed by 'innovative project team'. Reflecting on their experiences, the participants' view was that team selection in PROs was based on leadership skills and the ability to work in teams.

The establishment of a cross-functional steering team received the lowest score, with some participants suggesting that the ability to establish a cross-functional steering team was not an important factor to consider during the selection and appointment of project teams. Although some of the participants failed to rate 'building cohesion and stability in team working' in their questionnaires, during the discussion they expressed the need for teams to build a cohesive and stable team. This means that, although some of the variables were scored lower than others, the general view was that the variables were important, with an average score of 89.3 per cent for the 'appointment of projects teams' in SPM.

8.6.5 Alignment of projects with organisation's strategy

The alignment of a project strategy with the organisation's overall strategy was rated as the highest important variable during the verification exercise (Table 8.3). The responses, ranging from agreed to strongly agree, indicated that the variable was key to the concept of SPM. During the discussions, participants further highlighted its importance in helping organisations enhance their performance in the strategic management of R and D projects. From the verification result, it can be seen that all the participants acknowledged the need to align projects with an organisation's strategy. Some of the project directors present at the meetings recognised that their organisation's performance stood to gain by ensuring that projects were aligned with the organisation's strategy. Referring to their experience, the participants suggested that this part of the framework had been found to be effective in practice. In reality, the participants emphasised that R and D project performance depends on the effective alignment of projects with the organisational strategy.

8.6.6 Project selection and prioritisation

With respect to the selection and prioritisation of projects, the participants agreed that the prioritisation of strategic projects and the selection of projects to address the organisational strategic goals were key in the strategic management of R and D projects. In Table 8.3, it

can be seen that these two variables received the highest score. This illustrates that, in order to achieve an effective project performance, it is essential to select and prioritise strategic projects in order to create new products that will address the economic need of the country. In general, the participants agreed that the project selection and prioritisation was an important dimension to the strategic management of R and D projects. Referring to their experience, the participants recommended that this element within an SPM framework was an effective variable in practice.

8.6.7 Maximising R and D in the organisation

Within the context of an SPM framework, in response to the variable 'maximising R and D strategy in the organisation', the participants' rating was not as high as the other variables, leading to this being the lowest scored variable in the verification questionnaire. Although the total percentage score was 87.2 per cent, this was the lowest variable among all the factors in the SPM framework. However, during the discussion, participants argued that the maximisation of R and D depends on resources (people) and the R and D process employed in the organisation. This echoed the responses in the questionnaire and reflected on the scores as shown in Table 8.3.

8.6.8 Project management principles

Among the variables discussed as important factors in the development of an SPM framework, the participants agreed that the need to 'provide proven process and techniques' was a key element. From the results in Table 8.3, it can be seen that all the participants agreed that project management principles depended on the four variables identified within this particular category. During the discussion, participants also emphasised that risk management and quality management were also significant factors that would contribute to successful implementation of project management principles in an SPM framework. Although some participants did not fully endorse some of the variables contributing to the project

management principles, the general response was that all the variables were required to some degree. In general this showed that a project management principle was an important factor in an SPM framework.

8.6.9 Strategic project management process

In addressing the SPM process, almost all the participants agreed that the SPM process is essential to achieving strategic management of R and D projects. It was not surprising to see that, when the participants reflected on their personal experiences of project execution, they associated some of the variables with effective R and D project performance. The factors emerging from this category indicate that the framework needs to address both project implementation and the monitoring and control of projects. From the results, it was found that these variables were rated highly, indicating their importance to the strategic management of projects. Furthermore, from the verification table, the participants agreed with the SPM framework variables identified in this study. In addition, during the discussions the researcher observed that the participants agreed with all the factors identified as necessary for the development of an SPM framework. The participants also acknowledged that an enhanced project performance could be achieved if the six categories at the operational level (Figure 8.1) were combined and managed effectively. Furthermore, there was also a consensus that the initial focus should be on the nine variables discussed in this section.

8.6.10 Validation results

Table 8.4 is a representation of the assessment of the proposed SPM framework for PROs in Nigeria. There were twenty participants who participated in the validation exercise. The SPM framework validation result describes how the effective execution of R and D projects were perceived by project management practitioners in Nigeria. Table 8.4 illustrates that participants acknowledged that the framework highlighted several key factors of SPM that are required in order to enhance the execution of R and D projects in PROs in Nigeria.

However, 4 participants (1, 2, 4, and 18) were of the view that, although the framework presented a useful means of enhancing the execution of R and D projects, a practical example was required to enable project management practitioners to compare those projects executed using the framework against those completed under the old project system, and also to highlight areas of improvement, if any. This, they suggested, would also provide a better understanding of the framework, but emphasised that training would be needed prior to its full implementation. Interestingly, during the discussions, participants acknowledged that there is an increased need to extend this to other research organisations, aside from the Federal Ministries of Science and Technology in Nigeria, to enable them work together. In their opinion, the framework provided a generic application and established a basis for the execution of R and D projects.

Table 8.4: Validation result

The development of SPM framework will require which of the following	**Participants' Level of Agreement**																				**Average Scores**	
The development of a project-based organisational structure	5	5	5	4	5	5	5	5	5	4	5	5	5	4	4	3	5	5	4	4	4.6	92%
Management involvement	5	5	5	4	5	5	5	5	5	5	5	5	5	4	5	5	4	5	5	5	4.85	97%
Appointment of project teams	5	5	5	5	4	5	5	5	5	5	4	4	5	5	4	4	5	5	5	5	4.75	95%
Appointment of strategic project leadership	5	4	5	5	5	5	5	5	5	5	5	4	4	5	4	4	4	5	5	5	4.7	94%
Strategic alignment of projects	5	4	5	5	5	5	5	5	5	5	4	4	4	4	4	4	4	5	5	5	4.6	92%
Prioritisation and selection of R and D projects	3	4	5	5	5	5	5	5	5	5	4	4	5	5	4	4	4	5	5	5	4.6	92%
Maximising the R and D strategy in the organisation	5	4	5	5	3	5	5	5	5	5	4	3	4	3	4	4	5	5	5	4	4.4	88%
Adoption of standard project management principles	5	4	4	5	4	5	4	5	5	5	4	4	5	3	4	5	3	5	5	5	4.45	89%
R&D project implementation through SPM process	3	5	5	5	5	5	5	5	5	5	4	4	4	3	3	4	5	5	5	4	4.45	89%
The factors identified can help to enhance the application of SPM in the execution of R and D projects	4	4	4	4	3	5	5	4	5	5	4	3	3	3	4	4	5	5	5	4	3.9	78%
The SPM framework is easy to understand and follow	1	4	3	2	2	4	4	4	4	4	5	4	4	3	3	3	4	4	4	4	3.3	66%
The SPM framework can be employed without much training	1	5	3	2	4	2	2	3	2	4	5	3	3	2	3	2	4	4	2	2	2.1	42%
The SPM framework provides a generic structure	5	5	2	4	5	5	4	3	4	5	5	4	4	5	3	3	3	5	5	4	4.15	83%
The framework provides a basis for future research on the application of SPM in PROs	5	5	3	5	5	5	5	5	5	5	4	4	3	3	4	4	5	5	5	4	4.45	89%

Reflecting on their personal experiences, the majority of participants agreed that the proposed framework, which could be generally applied, would help to streamline R and D

activities through improved management and control and thus ensure greater R and D project success. With the increasing need for their organisations to perform better, participants affirmed that the SPM framework provides a background for further research on the strategic management of R and D projects. The results revealed by the verification and validation exercise suggest that there is the need for researchers in PROs to advance beyond the mere conventional management of projects to a more enhanced and strategic management style, as this will enable PROs to achieve a sustainable competitive advantage.

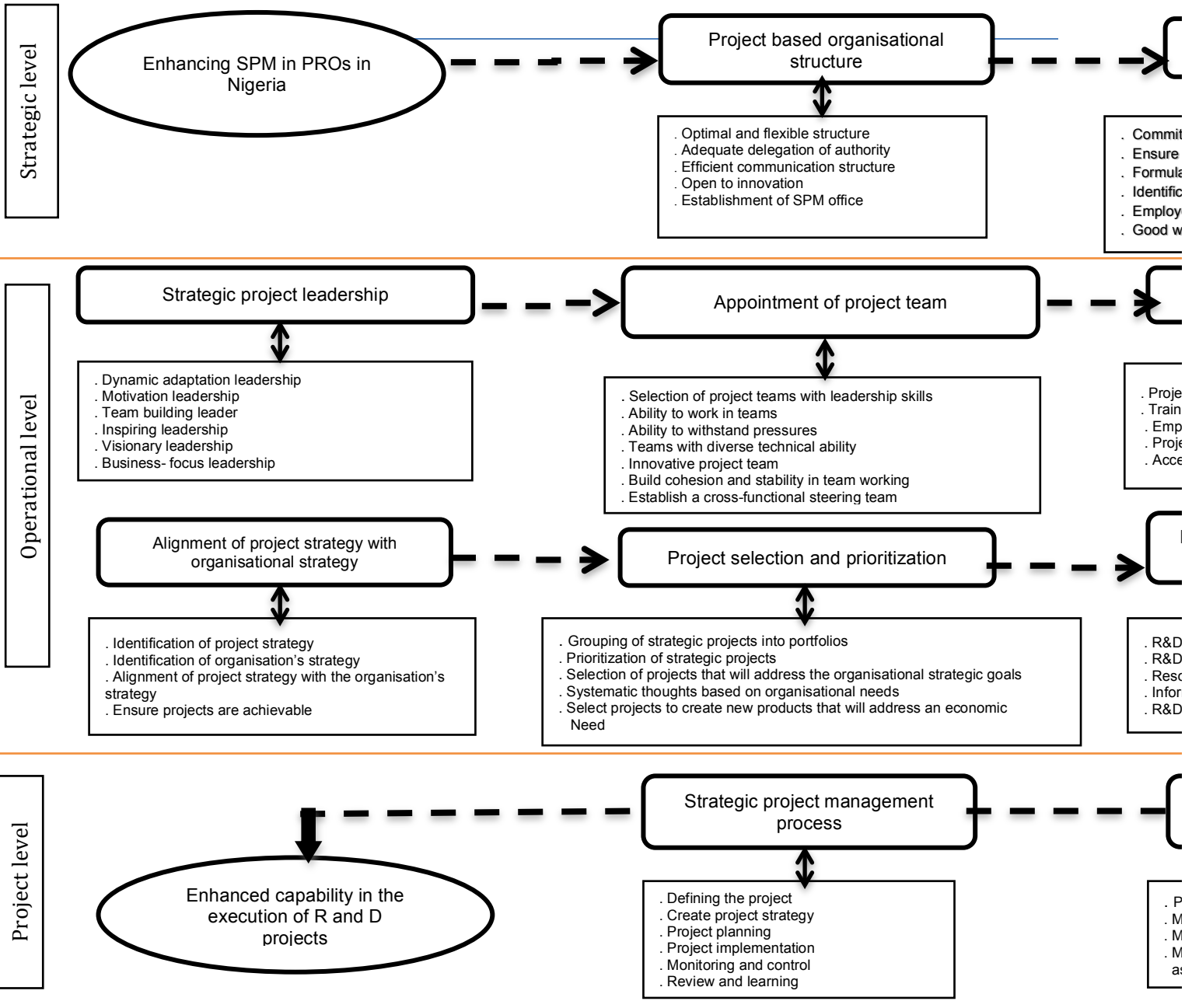

Figure 8.2: The Proposed Strategic Project Management Framework

8.7 THE STRATEGIC PROJECT MANAGEMENT (SPM) FRAMEWORK

The SPM framework is presented in Figure 8.2 and is based on the verification and validation process. The results of the respondents' responses are shown in Table 8.3 and 8.4. The development step of the framework is outlined, and the purpose of the SPM framework discussed in section 8.2, with an overview of the categories within an SPM framework presented in section 8.3. Finally, the next section discusses the implications for the use of the final SPM framework.

8.8 FRAMEWORK IMPLICATIONS

The growing trend in enhancing innovation, is giving rise to a need for the effective and successful execution of R and D projects. The proposed framework in this study has implications for project management practitioners working in PROs and is committed to enhancing the success rate of R and D projects. It is not suggested that the use of an SPM framework by project management practitioners in PROs will result in an instant understanding and awareness of what is required of them. However, the proposed SPM framework would provide the project management practitioners with a wealth of experience in a condensed and simplified format, which may be used as a guide toward the successful execution of R and D projects. In turn, this could improve the performance of the project management practitioners themselves, which would further guarantee project success. As affirmed by the participants during validation process, it is expected that, in applying the SPM framework, its value could be of immense benefit to the PROs in Nigeria. It could achieve a more focused R and D objective that would yield improved results and enhanced competences and capabilities. Furthermore, it could ensure effective project management and allow project management practitioners in PROs to consistently reach high performance levels.

8.9 CHAPTER SUMMARY

This chapter presents the SPM Framework, which is based on the case study findings and the development of a framework for project management practitioners in PROs in Nigeria. The results obtained from the verification and validation exercise of the outline SPM framework were presented together with the final framework based on that validation process. The aim of the verification and validation was to measure the extent to which the proposed SPM framework is considered to be valuable, complete, practical, and adequate.

The proposed framework was intended to provide project management practitioners in PROs with an understanding of the process of managing and executing R and D projects effectively. As illustrated in the verification and validation results, the participants expressed willingness and a capacity to incorporate the SPM framework into their organisations. Finally, the SPM framework is expected to provide project management practitioners in PROs with a clear and simple set of guidelines to improve the probability of project success. This chapter concludes with a discussion of the implications of the SPM framework. In the next chapter, recommendations and further research work are presented.

CHAPTER NINE: RESEARCH CONCLUSIONS AND RECOMMENDATIONS

9.1 INTRODUCTION

The aim of this research is to examine the application of SPM in executing R and D projects in PROs in Nigeria, and to propose a framework for the effective execution of R and D projects. This chapter presents a summary of the key findings of this research, states how the research objectives were achieved and draws conclusions from these. The chapter also provides recommendations for project management practitioners and the PROs in Nigeria. The research limitations are also presented and the chapter concludes by suggesting further research work.

9.2 SUMMARY OF RESEARCH PROCESS

This thesis is structured in nine chapters. Chapter One introduces the research work and presents its aim, objectives and justification, and concludes with the structure of the thesis.

Chapter Two reviews the PROs and the SPM concept. The chapter focuses on the SPM concept but also provides an opportunity for the reader to gain an overview of Nigeria, the PROs and their current issues.

Chapter Three reviews the conceptual framework. The chapter focuses on the theoretical and conceptual views of SPM, the review of which allows the researcher to develop the theoretical aspects, together with the context within which the research is conducted.

Chapter Four presents the research design and methodology, and the appropriate research approach and the process by which these were selected and justified. The research process is explained in three phases: review of literature; survey questionnaire and interviews; and framework development and validation.

Details of the findings are presented in Chapters Five and Six, while the analysis and discussion of findings from the exploratory, semi-structured questionnaires and interviews with Nigerian PRO project management practitioners are discussed in Chapter Seven.

Chapter Eight presents the proposed SPM framework, which was developed by drawing on insights gained through analysis of the survey and the interview process. A detailed explanation of the validation process is also given in Chapter Eight.

9.3 RESEARCH OBJECTIVES AND CONCLUSIONS

This section presents the conclusion to this research based on the achievement of the research objectives. Objectives one and two were primarily achieved through literature reviews and survey research analysis of the four selected PROs in Nigeria. This was based on the screening process of the questionnaire, and interviews in which the practical application of SPM in the execution of R and D projects was discussed. Objectives three and four were achieved through the survey research analysis of the findings and the development of key themes. This was supported by an analysis of the research literature. Objective five was achieved through the development of an SPM framework (*Figure 8.2*), and the framework validation was achieved through the use of completed questionnaires from twenty respondents in PROs in Nigeria. Table 9.1 summarises how each of the five research objectives were achieved.

Table 9.1: Methods used to achieve the research objectives

Research Objectives	Methods of Achievement	Chapters of the Thesis
Objective one: - Establish the relationship that exists between theory and practice in relation to SPM	The primary method was the literature review and the survey research findings from the four case studies to support the literature findings.	Two, Three
Objective two: - Appraise the key determinants associated with SPM process and their importance in the effective implementation of projects in PROs	The primary method was the literature review and the survey research findings from the four case studies.	Two, Three
Objective three: - Identify the key variables that inhibit SPM application in PROs;	The primary method was the survey research from the case study review findings.	Five, Six, Seven
Objective four: - Measure the impact of SPM initiatives in improving and enhancing project success in PROs;	The primary method was the survey research from the case study review findings.	Five, Six, Seven
Objective five: - To develop an SPM framework that will enhance the execution of R and D projects in PROs in Nigeria.	The development of SPM framework based on the analysis of findings from the survey research and the development of the categories and sub-categories. Also the by testing of SPM framework through focus group presentation with twenty validation respondents.	Eight

9.3.1 Objective 1: The relationship between SPM theory and practice

The objective was to review the SPM concept and its practical application in the execution of R and D projects in PROs in Nigeria. Therefore the practical implementation of SPM was discussed in this context. As highlighted in Table 9.1, the objective was achieved through a review of SPM and the survey data. It emerged that the theoretical concept of SPM and the current practice in PROs in Nigeria differed, indicating a variance in procedure. Due to the dynamic nature of the PROs, those projects executed presented challenges and procedural variations imposed by the supervising government officials. Thus the process of project prioritisation and the selection of R and D projects aligned to organisational strategy were not achieved. The outcome of this objective concluded that PROs in Nigeria occupy an explicitly prominent, and indeed central, focal point in the country, thus the failure to meet required standards needs to be addressed if the effective execution of R and D projects is to be achieved.

9.3.2 Objective 2: Key determinants associated with SPM

This objective aimed to identify the key determinants associated with the application of SPM in the execution of R and D projects. The findings highlighted the variables associated with

SPM application, and it emerged that, among the variables associated with SPM, the appointment of project teams, experiences and competences of the project team, project funding, project planning, adoption of a well-defined project management framework, employees' motivation, understanding of SPM concept and project management methodology were its key determinants. It was also established that the appointment of project teams at the beginning of the project was the highest rated key determinant associated with SPM, suggesting that people are key to successful project execution. It was concluded that the alignment of appropriate personnel within the project team, SPM and project management technologies, and sufficient funding, will serve to enhance the effective execution of R and D projects in PROs in Nigeria.

9.3.3 Objective 3: The key variables that affected the application of SPM

This objective was to identify the factors that affect the application of SPM implementation in PROs in Nigeria. To achieve this, the participants' perceptions on this issue were obtained. It emerged that the primary factor was considered to be the government's inability to provide enough funds for project execution. Several opinions transpired but explicit was the view that there were a number of factors affecting the application of SPM in PROs in Nigeria. Some, identified during the interviews, included the lack of skilled project management personnel, lack of a cohesive project team approach, a failure to adopt project monitoring and evaluation techniques, an absence of project implementation strategies within organisations, poor project planning, lack of general understanding of SPM concepts, project overload issues, a lack of employee motivation and negative employee attitudes. The main conclusion from this objective, provided by the participants, was that the lack of understanding of SPM concepts and skilled project management personnel were the most important factors that affected the application of SPM in PROs in Nigeria.

9.3.4 Objective 4: The impact of SPM initiatives on project success

The fourth objective was to investigate whether the initiation of SPM had a positive or negative impact on R and D project execution. Enquiries revealed that the participants' view varied, with some reporting that it had a positive impact while others stated that there was no impact. However, it emerged that the concept of SPM was new to PROs in Nigeria and an accurate assessment of the impact of SPM initiatives was unavailable. The objective concluded that, although the SPM initiative was new, the introduction of SPM in the management of R and D projects in some organisations has had a positive outcome and is expected to enhance project success.

9.3.5 Objective 5: SPM framework development and validation

One of the main aims of this research work was to propose an SPM framework for senior project management practitioners to use in their R and D projects in Nigerian PROs. The framework, developed and presented in Chapter Eight, was based on an analysis and categorisation of findings from the research data. The framework provided an integration of project management principles with those SPM processes and strategies that were identified as vital components, which together would enhance the execution of R and D projects. This was achieved using the findings from the research survey, the conclusions of the literature review and the views of the validation focus group. The conclusion was drawn that the proposed SPM framework provides an additional project management tool for senior project management practitioners in PROs in Nigeria.

9.4 CONCLUSIONS

The research focused on the application of SPM for the execution of R and D projects in PROs in Nigeria. In general terms, although the literature review recognised the importance of SPM in the successful execution of projects, the study identified issues and procedural variances, both in its use and concept, which had been lacking in the literature.

A number of factors affecting the application of SPM in PROs in Nigeria were identified. Although the challenges were common to organisations new to the application of SPM, the factors identified included: project funding, development of project teams, organisational culture, employees' motivation, lack of knowledge with respect to project management principles and SPM concepts, and poor project planning, especially with regard to risk management. As established in this research, the concept of SPM is new to PROs in Nigeria, and its impact on R and D projects was relatively unknown. However, most of the participants from those organisations where SPM had been introduced agreed that the introduction of SPM had positively influenced the execution of R and D projects and, if implemented, was expected to enhance project success.

The research concluded that an SPM framework could be released as a management tool for senior project management practitioners working in PROs in Nigeria and, based on findings from the survey and literature review, would improve the execution of R and D projects. The resulting project success would benefit those practitioners and enhance their organisation's performance. It was identified that, for an effective application of SPM in the execution of R and D projects, there is the need for PROs in Nigeria to adopt the SPM framework to ensure strategic selection, prioritisation and alignment of projects with the organisational strategy.

With the quest for an increase in R and D performance gains importance, the need for research organisations to successfully execute research projects will undoubtedly increase. However, the framework proposed in this research may not be able to eliminate all the barriers that hindered the application of SPM in the execution of R and D projects. Nevertheless, despite the fact that PROs are government-owned organisations and may therefore operate outmoded procedures, should the SPM framework be employed by senior project management practitioners, it would serve as a standard structure superior to the traditional approaches used in the execution of R and D projects. It was further established

that in Nigeria there is no standard structures for governing the activities of PROs, and this has created a fundamental barrier to the effective execution of R and D projects in research organisations. The SPM framework, therefore, is a standard project management framework that can be used to bridge this gap.

From the qualitative findings, it emerged that the organisational culture and a lack of knowledge about project management principles and SPM concepts were the core areas upon which all the factors that affected SPM application in PROs hinged. As shown in this study, the motivation of employees emerged as one factor that affected PRO project management practitioners' attitudes towards the effective execution of R and D projects in Nigeria. Although initial findings from the participants indicated that SPM was practised in PROs in Nigeria, the subsequent results indicated that what was actually practised was traditional project management methodology, and most of the participants rated the level of its practical implementation as low.

The resistance by some PRO project management practitioners to change practices, and their inability to manage changes that occurred during project execution, were common barriers that hindered the effective application of SPM in R and D projects. Meanwhile, it was established that the involvement of top management of PROs in Nigeria was found to contribute to the overall actualisation of the research organisation's execution and management of R and D projects. In general, therefore, it appears that the success of R and D projects in Nigerian PROs depends on the effective implementation of SPM, and the proposed framework presents a standard approach that will enhance project performance. The proposed framework will also enable senior project management practitioners in PROs in Nigeria to improve upon previous poor project performances and also empower project leaders to better manage those factors within SPM that are vital to the successful execution of R and D projects in the future.

9.5 RESEARCH CONTRIBUTIONS TO KNOWLEDGE

The realisation of the research objectives was demonstrated in the preceding chapter of this thesis, and the research was not limited to only achieving the objectives, but its contribution to knowledge is also reflected in theory and in practice. The research established that unfamiliarity with project management principles and SPM processes, together with organisational structures and a lack of skilled project management practitioners, were the core factors that affected SPM application in PROs. This resulted in the proposal of an SPM framework for project management practitioners in Nigeria that would help to overcome those barriers described in 9.4 and effectively enhance the execution of R and D projects in PROs. According to those who participated in the focus group session during the validation of the framework, if the framework is successfully implemented, the success of future R and D projects will not only improve, but also there will be an increase in research output, leading to the marketing of innovations that can impact positively on the industrial sector of the country. The research achievements with regards to contribution to knowledge have been summarised in the following points:

- The literature review highlighted the importance of SPM in the management of R and D projects and also revealed that the research area was new, therefore original. Furthermore, the research methodology employed facilitated the gathering of robust data from the project management practitioners in PROs in Nigeria.
- Gaps in practice have been identified with regards to the theory of SPM and the practical application of the process.
- Regarding research innovation, the research contributed to knowledge by providing an integrated SPM framework for an enhanced execution and management of R and D projects.

9.6 RECOMMENDATIONS TO PUBLIC RESEARCH ORGANISATIONS

As presented in this study, the success of PROs depends on the effective execution of R and D projects. Thus the following recommendations were deemed necessary for project management practitioners working in Nigerian PROs and in the Nigerian Federal Ministry of Science and Technology.

9.6.1 The public research organisations in Nigeria

- PROs should ensure that SPM concepts are built into their project proposals and operational manuals and are enforced as a matter of policy.
- For R and D projects, the top management of research organisations should adopt the SPM process to guarantee a streamlined project execution. This can be achieved by appointing a project team with the right skills to manage and execute those projects.
- In accordance with current project management best practices, there should be an emphasis on developing, training and enhancing the skills and management abilities of existing staff.
- Prior to the inception of any project, research organisations should establish a clear project budget and set aside sufficient funds, when available, to ensure that projects are conducted through to completion and that no new projects are commenced without adequate funds being available.

9.6.2 The Nigerian Federal Ministry of Science and Technology

- A repository of policies is required to enhance the commercialisation of R and D projects. The supervising ministry of PROs should encourage the adoption of a standard and consistent structure for the effective monitoring of R and D project activities, and maintain constant compliance with such.

- The supervising ministry should approve and ensure the introduction of a project-based organisational structure for PROs involved in R and D projects. This will enhance the proper execution of R and D projects in the organisations.

9.7 LIMITATIONS OF THE RESEARCH

Research generally has limitations and this research was no different in that there were limitations in its conduct and scope. The limitations are outlined as follows:

- This research was primarily limited by the scant literature in the area of study. The application of SPM in research organisations is a relatively new area and there was not much information available.
- The generalisability of the findings. According to Bryman (2012), the use of a random selection process does not guarantee a representative sample, due to factors that operate over and above the chosen selection system that can jeopardise the authenticity of a sample. For this research study it was difficult to define the population, thus a straight-forward sample technique was employed. The research was limited to only four case studies and this was representative of project management practitioners in PROs in Nigeria. For example, during the quantitative and qualitative research, a greater depth of information would have been obtained if other employees were included.
- The research was carried out in government organisations and, due to government policy on keeping some information secret, participants were restrained from releasing some information.

9.8 RECOMMENDATIONS FOR FUTURE RESEARCH

This research has achieved its aim to propose an SPM framework for project management practitioners in PROs and, although the SPM framework was for PROs in Nigeria, it can be

used as a standard framework for other African research organisations involved in executing research projects. However, there are also some other areas in the application of SPM that were not covered in-depth due to the scope of this research work. It is recommended that further research be undertaken in the following areas:

- Follow-up research is required to validate the potential of using the framework for managing R and D projects in different research organisations, a matter which could not be incorporated here due to the scope of this research. This would provide not only data about the validity of the SPM framework in generic terms, but would also generate additional data on the impact of SPM initiatives on projects, data which could be used to further refine the proposed SPM framework.

- The proposed framework was developed with the following components: the organisational structure, top management involvement, strategic leadership, development of project team, experiences and competences of project team, alignment, selection and prioritisation of projects, maximising R and D strategy, project management techniques and SPM process. There is the need for further research in identifying the relationship among these components, and the impact of such relationships on the overall project performance.

- The research suggests the promotion of further work on the subject of SPM. Although there has been significant research on strategic management of projects, the focus has been more on construction, IT and engineering projects with little or no attention to R and D projects. This highlights the need for further research on the use of SPM to address different areas of R and D projects in research organisations.

- It was established that project funding was one of the important factors affecting the

application of SPM. There is the need for further research focusing on the development of ideas that could be used to guarantee availability of sufficient project funding for the successful execution of R and D projects.

- It is highly recommended that further research work is conducted on the subject of effective R and D project planning in research organisations. Although the research's main focus was on the implementation of SPM, it also established that poor planning was one of the major factors affecting the application of SPM. There is the need, therefore, for further research work on R and D project planning.

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APPENDICES

APPENDIX A

Table 2.1: Federal research and development institutes in Nigeria

Ministry	Research Institute	Mandate
Ministry of Agriculture and Rural Development	National Root Crops Research Institute (NRCRI) Umudike, PMB 7006, Umuahia, Abia State	R and D into root c
	National Animal Production Research Institute (NAPRI), Shika, PMB 1096,Zaria, Kaduna State	R and D for livesto
	National Veterinary Research Institute (NVRI), P.M.B. 1, Vom, Plateau State	Research into anir
	Institute for Agricultural Research (IAR) Ahmadu Bello University, PMB 1044, Samaru, Kaduna State	Farming systems r
	National Institute for Freshwater Fisheries Research (NIFFR), P.M.B. 6006, New Bussa, Niger State	Research into fish
	National Cereals Research Institute (NCRI), Badeggi, P.M.B. 8, Bida, Niger State	R &D in cereals, ri
	National Horticultural Research Institute (NIHORT), PMB 5432, Idi-Ishin, Jericho GRA, Ibadan	R&D for fruit crops
	Nigerian Institute for Oceanography and Marine Research (NIOMR), 3 Wilmot Point Road, Victoria Island, P.M.B 12729, Lagos	R&D in marine res
	Institute for Agricultural Research and Training (IAR&T), OAU, Moor Plantation, PMB 5029, Ibadan	Farming system re
	Lake Chad Research Institute of Nigeria (LCRIN), PMB 1293, Gamboru-Ngala Road, Maiduguri, Borno State	Research to ensur Basin
	Nigerian Institute for Oil Palm Research (NIFOR), PMB 1030, Benin City, Edo State	Oil palm, raffia pal
	Rubber Research Institute of Nigeria (RRIN), Iyanomo, Km 19, Benin-Sapele Road, P.M.B. 1049, Benin City, Edo State	Rubber research a
	Cocoa Research Institute of Nigeria (CRIN), Idi Ayunre, Km 14, Ibadan/Ijebu-Ode Road, PMB 5244, Ibadan	Cocoa, Cola nut re
	National Agricultural Extension Research and Liaison Service (NAERLS), ABU, PMB 1067, Samaru-Zaria, Kaduna State	Agricultural Extens
	Nigeria Stored Products Research Institute (NSPRI), Km 3, Asa Dam Road, PMB 1489, Ilorin, Kwara State	Development of te agricultural produc
	National Centre for Agric Mechanization (NCAM), Km 18, Ajase-Ipo Road, PMB 1525, Ilorin, Kwara State	Agricultural machi conservation
	Agricultural & Rural Management Training Institute (ARMTI), Ajase-Ipo Road, P.M.B. 1343, Ilorin, Kwara State	Training of agricul
Ministry of Education	National Educational Research & Development Council (NERDC), Lokoja/Kaduna Road, Sheda, PMB 91, Garki, Abuja	Curriculum develo research
	National Institute for Educational Planning and Administration, Km4 Laje Road, Off Ondo-Ore Road, PMB 562, Ondo, Ondo State	Research in educa
Ministry of Environment, Housing and Urban Development	Forestry Research Institute of Nigeria PMB 5054, Jericho GRA, Ibadan	Forestry products
Ministry of Health	Nigerian Institute of Medical Research (NIMR) 6, Edmund Crescent, Yaba, PMB 2013, Sabo Post Office, Yaba, Lagos	R&D in Medicinal
	National Institute for Pharmaceutical Research & Development (NIPRD), Idu Industrial Area, P.M.B. 21, Abuja	Drug manufacturir
Ministry of Science And Technology	Nigerian Institute for Trypanosomiasis Research (NITR), No. 1 Surame Road, UngwanRimi GRA, PMB. 2077, Kaduna	River blindness re
	The Nigerian Institute of Science Laboratory Technology (NISLT)	Training of laborat
	Energy Commission of Nigeria (ECN)	Renewable energy
	National Board for Technology Incubation (NBTI)	Technology busine
	Nigerian Communication Satellite Ltd (Nig.Com Sat)	Marketing of satell
	National Space Research & Development Agency (NARSDA)	Space research ar
	Nigerian Institute for Leather Research (NILR)	Leather technolog
	National Centre for Technology Management (NACETEM)	Technology policy
	National Biotechnology Development Agency (NABDA)	Biotechnology res
	National Research Institute for Chemical Technology (NARICT), Old Kano Road, Basawa, PMB 1052, Zaria	Chemical technolo
	Nigerian Building and Road Research Institute (NBBRI)	Building, roads res
	Raw Materials Research and Development Council (RMRDC), Plot 427, Auguyi-Ironsi Street, Maitama District, PMB 232, Abuja	Raw materials con
	Project Development Institute (PRODA), Emene Industrial Layout, Km12, Off Enugu-Abakaliki Road, PMB 01609, Enugu	Industrial equipme
	Federal Institute of Industrial Research Oshodi (FIIRO), Blind Centre Street, Via Cappa Bus Stop, Off Agege Motor Road. PMB 21023, Ikeja, Lagos	Food processing a
	National Office for Technology Acquisition and Promotion (NOTAP), Plot 762, No. 1, Blantyre Street, Off Adetokunbo Ademola Crescent Wuse II Post Office, Abuja	Intellectual proper
	Science and Technology Complex (SHESTCO), Sheda, Lokoja-Abuja Road, FCT, Abuja	Advanced science
	Nigerian Natural Medicine Development Agency, Kofo Abayomi Street, Victoria Island, Lagos	Natural medicine r
	National Agency for Science & Engineering Infrastructure (NASENI), Idu Industrial Area, Garki, Abuja	Industrial research

	Nigerian Institute of Social & Economic Research (NISER), Oyo Road, Ojoo, PMB 5, UI Post Office, Ibadan	Research on the E
	Centre for Management Development (CMD), Shangisha Road, Magodo, Lagos	Management rese
National Planning Commission	Michael Imoudu National Institute of Labour Studies, (MILLS), Km 7, Ajasepo Road, P.M.B 1524, Ilorin, Kwara State	Training of labour
Ministry of Labour	National Productivity Centre, Utako, Abuja	Productivity studie
Ministry of Industry	Centre for Automotive Design and Development (CADD) Samaru, Zaria	Automotive resear
National Sports Commission	National Institute of Sports, (NIS),National Stadium Complex, Surulere, Lagos	Sports research
Ministry of Transport	Nigerian Institute for Transport Technology (NITT), Basawa/Old Kano Road, Palladon, Basawa PMB 1148, Zaria, Kaduna State	Transport studies
Ministry of Mines and Steel Development	National Metallurgical Development Centre, (NMDC), Plot PSG 390 and BPG 179, Zaria Road, P.M.B 2116, Jos. Plateau State	Metallurgical mine
The Presidency	National Institute for Policy and Strategic Studies (NIPSS), Kuru P.M.B 2024, Bukuru. Plateau State	Strategic studies
Federal Ministry of Foreign Affairs	Nigerian Institute for International Affairs (NIIA), No. 13/15, Kofo Abayomi Street, Victoria Island, Lagos	International relati

Source: (Compiled from Committee of Directors of Research Institute Report, 2014)

APPENDIX B

LIVERPOOL JOHN MOORES UNIVERSITY

PARTICIPANT INFORMATION SHEET

Dear Sir/Madam

Analysis of Strategic Project Management (SPM) Application in Public Research Organisations in Nigeria

My name is Ugonna C.U., currently undertaking a PhD course at the Liverpool John Moores University, UK. You are please requested to take part in this research study. Before you decide it is important that you understand why the research is being done and what it involves. Please take time to read the following information. Ask us if there is anything that is not clear or if you would like more information. Please do take time to decide if you want to take part or not.

The purpose of this research is to identify the barriers affecting the application of strategic project management in R&D projects, proffering a framework for addressing those barriers and improving the effectiveness of project implementation in public research organisations in Nigeria. It is my belief that ascertaining strategic project management principles from senior managers will greatly assist in the enhancement of corporate business models in Nigeria. The decision to choose your organisation was based on the excellent background your organisation has had on project management.

I would be very grateful if you could complete the attached questionnaire. The questionnaire should take no longer than **30** minutes to complete and will provide, as I have mentioned, vital information for my research. You are assured of confidentiality and that any identifying information will be destroyed at the data processing stage of the research. Please be assured that the identity of your project managers and your organisation shall remain strictly confidential.

Hopefully the research will provide a comprehensive review of success factors of strategic project management. If you would like a summary of the research findings I should be pleased to forward a copy on completion of the survey. If you have any further questions or would like a discussion, you can contact us through the e-mail address C.U.Ugonna@2014.ljmu.ac.uk or (E.G.Ochieng@ljmu.ac.uk).

Your assistance and co-operation in this research will be welcome and gratefully received; I hope you will be able to assist in furthering my research studies. Once again if you have any queries please do not hesitate to contact me.

Yours sincerely,

PhD Researcher Student: Ugonna C.U

Academic Supervisor: Dr Edward Ochieng

APPENDIX C

STUDY QUESTIONNAIRE

Strategic Project Management is the process of selecting, managing and measuring project outcomes to ensure optimal value for an organisation. It also ensures that projects undertaken by an organisation meet the criteria set up by the organisation's leadership to ensure alignment with the strategic vision of the organisation. Please indicate to what extent you agree or disagree with the following definition, by circling **(O)** the appropriate number.

Very Unsatisfactory	Unsatisfactory	Not Sure	Satisfactory	Very Satisfactory
1	**2**	**3**	4	**5**

SECTION 1: GENERAL INFORMATION. In each of questions **1-5** please **tick (√)** one of the boxes only.

1. In what research sector does the main aspect of your business activities fall under?

Agricultural [ ] Industrial Research [ ] Environmental Research [ ] Science and Technology Research [ ] Others [ ] please specify

2. State your current job title.

Project director [ ] Project manager [ ] Project Planner [ ] Client [ ] Others [ ] (please specify)

3. How long have you worked within this sector?

Less than a year [ ] 1-5 years [ ] 11-15 years [ ] 16-20 years [ ] More than 20 years [ ]

4. How long have you been involved with managing projects?

Less than a year [ ] 1-5 years [ ] 6-10years [ ] More than 20 years [ ]

5. How effective has the application of project management been on your most recent projects?

Very effective [ ] Less effective [ ] Fairly effective [ ] Not been met [ ]

SECTION TWO: Project Management Practices

1. What type of projects do you deliver in your organisation?

R &D projects ( ); Construction projects ( ); Fabrication projects ( ); Development Projects ( ).

2. During the project identification phase, does your organisation : **-**

(a) Undertake feasibility? Yes or No. If yes, what is the rate of adoption?

Very Unsatisfactory ( ); Unsatisfactory ( ); Not sure ( ); Satisfactory ( ); Very satisfactory ( )

(b) Carry out environmental impact assessment? Yes or No. If yes, what is the rate of assessment?

Very Unsatisfactory ( ); Unsatisfactory ( ); Not sure ( ); Satisfactory ( ); Very satisfactory ( )

(c) Study the sustainability of the project? Yes or No. If yes, what is the rate?

Very Unsatisfactory ( ); Unsatisfactory ( ); Not sure ( ); Satisfactory ( ); Very satisfactory ( )

(d) Carry out risk assessment for the project? Yes or No. If yes, what is the rate?

Very Unsatisfactory ( ); Unsatisfactory ( ); Not sure ( ); Satisfactory ( ); Very satisfactory ( )

(e) Appoint Project Team from the Beginning? Yes or No. If yes, what is the rate?

Very Unsatisfactory ( ); Unsatisfactory ( ); Not sure ( ); Satisfactory ( ); Very satisfactory ( )

(f) Set up Project Office? Yes or No. If yes, what is the rate?

Very Unsatisfactory ( ); Unsatisfactory ( ); Not sure ( ); Satisfactory ( ); Very satisfactory ( )

(g) Prepare a "Project Charter" which describes scope, objectives, time, budget, and risks? Yes or No. If yes, what is the rate?

Very Unsatisfactory ( ); Unsatisfactory ( ); Not sure ( ); Satisfactory ( ); Very satisfactory ( )

(h) Set up a "Job Description" for the project team? Yes or No If yes, what is the rate?

Very Unsatisfactory ( ); Unsatisfactory ( ); Not sure ( ); Satisfactory ( ); Very satisfactory ( )

Planning Phase:
Does the organisation prepare the following during the planning phase of the project?

1. Detailed project plan, describing implementation of the project? Yes-----; No-------
   If yes, what is the rate?

Very Unsatisfactory ( ); Unsatisfactory ( ); Not sure ( ); Satisfactory ( ); Very satisfactory ( )

2. Financial plan showing the required costs during the implementation phases of the project? Yes-------; No------- If yes, what is the rate?

Very Unsatisfactory ( ); Unsatisfactory ( ); Not sure ( ); Satisfactory ( ); Very satisfactory ( )

3. Develop quality plan to monitor the quality of the outputs and to identify actions that will be used to achieve the required quality? Yes----; No---- If yes, what is the rate?

Very Unsatisfactory ( ); Unsatisfactory ( ); Not sure ( ); Satisfactory ( ); Very satisfactory ( )

4. Develop procurement plan? Yes-----; No------ If yes, what is the rate?

Very Unsatisfactory ( ); Unsatisfactory ( ); Not sure ( ); Satisfactory ( ); Very satisfactory ( )

5. Prepare risk plan for the project? Yes----; No----- If yes, what is the rate?

Very Unsatisfactory ( ); Unsatisfactory ( ); Not sure ( ); Satisfactory ( ); Very satisfactory ( )

6. Develop communication plan for all related parties? Yes----; No---- If yes, what is the rate?

Very Unsatisfactory ( ); Unsatisfactory ( ); Not sure ( ); Satisfactory ( ); Very satisfactory ( )

Execution Phase:

1. Manage and control activities of the projects and that of the project team? Yes-----or No------ If yes, what is the rate?

Very Unsatisfactory ( ); Unsatisfactory ( ); Not sure ( ); Satisfactory ( ); Very satisfactory ( )

2. Manage the funds not to exceed the allocated budget for the project? Yes-----or No------

If yes, what is the rate?

Very Unsatisfactory ( ); Unsatisfactory ( ); Not sure ( ); Satisfactory ( ); Very satisfactory ( )

3. Manage time effectively? Yes-----or No------ If yes, what is the rate?

Very Unsatisfactory ( ); Unsatisfactory ( ); Not sure ( ); Satisfactory ( ); Very satisfactory ( )

4. Pass through due processes for project procurement? Yes-----or No------
   If yes, what is the rate?

Very Unsatisfactory ( ); Unsatisfactory ( ); Not sure ( ); Satisfactory ( ); Very satisfactory ( )

5. Set standards for the delivery of project outputs? Yes-----or No------
   If yes, what is the rate?

Very Unsatisfactory ( ); Unsatisfactory ( ); Not sure ( ); Satisfactory ( ); Very satisfactory ( )

6. Manage risks, issues and other problems that may arise during the implementation of the project effectively? Yes-----or No------. If yes, what is the rate?

Very Unsatisfactory ( ); Unsatisfactory ( ); Not sure ( ); Satisfactory ( ); Very satisfactory ( )

7. Manage the changes that arise during the implementation of the project effectively? Yes-
   ---Or No----. If yes, what is the rate?

Very Unsatisfactory ( ); Unsatisfactory ( ); Not sure ( ); Satisfactory ( ); Very satisfactory ( )

8. Manage communication among all relevant parties effectively? Yes-----or No---. If yes, what is the rate?

Very Unsatisfactory ( ); Unsatisfactory ( ); Not sure ( ); Satisfactory ( ); Very satisfactory ( )

Project Closure:

1. Evaluating the project after closing to determine the level of achievement with respect to the objectives of the project and its success and lessons learned? Yes-----or No------
   If yes, what is the rate?

Very Unsatisfactory ( ); Unsatisfactory ( ); Not sure ( ); Satisfactory ( ); Very satisfactory ( )

2. Disseminating the lessons learned from the project? Yes-----or No----.If yes, what is the rate?

Very Unsatisfactory ( ); Unsatisfactory ( ); Not sure ( ); Satisfactory ( ); Very satisfactory ( )

3. Documenting and archiving all Documentations for the project after finishing? Yes-- or No----. If yes, what is the rate?

Very Unsatisfactory ( ); Unsatisfactory ( ); Not sure ( ); Satisfactory ( ); Very satisfactory ( )

How will you describe your organisation's performance with regard to managing projects through base-line plans?

Very Unsatisfactory ( ); Unsatisfactory ( ); Not sure ( ); Satisfactory ( ); Very satisfactory ( )

SECTION 111: Factors hindering application of strategic project management?

The following factors are associated with the application of strategic project management. Please indicate (i.e. tick (√) the level of importance of each factor using a scale from 1 to 5 where: 1 indicates "very important"; 2 "important"; 3 "fairly important"; 4 "strongly important"; and 5 "not important".

S/N	SPM factors	1	2	3	4	5
1	Appointing of project team from the beginning					
2	Experiences and competences of the project team relating to the nature of the project					
3	Understanding the principles of project management					
4	Adoption of well-defined project management framework					
5	Computing and software programs to manage the project effectively					
6	Communication between project team and the management					
7	Pre-planning of the project					
8	Feedback from previous projects					
9	Standards and specifications for the elements of the project					
10	Stimulation and motivation of employees					
11	Organisation's routine procedures					
12	Clear project management methodology					
13	Team working between all team members of the project					
14	The project funding					

Thank you very much for taking part in this survey.

APPENDIX D

ith SPM

	Appointing of project team from the beginning	Experiences and competences of the project team to the nature of the project	Understanding the principles of project management	Adoption of well- defined project management framework	Computing and software programs to manage the project effectively	Communication between project team and the management	Pre-planning of the project	Feedback from previous projects	Standards and specifications for the elements of the project	Stimulation and motivation of employees	Organisations routines procedures
Correlation Coefficient	1.000	.421**	.316**	.371**	.084	.132	.430**	.142*	.272**	.211**	.023
Sig. (2-ailed)		.000	.000	.000	.228	.058	.000	.042	.000	.002	.740
N	210	208	200	203	208	206	205	207	208	208	208
Correlation Coefficient	.421**	1.000	.347**	.302**	.058	.165*	.300**	.297**	.159*	.306**	.038
Sig. (2-ailed)	.000		.000	.000	.406	.018	.000	.000	.022	.000	.583
N	208	209	199	202	207	205	204	206	207	207	207
Correlation Coefficient	.316**	.347**	1.000	.428**	.261**	.134	.176*	.171*	.280**	.255**	.228**
Sig. (2-ailed)	.000	.000		.000	.000	.061	.014	.016	.000	.000	.001
N	200	199	201	194	199	197	196	199	199	199	200
Correlation Coefficient	.371**	.302**	.428**	1.000	.376**	.228**	.395**	.339**	.333**	.248**	.213**
Sig. (2-ailed)	.000	.000	.000		.000	.001	.000	.000	.000	.000	.002
N	203	202	194	204	202	203	199	201	202	202	203
Correlation Coefficient	.084	.058	.261**	.376**	1.000	.051	.203**	.183**	.201**	.190**	.338**
Sig. (2-ailed)	.228	.406	.000	.000		.470	.004	.009	.004	.006	.000
N	208	207	199	202	209	205	204	206	207	207	207
Correlation Coefficient	.132	.165*	.134	.228**	.051	1.000	.210**	.277**	.158*	.158*	.125
Sig. (2-ailed)	.058	.018	.061	.001	.470		.003	.000	.023	.024	.074
N	206	205	197	203	205	207	202	204	205	205	205
Correlation Coefficient	.430**	.300**	.176*	.395**	.203**	.210**	1.000	.242**	.168*	.023	.133
Sig. (2-ailed)	.000	.000	.014	.000	.004	.003		.000	.016	.739	.059
N	205	204	196	199	204	202	206	203	204	205	204
Correlation Coefficient	.142*	.297**	.171*	.339**	.183**	.277**	.242**	1.000	.265**	.254**	.226**
Sig. (2-ailed)	.042	.000	.016	.000	.009	.000	.000		.000	.000	.001
N	207	206	199	201	206	204	203	208	206	206	207
Correlation Coefficient	.272**	.159*	.280**	.333**	.201**	.158*	.168*	.265**	1.000	.267**	.120
Sig. (2-ailed)	.000	.022	.000	.000	.004	.023	.016	.000		.000	.086
N	208	207	199	202	207	205	204	206	209	207	207
Correlation Coefficient	.211**	.306**	.255**	.248**	.190**	.158*	.023	.254**	.267**	1.000	.153*
Sig. (2-ailed)	.002	.000	.000	.000	.006	.024	.739	.000	.000		.028
N	208	207	199	202	207	205	205	206	207	209	207
Correlation Coefficient	.023	.038	.228**	.213**	.338**	.125	.133	.226**	.120	.153*	1.000
Sig. (2-ailed)	.740	.583	.001	.002	.000	.074	.059	.001	.086	.028	
N	208	207	200	203	207	205	204	207	207	207	209
Correlation Coefficient	.211**	.228**	.309**	.420**	.200**	.290**	.273**	.316**	.318**	.282**	.112

Sig. (2-ailed)	.002	.001	.000	.000	.004	.000	.000	.000	.000	.000	.108
N	207	206	198	201	206	204	203	205	206	206	206
Correlation Coefficient	.442**	.344**	.191**	.343**	.151*	.200**	.297**	.250**	.247**	.370**	.103
Sig. (2-ailed)	.000	.000	.007	.000	.030	.004	.000	.000	.000	.000	.140
N	206	205	197	200	205	203	203	204	205	206	205
Correlation Coefficient	.481**	.256**	.264**	.261**	.146*	.114	.324**	.052	.320**	.339**	.025
Sig. (2-ailed)	.000	.000	.000	.000	.036	.104	.000	.458	.000	.000	.722
N	209	208	200	203	208	206	205	207	208	208	208

.01 level (2-tailed).

05 level (2-tailed).

APPENDIX E

LIVERPOOL JOHN MOORES UNIVERSITY

Dear Sir/Madam

Analysis of Strategic Project Management (SPM) Application in Public Research Organisations in Nigeria

My name is Ugonna C.U, currently undertaking a PhD course at the Liverpool John Moores University, UK. You are please requested to take part in this research study. It is important that you understand why the research is being done and what it involves. Please take time to read the following information. Ask us if there is anything that is not clear or if you would like more information. Please you are free to accept or refuse to be interviewed as it is optional and this will not be documented.

The purpose of this research is to identify the barriers affecting the application of strategic project management in R&D projects, proffering a framework for addressing those barriers and improving the effectiveness of project implementation in public research organisations in Nigeria. It is my belief that ascertaining strategic project management principles from senior managers will greatly assist in the enhancement of corporate business models in Nigeria. The decision to choose your organisation was based on the excellent background your organisation has had on project management.

You are please requested to note that all interviews will take place in the participant's office. At your request, I will be pleased to forward a summary of the research findings. If you have any further questions or would like a discussion please contact us.

Your assistance and co-operation in this research will be welcomed and gratefully received.

Yours sincerely,

PhD Researcher Student: Ugonna C.U
C.U.Ugonna@2014.ljmu.ac.uk or

Academic Supervisor: Dr Edward Ochieng
E.G.Ochieng@ljmu.ac.uk.

APPENDIX F

SEMI-STRUCTURED INTERVIEW

The following questions are to be asked by the interviewer. There is no specific pattern and the questions can be redirected for proper understanding and also get the right answer needed.

- Is your organisation purely a project-based organisation?
- What type of management structure is practised in your organisation?
- What are the processes in place for Strategic Project Management (SPM) in your Organisation?
- How many projects do the offices carry out in a year?
- How do you select projects and programmes in your organisation?
- What is the success rate of projects and programme in the organisation?
- What are the factors that hinder project success in your organisation?
- Is SPM applied in the planning and management of projects?
- What are the major challenges to successful implementation of SPM in your organisation?
- What is the management level of involvement in SPM?
- What strategic framework is in place for managing projects?
- How will you rate the success of SPM in your organisation?

APPENDIX G

VERIFICATION QUESTIONNAIRE

Variables associated with strategic project management application

The following is a list of variables, which are associated with the application of strategic project management in R and D projects. Please indicate the level of agreement with each variable using a scale of 1 to 5 where: 1 indicates 'strongly agree'; 2 'agree'; 3 'uncertain'; 4 'disagree' and 5 'strongly disagree'.

Level of agreement	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree
Project-based organisational structure • Optimal and flexible structure					
• Adequate delegation of authority					
• Efficient communication structure					
• Open to innovation					
• Establishment of Strategic Project Management Office (SPMO)					
Management involvement • Committed executives					
• Ensure good communication channel					
• Formulation of organisation's strategy					
• Identification of strategic projects					
• Employees' motivation					
• A good working relationship between executives and staff					
Strategic project leadership • Dynamic adaptation leadership					
• Motivation leadership					
• Team building leader					
• Inspiring leadership					
• Visionary leadership • Business- focus leadership					
Appointment of project team • Selection of project teams with leadership skills					
• Ability to work in teams					
• Ability to withstand pressures					
• teams with diverse technical ability					
• Innovative project team					
• Build cohesion and stability in team working					
• Establish a cross-functional steering team					
Alignment of projects with organisation's strategy • Identification of project strategy					
• Identification of organisation's strategy					

• Alignment of project strategy with the organisations strategy					
• Ensure projects are achievable					
Project selection and prioritisation • Grouping of strategic projects into portfolios					
• Prioritisation of strategic projects					
• Selection of projects that will address the organisational strategic goals					
• Systematic thoughts based on organisational needs					
• Select projects to create new products that will address an economic need					
Maximising R&D strategy in the organisation • R&D culture					
• R&D processes					
• Resources (people)					
• Information system					
• R&D Key Performance Indicators (KPIs)					
Project management principles • Provide proven processes and techniques					
• Managing change, issues and risk					
• Managing the project life cycle					
• Managing the resources and communication aspects					
Strategic project Management process • Defining the project					
• Create project strategy					
• Project planning					
• Project implementation					
• Monitoring and control					
• Review and learning					

APPENDIX H

VALIDATION QUESTIONNAIRE

The following is a list of factors which are associated with the SPM performance framework proposed in this study. Please tick the level of agreement with each variable using a scale from 1 to 5 where: 1 indicates 'strongly agree'; 2 'agree'; 3 'uncertain'; 4 'disagree' and 5 'strongly disagree'.

	Level of agreement	**1**	**2**	**3**	**4**	**5**
1	The development of a project-based organisational structure					
2	Management involvement					
3	Appointment of project teams					
4	Appointment of strategic project leadership					
5	Strategic alignment of projects					
6	Prioritisation and selection of R and D projects					
7	Maximising the R and D strategy in the organisation					
8	Adoption of standard project management principles					
9	R&D project implementation through SPM process					
10	The factors identified can help to enhance the application of SPM in the execution of R and D projects					
11	The SPM framework is easy to understand and follow					
12	The SPM framework can be employed without much training					
13	The SPM framework provides a generic structure					
14	The framework provides a basis for future research on the application of SPM in public research organisations					

15. Please comment on how the SPM framework can be enhanced if any.

16. What value can the SPM framework bring to R &D organisations?

APENDIX I

Table 8.3: Verification results of variables for effective SPM application in public research organisations in Nigeria

Questions	Participant's response																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	**Average**	
																					Score	**%**
Project-based organisational structure																						
Optimal and flexible structure	4	5	5	5	5	5	5	5	4	4	4	4	4	5	4	4	5	5	4	4	4.3	86
Adequate delegation of authority	4	5	5	5	5	5	5	4	4	4	4	4	5	5	4	4	5	4	4	4	4.25	85
Efficient communication structure	4	4	5	5	5	5	5	4	5	4	3	5	4	5	5	5	5	5	4	4	4.4	88
Open to innovation	4	5	5	5	5	5	5	5	5	3	4	5	4	5	5	3	5	5	4	5	4.6	92
Establishment of Strategic Project Management Office (SPMO)	4	5	4	4	5	5	4	5	3	4	5	5	3	5	4	5	5	5	4	4	4.4	88
Total																					**4.39**	**87.5**
Management involvement																						
Committed executives	4	5	4	4	5	5	5	5	5	4	5	5	5	3	5	5	5	5	5	5	4.7	94
Ensure good communication channel	4	4	5	5	5	5	5	5	4	3	4	5	5	4	5	5	5	5	5	4	4.6	92
Formulation of organisation's strategy	4	5	4	5	5	5	4	4	5	4	5	4	5	4	5	4	5	5	5	4	4.55	91
Identification of strategic projects	4	5	4	5	5	5	5	5	4	5	5	5	4	5	4	4	5	5	5	4	4.65	93
Employees' motivation	1	5	5	5	5	5	5	5	5	4	4	4	4	4	5	3	5	5	5	4	4.4	88
A good working relationship between executives and staff	3	4	5	5	5	5	5	4	5	4	4	5	4	4	5	4	5	4	5	4	4.45	89
Total																					**4.56**	**91.2**
Strategic project leadership																						
Dynamic adaptation leadership	4	4	5	5	5	5	5	5	5	3	4	4	4	4	4	4	4	5	4	4	4.35	87
Motivation leadership	3	5	5	5	5	5	5	5	4	4	4	4	5	4	5	4	5	5	4	4	4.5	90
Team building leader	4	5	5	5	5	5	5	5	4	4	4	4	5	4	5	5	5	5	4	4	4.6	92
Inspiring leadership	4	5	5	5	5	5	5	5	5	4	4	4	4	4	5	3	5	5	4	4	4.5	90
Visionary leadership	4	4	5	5	5	5	5	4	4	4	4	4	4	4	5	2	5	5	4	4	4.3	86
Business- focus leadership	4	5	5	5	5	5	5	5	4	4	5	4	4	4	5	2	5	5	4	4	4.35	87
																					4.43	**88.7**
Appointment of project team																						
Selection of project teams with leadership skills	5	4	5	5	5	5	5	5	5	4	4	5	5	4	4	5	5	5	5	4	4.7	94
Ability to work in teams	5	5	5	5	5	5	5	5	4	4	4	5	4	5	4	5	5	5	5	4	4.7	94
Ability to withstand pressures	5	5	4	5	5	5	5	4	3	4	4	3	4	4	5	4	5	4	5	3	4.3	86
Teams with diverse technical ability	5	5	5	5	4	5	5	5	4	4	4	5	4	5	5	4	5	5	5	4	4.65	93
Innovative project team	5	5	5	5	5	5	5	5	4	5	5	4	3	4	5	3	5	5	5	4	4.6	92

Build cohesion and stability in team working	5	4	4	5	5	5	5	4	3	3	3	4	4	4	5	4	4	4	5	4	4.2	84
Establish a cross-functional steering team	5	4	4	5	4	4	5	5	5	4	4	4	3	3	4	4	4	4	5	2	4.1	82
																					4.46	**89.3**
Alignment of projects with organisation's strategy																						
Identification of project strategy	5	5	5	5	4	5	5	5	5	4	5	5	5	4	5	5	5	5	4	5	4.8	96
Identification of organisation's strategy	5	4	5	4	5	5	5	5	5	5	5	4	5	5	5	4	5	5	4	5	4.75	95
Alignment of project strategy with the organisations strategy	5	5	5	4	5	5	5	5	5	5	4	4	5	5	4	4	4	5	4	5	4.65	93
Ensure projects are achievable	4	5	5	5	5	5	5	5	5	4	5	4	5	5	4	5	5	5	4	5	4.75	95
																					4.74	**94.8**
Project selection and prioritisation																						
Grouping of strategic projects into portfolios	4	4	5	4	2	5	5	5	4	4	4	4	4	4	4	4	5	5	5	2	4.15	83
Prioritisation of strategic projects	4	5	5	5	5	5	5	4	4	4	4	4	5	4	5	4	5	5	5	4	4.55	91
Selection of projects that will address the organisational strategic goals	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	5	5	5	4	4.85	97
Systematic thoughts based on organisational needs	4	4	5	4	5	5	4	5	4	4	4	4	5	5	5	4	5	4	5	3	4.4	88
Select projects to create new products that will address an economic need	4	5	5	4	5	5	4	5	4	4	4	4	5	5	5	3	4	4	5	4	4.4	88
																					4.47	**89.4**
Maximising R&D strategy in the organisation																						
R&D culture	3	4	5	4	5	5	4	4	3	5	4	4	4	3	5	5	5	5	5	4	4.3	86
R&D processes	4	4	5	4	5	5	5	4	4	4	5	4	4	3	5	5	5	5	5	4	4.45	89
Resources (people)	5	5	5	5	5	5	5	4	5	4	3	4	5	4	5	5	5	5	5	4	4.65	93
Information system	4	4	4	5	5	5	4	4	3	3	3	4	4	3	5	4	5	4	5	4	4.1	82
R&D key performance indicators (KPIs)	2	5	4	5	5	5	4	4	4	4	5	4	5	3	5	4	5	5	5	3	4.3	86
																					4.36	**87.2**
Project management principles																						
Provide proven processes and techniques	4	5	4	5	4	5	5	4	5	3	3	4	5	4	5	4	5	5	5	5	4.45	89
Managing change, issues and risk	2	5	5	5	5	5	5	5	5	4	5	4	4	4	4	3	5	5	5	4	4.45	89
Managing the project life cycle	2	4	5	5	5	5	5	5	4	5	5	4	4	3	5	4	5	5	5	4	4.45	89
Managing the resources and communication aspects	2	4	4	5	5	5	5	5	3	4	4	4	5	3	4	5	5	4	5	4	4.25	85
																					4.4	**88**
Strategic project Management process																						
Defining the project	4	5	5	4	5	5	5	5	5	4	5	4	5	5	5	5	5	5	5	4	4.75	95
Create project strategy	4	4	5	5	5	5	5	5	4	4	5	4	5	5	5	5	5	5	5	4	4.7	94

Project planning	4	5	5	5	5	5	5	5	4	4	5	5	5	4	5	5	5	5	5	4	4.75	95
Project implementation	3	5	5	5	5	5	5	4	4	4	4	5	5	3	5	4	5	5	5	4	4.5	90
Monitoring and control	3	5	5	4	5	5	5	5	5	4	4	5	4	3	5	3	5	5	5	5	4.5	90
Review and learning	3	5	5	4	5	5	5	5	5	4	5	5	5	3	5	4	5	5	5	4	4.6	92
																					4.63	**92.7**