USMANU DANFODIYO UNIVERSITY, SOKOTO
(POSTGRADUATE SCHOOL)

AN EMPIRICAL ANALYSIS OF THE DETERMINANTS AND EFFECT OF INNOVATION ON THE PERFORMANCE OF MICRO, SMALL AND MEDIUM ENTERPRISES (MSMEs) IN NIGERIA

A Thesis
Submitted to the
Postgraduate School,

USMANU DANFODIYO UNIVERSITY, SOKOTO,NIGERIA.

In fulfillment for the Degree of

DOCTOR OF PHILOSOPHY (ECONOMICS)

BY

BELLO Okanla Fatai
(Adm. No: 13310204009)

DEPARTMENT OF ECONOMICS

FEBRUARY, 2021

DEDICATION

This thesis is dedicated to my late parents, Alhaji Bello and Alhaja Hussainat Bello

CERTIFICATION

This thesis by BELLO Okanla Fatai has met the requirements for the award of the Degree of Doctor of Philosophy (Economics) of the Usmanu Danfodiyo University, Sokoto, and is approved for its contribution to knowledge.

---------- ----------

Prof. Tukur Garba Date

Major Supervisor

---------- ----------

Prof. Mika'ilu Abubakar Date
Co-Supervisor I

---------- ----------

Prof. Nasiru Musa Yauri Date
Co-Supervisor II

---------- ----------

External Examiner Date

---------- ----------

Prof. HarunaMohammed Aliero Date
Head of Economics Department

---------- ----------

Prof. A.A Sokoto Date
Dean, Faculty of Social Sciences.

ACKNOWLEDGEMENTS

In the name of Allah, the Beneficent, the Most Merciful. Glory be to Allah, the lord of the universe who created man within His endless desires. May His peace and blessings be upon the noblest prophet Muhammed, his household, companions and those that follow their path till the day of judgment.

I wish to express my profound gratitude to my major supervisor, Prof. Tukur Garba for his guidance, constructive comments, and suggestions towards the success of this work. I also deeply appreciate the guidance, suggestions and selfless help of my co-supervisors, Prof. Mika'ilu Abubakar and Prof. Nasir Musa Yauri. They deserve to be commended for their valuable contributions, time and efforts they have invested in this research work.

My sincere gratitude to the head of Economics Department Prof. Haruna Mohammed Aliero and the entire lecturers and administrative staff of Economics Department, Usmanu Danfodiyo University, Sokoto who are the source of inspiration to me in one way or the other. May Almighty Allah reward and increase them in knowledge.

Furthermore, I would like to express my deepest appreciation to my wife Alhaja Monsurat Folakemi Bello and my children, Abdulrahman, Abdulmuiz, Hussainat and Hassanat, for their understanding, support and encouragement during the period of this study. Almighty Allah will strengthen the bond of unity in our household. Amin.

TABLE OF CONTENTS

LIST OF TABLES

ABSTRACT

This study investigates the determinants of innovation and its effect on micro, small and medium enterprises' (MSMEs) performance in Nigeria. To achieve the objective of this study, a cross-sectional enterprise survey dataset conducted by the World Bank in Nigeria between April 2014 and February 2015 has been applied and analysed using robust logistic regression model, for a sample of 504 manufacturing MSMEs. The findings of this study indicate that those manufacturing MSMEs that spend on research and development (R&D) and recruit skilled employees are found to be more innovative in all types of innovation than their counterparts. However, manager's/owners' experience, and foreign ownership are found to have no significant effect on all types of innovation. With regards to the effect of innovation on performance, the findings reveal that all the four types of innovation have a significant positive influence on enterprises' performance. Therefore, the policy implications of the findings of the study are: For the manufacturing MSMEs to be able to innovate they must spend on research and development, and recruit skilled workers. Similarly, for the manufacturing MSMEs to be able to improve their performance, they must enhance their innovative capability. This study therefore recommends that manufacturing MSMEs in Nigeria should continue to employ workers with higher qualifications and professionalism. This may ensure their promotion of innovation capability. In addition, since innovation triggers MSMEs performance in Nigeria, pursuance and application of factors that influence innovation positively should be ensured byproviding enabling environment by the government for businesses to thrive.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The role of innovation in improving the performance of micro, small and medium enterprises (MSMEs) has been emphasised in Economics of Innovation literature. Researchers including Schumpeter (1934), Ho, Pham and Tom (2001), Marques and Ferreira (2009), Onwumere and Ozioma (2015), and many others attest to the fact that successful innovation tends to promote enterprises' performance.

Innovation is one of the fundamental instruments of growth strategies and it increases the existing market share and provides a company with a competitive edge (Hitt, Ireland, Camp & sexton 2001). Hitt et al. (2001) argue that strategic competitiveness can best be achieved by enterprises through developing new technologies. Therefore, the only way for anenterprise to gain a sustainable competitive advantage is invariably to upgrade its processes and activities through innovation (Porter, 1990). Even if innovation does not get direct rewards by market, it can be used to generate dynamic capabilities to manage changes in the organization's environment (Teece, 1988) and to gain first-mover advantages or react speedily to market changes (Cohen & Levinthal, 1990). The significance of innovation can also be observed in the work of Fagerberg, Mowery and Nelson (2005) who assert that innovative countries have higher levels of productivity and income than less-innovative ones.

According to Lin and Chen (2007), innovation is a dominant factor for anenterprise's competitiveness. It fuels organizational growth, drives future success and is the engine that allows businesses to sustain their viability in a global economy. Enterprises must be able to create and commercialize a stream of new products and processes that extend the technology frontier, while at the same time keeping a step or two ahead of their rivals.

Consequently, the pressures on all business enterprises to continuously innovate, so as toenable themselves to develop and launch new products and services, are greater than ever. The successful development and launch of new products and services arefundamentally important to the survival and success of business enterprises, irrespective of their size (Wynarczyk & Thwaites, 1997).

The importance of micro, small and medium enterprises (MSMEs) in developing economy like Nigeria is well recognized because Nigerian economy is dominated by MSMEs in manufacturing, agriculture, commerce and services(Akande& Ojokuku, 2008). Micro, small and medium enterprises constitute a higher proportion of a nation's business activities and generate more employment opportunities than the large companies in recent years (Abereijo, Ilori, Taiwo & Adegbite, 2007). In developing countries, MSMEs are important not only because they create employment but also because they employ unskilled workers who are overly abundant in developing countries (Akande& Ojokuku, 2008). MSMEs have also gained prominence and been considered as a seed bed of innovations, inventions and employment generation (Abereijo et al., 2007). MSMEs are widely recognized as key engine of economic development and poverty alleviation. Apart

from the numerous goods and services produced by MSMEs, they also provide training ground for entrepreneurs even as they generally rely on the use of local raw materials.

In Nigeria as well as in most other countries of the world, MSMEs are recognized by policy makers as an important reservoir for growth, as they represent the vast majority of all enterprises. The contribution of MSMEs to economic growth, export, job creation, innovation and entrepreneurship development has been widely recognized (Akpotohw, 2007; Hamid & Bello, 2008; & Kwaido, 2009). However, many of these MSMEs do not survive their first year in business (Akande & Ojokuku, 2008) and as such do not provide needed benefits to society. The nature of MSMEs operations, capital requirement and employment generation effects have made them the focus of most developmental efforts in less developed countries particularly in view of their capacity as engine of poverty reduction (Abereijo et al., 2007). Poverty reduction has also over the years been of great concern and challenge to promotion of MSMEs globally as a tool for poverty reduction and economic development.

According to Ilori, Oke, and Sanni (2000), Oyewale (2005), Egbetokun, Adeniyi and Siyanbola (2012) most enterprises in developing countries, Nigeria in particular, are micro, small and medium sized with limited human and financial capabilities. They lack in-house capabilities to undertake innovation and have weak linkages with knowledge institutions. Since they have limited internal research and development (R&D) capabilities and weak linkage with knowledge

institutions, they leverage on market and industry sources, competitors and on knowledge network such as industry association.

Despite the risk and uncertainty, when successful, innovation can have a sizeable impact on enterprises' financial results and economic performance. In order to deal with this environment of risks and uncertainties, enterprises must recognise the basic need for innovation in order to obtain and sustain competitive advantage and develop strategies directed towards the development of new products to be able to compete in a highly competitive business environment (Akande & Ojokuku, 2008). Innovation is therefore considered by many researchers and managers to be critical for enterprises to compete efficiently in both domestic and global markets (Hitt et al., 2001).

In view of the contemporary challenges enterprises face, innovation is seen as an increasingly key factor in the competitiveness of anenterprise, as a result, the more detailed study of the factors that determine innovative capacity of enterprises is crucial. Besides the importance of understanding whether enterprises are or are not innovative, and identifying which factors contribute to the development of innovative behaviour, the ways in which innovative behaviour influences enterprise performance also needs closer analysis.

The study of the determinants of innovation on the performance of MSMEs have received great attention from researchers, examining different aspects of the subject matter. For instance, Andrea and Mario (2006), Acs and Isberg (1991), and Lee (2003) investigate innovation and enterprise size, while Falk (2008),

Dachs and Ebersberger (2007), and Guadalupe, kuzmina and Thomas (2010) study foreign ownership as a determinant of innovation. In addition, Afful (2010) examine the influence of age of anenterprise on the innovative capability of MSMEs. A number of studies have also investigated the influence of education and training on innovative capability of MSMEs (Nahlinder, 2010; Silva & Leitao, 2009; Okpara, 2011). Many others have investigated the determinants of innovation types on MSMEs performance in relation to different other variables such as research and development, exposure to foreign trade and barriers to innovation (Shefer & Frenkel, 2005; Love & Ganatokis, 2013; Afful, 2010; Faloye, 2015). The results of the various studies are at variance with each other suggesting that research in this area is inconclusive. In addition, most of the studies have been conducted to understand the determinants of innovation in developed markets and economies.

However, the characteristics of MSMEs and the business environment in developed countries are not exactly the same as those in developing countries, therefore the findings and policies from developed countries cannot be generalised and applied to developing countries like Nigeria. Moreover, some of these cross-sectional database studies (such as, Lee, 2003; Andrea & Mario, 2006; Mulu, 2009) suffer from methodological weaknesses, while most of them (such as Andrea & Mario, 2006; Nahlinder, 2010; Falk, 2008) fail to conduct multicolinearity and heterogeneity tests to find out if the independent variables included in the estimation are not correlated. Thus, the results may not be robust.

Similarly, researchers have shown great interest in the investigation of the effects of innovation on the performance of MSMEs (Salim & sulaimam, 2011; Marques & Ferreira, 2009; Calantone, Cavusgil & Zhao, 2002; and Cainelli, Evangelista & Savona, 2006). Different studies have investigated variables that affect performance of MSMEs. For instance, Maques and Ferreira (2009), Engel, Rothgangand Trettin (2002), and Al-Ansari (2014) study innovation and its impacts on growth of MSMEs, while Gunday, Ulusoy, Kilik, and Akpan (2011), Hassan, Saukat, NawazandNas (2013), and Waloba and Nguigi (2013) investigate the effect of innovation typologies on the performance of MSMEs. The results are generally mixed with some getting significant positive relationship, while others find significant negative relationship, and others find no significant relationship between the variables. This suggests that the investigation into the nature of the effects of innovation on enterprises performance is inconclusive.

Furthermore, the literature survey reveals that the studies on innovation and its effect on performance are observed to have concentrated in Western, Middle and Far East and very little empirical evidence is noticeable in Africa. The issue of innovation and how it relates to enterprises' performance, specially MSMEs is therefore yet to be exhaustively explored in Nigeria. For example, Jegede, Ilori, Sonibare and Siyanbola (2012) have investigated on the determinants of innovation already for large enterprises, but for MSMEs, not much information on determinants of innovation is known. Besides, since a large share of enterprises in Nigeria consists of MSMEs, it maybe worthwhile to investigate empirically the factors that influence innovation in Nigeria MSMEs. The study of Faloye (2015)

on the determinants of innovation on SMEs in South-Western Nigeria focuses on technological and organizational innovation only, while we have other typologies of innovation (marketing and organisational). Similarly, Olughor (2015) study on the effect of innovation on the performance of SMEs organizations in Nigeria examines only 20 SMEs within Lagos and Ibadan. Therefore, there is the need for a wider coverage as the number of SMEs sampled and scope cannot be used for generalization in Nigeria. The literature review find no consistent results on whether all types of innovation altogether influence enterprises' performance. In view of all these, this study is thus a wakeup call to empirically investigate the determinants and effects of innovation on the performance of micro, small and medium enterprises in Nigeria.

1.2 Statement of the Problem

In both developed and developing countries, the government is turning to micro, small and medium enterprises, as a means of achieving some policy objectives (such asprovision of employment, economic growth, etc) and a veritable means of solving some socio-economic problems (such as joblessness, insecurity of live, etc). They are a seedbed of innovation, inventions and employment **(**Abereijo et al., 2007**)** and they constitute the majority of Africa's enterprise base (Kraemer-Mbula, Lorenz, Takala-Greenish, Jegede, Garba, Mutambala, & Esemu)**.**Because of their obvious importance in terms of innovative and entrepreneurial capability, governments and policy makers nowadays pay more attention to them. Globalization has also made economies and businesses become more

interdependent for survival and growth. However, as globalization creates new opportunities for MSMEs, it also creates new challenges for them.

In today's global and materialised economy, the ability of a country to develop, adapt and harness its innovative potential is becoming critical in terms of long term economic growth and competitiveness. Halty-Carrere (1979) argues that the ability to innovate technologically seems to represent the highest degree of development of an industrial society. Most African countries are underdeveloped because their capacity to innovate is quite low both in the private and public sectors (Wolf, 2007).

In Nigeria, MSMEs have not performed creditably well and hence have not played the expected vital role in the economic growth and development of Nigeria**(**Akande & Ojokuku, 2008**)**. The situation has been a great concern to the government, citizenry, operators, practitioners and the organized private sector. Just as it has been a great concern to all and sundry to promote the performance of MSMEs, the vital subsector has fallen short of expectation. This situation is worrisome when compared with what other developing and developed countries have been able to achieve from their MSMEs. Government at various levels in Nigeria has formed different policy- incentives aimed at boosting the performance of MSMEs in order to reduce poverty and enhance economic development. Some of the governmental agencies and programmes that emanated from such policy incentives include National Directorate of Employment (NDE), National Poverty Eradication Programme (NAPEP), National Economic Empowerment and

Development Strategy (NEEDS) among others. Despite these efforts however, manufacturing MSMEs in Nigeria have failed to perform up to expectation.

Previous initiatives designed to assist MSMEs in Nigeria include: Mandatory minimum credit allocation by banks to small scale enterprises; the World Bank SME I and SME II loan programmes, the Agricultural Credit Guarantee Scheme Fund (ACGSF) and the Small and Medium Industries Equity Investment Scheme (SMIEIS). The most ambitious move ever made by the government was the establishment of Small and Medium Scale Enterprises Development Agency of Nigeria (SMEDAN) (Ogboru, 2007).

The promotion of micro, small and medium enterprises is becoming a popular development tool. Accordingly, governments, researchers, policy makers and donors in the developing countries have shown increasing interest in promoting innovations and entrepreneurship in order to stimulate the performance of MSMEs. The growing interest in the subject stems from the intensification of the global process brought about by the revolution in telecommunication which enhances trade within the global economy, the intensive ongoing technological change stimulated by tremendous scientific advancement, and the recognition that it is necessary to go back to basic after experiencing the limits of traditional economic policies (Mulu, 2009). Various support programmes have been initiated with the aim to improve MSMEs' competitiveness through enhancing technology and innovation capabilities such as upgrading product quality, improving design and packaging, and training to improve competitiveness (Porter, 1990). The efficacy of such interventions, however, depends on identifying key factors that

foster or inhibit innovative capabilities of MSMEs. Therefore, Understanding the attributes of innovators and their impact on enterprises performance is crucial in order to formulate effective policies.

However, despite the attention given to micro, small and medium enterprises contributions to income and employment creation they are faced with harsh conditions**(**Abereijo et al., 2007**)** leading some of them failing to survive and grow to large corporate entities. One of the key means to overcome such harsh conditions maybe innovation. Micro, small and medium enterprises are viewed to be a fertile ground for innovation. Their advantages in adopting innovation lay in their flexibility and less rigid organizational structures, which on average promote a higher speed of response.

The study of the determinants of innovation and its effects on the performance of MSMEs has received great attention from researchers. A number of studies have investigated the subject matter in different countries and across countries (Lee, 2003; Marques & Ferreira, 2009, Acs & Audretsch, 1987; Adeyeye, Jegede, Oludare & Aremu, 2015 among others). Literature has yielded an extensive list of factors which seem to determine the idea generation for new and improved products. However the literature does not always give a clue to whether a determinant is relevant for an MSMEs, and fails to investigate to what extent the determinants of innovative ability overlap and differ between the various stages of the innovation process. In the same vein, some empirical studies (such as, Adeyeye, Jegede, Oludare & Aremu, 2015; Artige, 2011; Acs & Isberg, 1991) on the determinants of innovation and performance of MSMEs have been unable to

conduct some diagnostic tests such as multicolinearity and heteroscedasticity tests to find out whether the independent variables included in the estimation are correlated or not, and also to check if variance of different observations are constant. Thus, their results are bound to be bias.

In developed economies, a number of studies (such as, Andrea & Mario, 2006; Andey, Alan & Xiaolan, 2003; and Silva & Leitao, 2007) have been undertaken to analyse the link between enterprises' innovation activities and performance. However, in developing countries, especially in Nigeria, few studies have been carried out to understand which type of innovation drives enterprises' performance. For instance, Adeyeye et al. (2015) and Faloye (2015) have touched on some of the aspects of the subject matter for the Nigerian economy. Adeyeye *et al.* (2015) study micro-level determinants of innovation in the Nigeria manufacturing sector, the study was undertaken on the influence of innovation on the propensity to implement innovation and whether an enterprise size influences the type of innovation implemented by enterprises. Faloye (2015) also examines the determinants of innovation on SMEs in South-Western Nigeriabut focuses on technological and organizational innovation only while we have other typologies of innovation (marketing and organisational). In addition, these works fail to conduct diagnostic test to find out if there is an exact or approximately exact linear relationship among some or all the explanatory variables in their regression models. Thus, the results maybe spurious. Similarly, Olughor (2015) study on theeffect of innovation on the performance of SMEs organizations in Nigeria examines only 20 SMEs within Lagos and Ibadan. Therefore, there is the need for

a wider coverage as the number of SMEs sampled and scope cannot be used for generalization in Nigeria, it also focuses on the determinants of product innovation alone without paying attention to the determinants of other types of innovations. Jegede, Ilori, Sonibare and Siyanbola (2012) also investigate on the determinants of innovation for large enterprises, but for MSMEs, not much information on determinants of innovation is known. Besides, since a large share of enterprises in Nigeria consists of MSMEs, it maybe worthwhile to investigate empirically the factors that influence innovation among MSMEsin Nigeria. This study therefore seeks to fill in these gaps and contribute to this growing literature by investigating the determinants and effects of innovation on the performance of manufacturing MSMEs in Nigeria.

In view of these, this study intends to address the following research questions:

i.Does size of the enterprises determine innovative capacity of MSMEs?

iiDoes employees' skill influence innovation capacity of MSMEs?

iii.Does expenditure on research and development influence innovation capacity of MSMEs?

iv.Does experience of top manager/ owners of enterprises determine innovative capacity of MSMEs?

v. Does access to finance/credit influence performance of MSMEs?

vi. Does innovation influence MSMEs' performance?

1.3 Objectives of the Study

The main objective of this study is to empirically investigate the determinants and effects of innovation on the performance of micro, small and medium enterprises in Nigeria. Specifically however, this study aims at achieving the following objectives:i.To investigate the influence of enterprise's size on the innovative capacity of MSMEs.

i. To investigate the influence of employee's skill on innovative capacity of MSMEs
ii. To investigate the influence of expenditure on research and development on innovative capacity of MSMEs
iii. To investigate the influence of the experience of top managers/owners of enterprises on innovative capacity of MSMEs
iv. To examine the influence of access to finance/credit on MSMEs performance
v. To investigate the influence of types of innovation on MSMEs' performance

1.4 Hypotheses of the Study

The following hypotheses will be tested for achieving the objectives of this study.

$H_{01:}$ Anenterprise size is not likely to have any significant effect on innovative capacity of MSMEs

$H_{02:}$ Employees skill is unlikely to have any significant influence on MSMEs' ability to innovate

H_{03}: Expenditure on research and development is not likely to have any significant influence on MSMEs' ability to innovate

H_{04}: Experience of top manager/owner of enterprise is unlikely to have any significant influence on MSMEs' ability to innovate

H_{05}: Access to finance is not likely to have any significant effect on MSMEs' ability to perform

H_{06}: Innovation is not likely to exert any significant effect on MSMEs' performance

1.5 Significance of the Study

In today's highly competitive global business environment, it is generally accepted that the sustainability of anenterprise's competitive advantage will depend on its innovative capacity based on knowledge acquisition, integration and application (Pyka, 2012). While the importance of innovation is well established, there is still a need to develop an integrated perspective of the determinants of innovation and its influence on growth of MSMEs.

The importance of MSMEs as key engine of economic development and poverty reduction cannot be overemphasized. The impact of innovation and its complexity in the performance of MSMEs has been the subject of debate in the Economics of Innovation literature (Schumpeter, 1934; Ho et al. 2001; Marques & Ferreira, 2009; Onwumere & Ozioma, 2015). In Nigeria, several efforts [likeNational Directorate of Employment (NDE), National Poverty Eradication Programme (NAPEP), National Economic Empowerment andDevelopment Strategy

(NEEDS)] have been made through different policy-incentives aimed at boosting the performance of MSMEs in order to reduce poverty and enhance economic development. Despite these efforts however, MSMEs have failed to develop appreciably (Akande & Ojokuku, 2008).

This study has been justified based on its objective of investigating the factors that influence innovative capability of the MSMEs and influence of innovation on their performance. Although previous studies such as Andrea and Mario (2006), Andey, Alan and Xiaolan, (2003), and Silva and Leitao, (2007) have been conducted to understand the role of innovation in developed markets and economies, the findings are inconclusive. Similarly, despite the high profile of issue in current policy formulation in Africa, and Nigeria in particular, there is little empirical evidence on the determinants of innovation and its impact on MSMEs' performance. The existing few studies such as Abereijo et al. (2007), Adeyeye et al. (2015), Afful(2010), Faloye (2015), Lee (2003); Cainelli *et al*. (2006), Klomp and Vanleeuwen (2001), Lee (2009), Mulu (2009) and Hassan *et al*. (2013) did not conduct some diagnostic tests such as multicolinearity and heterogeneity tests to find out if the independent variables included in the estimation are not correlated and variances are constant. Moreover, most of the works reviewed investigate only process and product types of innovation, and ignore other innovation typologies (marketing and organizational). However, this study covers all types of innovation.

Most of the research studies on the determinants of innovation and its effect on performance are observed to have concentrated in Western, Middle and Far East and very little empirical evidence is noticeable in Africa. The issue of innovation and how it relates to enterprises' performance, especially MSMEs is therefore yet to be exhaustively explored in Nigeria. For example, Jegede, Ilori, Sonibare and Siyanbola (2012) have investigated the determinants of innovation already for large enterprises, but for MSMEs, not much information on determinants of innovation is known. Besides, since a large share of enterprises in Nigeria consists of MSMEs, it maybe worthwhile to investigate empirically the factors that influence innovation in Nigerian MSMEs. A limited number of studies have examined the four typologies of innovation (Product innovation, Process innovation, Marketing innovation and Organizational innovation) identified by (OECD, 2005a). For example, the study of Olughor (2015) focuses on the determinants of product innovation alone without paying attention to the determinants of other types of innovation. Similarly, Faloye (2015) examines the determinants of innovation on SMEs in South-Western Nigeria but focuses on technological and organizational innovation only, while we have other typologies of innovation (marketing and organisational).

Furthermore, Olughor (2015) study on theeffect of innovation on the performance of SMEs organizations in Nigeria examines only 20 SMEs within Lagos and Ibadan. Therefore, there is the need for a wider coverage as the number of SMEs sampled and scope cannot be used for generalization in Nigeria. The literature

also shows that the findings are in conclusive on whether all types of innovation altogether influence enterprises' performance.

By attempting to address some of the weaknesses of some of the empirical studies reviewed in this work, the findings of this study would have some practical significance. For instance, for entrepreneurs/business owners, the outcome of the study will enhance their understanding of MSMEs innovative capability and the effects of innovation on the growth of their businesses, hence adjusting business decisions in the right direction to stimulate businesses performance.

Similarly, the recommendations of this study could also help policy makers formulate consistent policies that will make manufacturing MSMEs more innovative and go a long way of curtailing import bills, improve the countries balance of payment (BOP) status and also promote economic growth. Also, the study will be useful in stimulating public discourse given the dearth of empirical studies in this area from emerging economies like Nigeria.

The study will also add to the available literature on the area of study while providing fresh inputs for policy makers and other researchers who may want to conduct further studies in the area of Economics of Innovation in Nigeria.

1.6 Scope of the Study

This research investigates the determinants of innovation among manufacturing micro, small and medium enterprises (MSMEs) and effect of innovation on performance of MSMEs in Nigeria. This study uses enterprise survey dataset conducted by the World Bank in Nigeria between April 2014 and February,

2015.The manufacturing sector is the primary business sectors of interest for this study, because manufacturing sector is still the largest sector in terms of export, innovation and productivity growth (Manyinka & Sinclair, 2012). Two thousand six hundred and seventy six (2676) manufacturing enterprise owners/managers with 5 or more employees were targeted for interview. However, dropping the missing values from the data of all the manufacturing MSMEs sampled makes only 504 MSMEs usable for this study. Regions covered by the survey dataset were selected based on the number of establishments, contribution to employment, and value added. In most cases these regions are metropolitan areas and reflect the largest centers of economic activity in Nigeria**.**

1.7 Limitations of the Study

A Research of this nature hardly escapes one hurdle or the other and this study is not an exception. One of the limitations of this study arises from the missing values for some variables, which is a common problem associated with a survey dataset. However, the researcher has been able to drop all the observations with the missing value from the large number of observations in the dataset.

Another limitation is that the variables determining innovation and enterprises' performance are so many and some of them have not been captured during the survey by the World Bank. Nevertheless, the researcher has ensured that the most relevant variables with complete data have been explicitly captured in the models while those not captured are subsumed in the error term.

1.8 Scheme of Chapters

This chapter apart, the remaining part of this thesis is organised into four chapters. Chapter two covers the theoretical framework and literature review. This consists of conceptual framework, concept of micro, small and medium enterprises theoretical framework, theoretical literature, determinants of innovation, the relationship between innovation and manufacturing MSMEs and other determinants of manufacturing MSMEs' performance.

The third chapter is on the research methodology. This consists of research design, sample size and sampling technique, sources and type of data, variables measurement, method of data analysis, pre- estimation tests, model specification and post- estimation tests.

The fourth chapter dwells on data analysis and interpretation, and discussion of results. This dwells on data presentation, analysis and interpretation, and discussion of results.

The fifth chapter deals with the summary of major findings, conclusions, policy implications and suggestions for further research.

CHAPTER TWO

THEORETICAL FRAMEWORK AND LITERATURE REVIEW

This chapter consists of conceptual framework, theoretical framework, theoretical literature, review of the determinants of innovation, review of the relationship between innovation and enterprise performance and review of other determinants of enterprises' performance.

2.1 Conceptual Framework

This subsection deals with concept of innovation, types of innovation (product innovation, process innovation, marketing innovation, and organizational innovation), and concept of MSMEs.

2.1.1 Concept of Innovation

The importance of innovation is on the rise and it has been described as the "industrial religion of the 21st century" that offers both a belief and palliative concerns about economic change, re-structuring, competition, competitiveness and survival in a turbulent and uncertain business world (Christenson, 1997). Examination of the innovation literature confirm that there are enormous diversity in views and approaches to what actually constitutes innovative activity, and also highlights some of the confusion that exists within the discipline itself. Confusion seems to stem from the fact that many definitions introduced peripheral concepts, which may deflect attention from the core components of innovation and make its

application difficult. Many definitions have been proposed to explain innovation, and as a result the term has gained greater ambiguity (Garcia & Calantone, 2002).

There are several definitions of innovation, each of which suggests different meanings and different forms of an innovative activity. As stated in the Oxford handbook of innovation, the concept of innovation refers to the putting into practice of inventions (Fagerberg, *et al.*, 2005). A narrow strictly technological approach focuses specifically on product and process innovations or technological innovation, which is often said to be the result of technological entrepreneurship (Fagerberg *et al.*, 2005). A broader approach refers to innovation as not only the development of new products, new processes and new sources of supply, but also the solicitation of new markets and the development of new ways to organize business (Fagerberg *et al.*, 2005).

Innovation refers to the search for development, adaptation, imitation and adoption of technologies that are new to a specific context (Rogers, 1983). An innovation system is therefore a network of organisations within an economic system that are directly involved in the creation, diffusion and use of scientific and technological knowledge, as well as the organisations responsible for the coordination and support of these processes (Rogers, 1983).

Similarly, Rogers (1995) defines innovation as any idea practice or object that is perceived to be new by an individual or other unit of adoption. He stated further that innovation involves the adoption of new products and/or processes to

increase competitiveness and overall profitability as well as involves new ways of identifying the needs of new and existing clients.

In a neo-Schumpeterian tradition, Roberts (1988) makes a clear distinction between invention and innovation. Invention, he argues, is the generation of an idea while innovation incorporates both invention and exploitation. In the same tradition, Elam (1993) defines innovation as the combining of materials in a novel fashion to produce other things, or the same things by a different method.

However, innovation has been considered as the development of a new product/service, the process of developing a new product or the adoptions of a new product which also can be investigated at various levels, such as the project level, industry sector, or region (Christenson, 1997). It has also been described as the successful implementation of creative ideas (Amabile, 1996) which can lead to solutions to the problems that can have a potential impact on revenues of anenterprise, industrial sector effectiveness, and the prosperity of nations (Harrisson & Huntington, 2000).

Moreover, in many studies there exists a strong orientation towards technical, technological and scientific considerations of business innovation (Dierckx & Stroeken, 1999; Feldman & Audretsch, 1999; Dickson & Hajimanolis, 1998). Exploring innovation within the marketing and entrepreneurship presents a clear picture of SMEs behaviour as well as offering practical advice for entrepreneurship (Day, 1998; Fillis 2002). It covers a range of issues necessary to provide value to customers and a good return to the organization. Burkler (1997)

sees innovation as an environment, a culture that exists in a company that drives value creation. To him innovation cannot be touched, heard, tasted or seen but it can be felt within an organization.

Innovation occurs in several functional areas of an organization. For example, Zhuang, Williamson, and Carter (1999) have considered innovation to be an invention; an improvement; diffusion; a problem solving process. They have also identified three different forms of innovative activities: output innovation; input innovation; and process innovation. The multiplicity of meanings of innovation is not however, confined to researches in the field of Economics, Business and Management. Other disciplines have varied, and often contested conceptions of the term innovation (Dickson & Hajimanolis, 1998). For instance, in studies that are rooted in wider sociological and geographical considerations they often conceptualize innovation as a social construct (Dierckx & Stroeken, 1999). According to Kuczmarski (1996) innovation is viewed as a mindset, a pervasive attitude, or a way of thinking that focused beyond the present and into the future vision.

Innovation is therefore the mechanism by which organizations develop value through new products, processes, and organizational systems that are needed to respond to changing markets, technologies and modes of competition (Balan & Lidnay, 2010; Kusiak, 2007). It plays a critical role in determining the long-term survival of organizations (Baark, Antonio, & Sharif, 2011), enhancing an organization's success, and maintaining its sustainable competitive advantages through value creation (Abereijo et al., 2007). Innovation is also a fundamental

component of entrepreneurship (Fazlzadeh& Moshiri, 2010) that creates complex industrial structures and faster economic growth in the globe (Hitt et al.,2001). In this era, where the globe is in an era of faster technological change, enterprises need to be able to innovate on a continuous basis, to produce new products and have the innovation capability to continue to develop new products. Therefore, enterprises are presented with the challenge to build their capacity to maintain a competitive advantage (Hitt et al.,2001).

The OECD's (Organisation for Economic Co-operation and Development) "Oslo manual" is a commonly accepted source for definitions of innovation (Garcia & Calantone, 2002). According to this manual "an innovation is the implementation of a new or significantly improved product (good or service) or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations (OECD, 2005a).

2.1.2 Types of Innovation

Innovation as a term is not only related to products and processes, but is also related to marketing and organization. Schumpeter (1934) described different types of innovation as new products, new methods of production, new sources of supply, the exploitation of new markets, and new ways to organize business. Drucker (1985) views innovation as the process of equipping in new improved capabilities or increased utility.

For this study, OECD (2005a) definition which provides international basis or guidelines for defining and assessing innovative activities as well as for

compilation and use of related data will be taken as the fundamental reference to describe, identify and classify innovations at enterprise level.

In the OECD (2005a), four different types of innovation are identified. These are product/service innovation, process innovation, marketing innovation and organizational innovation.

2.1.2.1 Product/Service Innovation

A product innovation is the introduction of a good or service that is new or significantly improved regarding its characteristics or intended uses; including significant improvements in technical specifications, components and materials, incorporate software, user friendliness or other functional characteristics (OECD, 2005b). Therefore, Product/service innovation can utilize new knowledge or technologies, or can be based on new uses or combinations of existing knowledge or technologies. The term product covers both goods and services. Product innovation is a difficult process driven by advancing technologies, changing customer needs, shortening product life cycles, and increasing global competition (OECD, 2005b). For success, it must involve strong interaction within the enterprise and further between the enterprises and its customers and suppliers (Akova, Ulusoy, Payzin & Kaylan, 1998). For a product to be regarded as innovative, the product must either be a new product or significantly improved with respect to its features, intended use, software, user-friendly or components and material (Ettlie & Reza, 1992). The first digital camera and microprocessors are the examples of the product innovation. Change in design that brings

significant change in the intended use or characteristics of the product is also considered as product innovation (OECD, 2005a).

The product/service innovation has many dimensions; first, from the perspective of the customer, when product is new to the customers. Secondly, from the perspective of the enterprise, when the product is new to the enterprise. And thirdly, product modification means bringing product variation in the existing products of the enterprise (Atuahene-Gima, 1996). Enterprises bring product innovation to enhance efficiency in the business (Polder*et al.*, 2010). In highly competitive environment of today, enterprises have to develop new products according to customer's needs (Olson, Walker and Ruekert, 1995).

The aim of product/service innovation is to attract new customers. Enterprises introduce new products or modify the existing ones according to needs of the customers (Adner & Levinthal, 2001). Shorter product life cycle of the products forces the enterprise to bring innovation in the products (Duranton & Puga, 2001). But in a competitive environment there is low competition at the time of introduction of a new product and that is why it earns high profit (Roberts, 1988). Ettlie and Reza (1992) state that enterprises brings product innovation to compete with other enterprises in the markets and bring product innovation to satisfy their customers. Product innovation is also reflected by the functional performance (Olson et al., 1995). Furthermore, Product/service innovation is one of the key factors that contribute to success of an organization. Therefore, new product

development is an important strategy for increasing the market share and performance of a business.

2.1.2.2 Process Innovation

A process innovation is the implementation of a new or significantly improved production or delivery method (Polder et al., 2010). This includes significant changes in techniques, equipment and/or software (Olson et al., 1995). Process innovations can be intended to decrease unit costs of production or delivery, to increase quality, or to produce or deliver new or significantly improved products (OECD, 2005b). Fagerberg *et al.* (2005) stressed that while the introduction of new products is commonly assumed to have a clear positive effect on the growth of income and employment, process innovation, due to its cost-cutting nature, can have a more hazy effect.

OECD (2005a) defines the process innovation as implementation of the production or delivery method that is new or significantly improved. Therefore, process innovation includes bringing significant improvement in the equipment, technology and software of the production or delivery method. Enterprises bring novelties in the production and delivery method to bring efficiency in the business. The new method must be at least new to the organization to the extent that the organization had never implemented it before. Anenterprise can develop new process either by itself or with the help of another enterprise (Polder et al., 2010). Enterprises bring process innovation to produce innovative products and amendments are also brought in their processes to produce the new products

(Adner & Levinthal, 2001). To decrease the production cost, enterprises go for bringing process innovation. Therefore, enterprises adopting new process to compete with other enterprises have to bring the process innovation to satisfy their customers. The process innovation, especially in the manufacturing organizations, can have significant impact on the productivity of the enterprises. The historical case studies showed that bringing automation in the production methods has increased the efficiency and productivity of the organizations (Ettlie & Reza, 1992).

2.1.2.3 Marketing Innovation

A marketing innovation is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, and product promotion of pricing (OECD, 2005a). Marketing innovations target at addressing customer needs better. Opening up new markets, or newly positioning of anenterprise's product on the market with the intention of increasing enterprise's sales.

The objective of marketing innovation is to increase the sales and market share and opening new markets. The distinctive feature for the marketing method is the implementation of new marketing method that the enterprise has never been implemented before. The product design, that only changes the appearance of the product and does not change the features and functionality of the product, is also marketing innovation (OECD, 2005a). Enterprises bring innovation in their marketing methods to bring efficiency in their businesses (Polder et al., 2010).

Marketing innovation is also referring to developing new techniques, and methods for marketing. Developing new techniques, methods and tools for marketing innovation include 'changed ways for collecting customer's information'. Enterprises now use computer software to collect customer information. The new format of trading like online store is also an example of marketing innovation (Kotler, 1991).

2.1.2.4 Organizational Innovation

Organizational innovation is defined as introduction of new practices of doing business, workplace organizing methods, decision making system and new ways of managing external relations (Polder et al., 2010). OECD (2005a) defines the organizational innovation as implementing new ways of organizing routine activities. Organizational innovation exists when enterprises change the method of organizing their activities that they have not implemented before. Organizational innovation can increase the performance of an organization by decreasing the transaction cost and administrative cost. Enterprises introduce organizational innovation to bring efficiency in the business. The new organizational method must be at least new to the organization and new method can be developed by the enterprise itself or with help of a third party (Polder et al., 2010). Organizations bring changes in their organizational set up by changing the ways of organizing things to compete with their competitors and satisfy their customers (Ettlie & Reza, 1992).

From the foregoing several different typologies can be identified that are related to each other. First, there is the difference between product/service and process innovations. Product innovations refer to new or improved products, while process innovation refers to innovations in the process which lead to the development and commercialization of products. Broadly taken, process innovations incorporate new methods of production, new ways of organizing and new sources of supply (Olson et al., 1995).

The second distinction is between market based innovations and technology innovation. Market based innovations refer to products that depart from existing mainstream markets by involving new and different technologies and creating a set of fringe, and usually new, customer values for emerging markets (Harrisson & Huntington, 2000). Technology based innovations refer to products that adopt new and advanced technologies and improve customer benefits relative to existing product for customers in existing markets (Tushman & Anderson, 1987). To Atuahene-Gima, (1996) both types of innovation are beneficial to organizational performance, but technology based innovations have a greater impact on organizational performance than market based innovation do.

The third and most discussed distinction is between radical and incremental innovations which also address the distinction between market innovation and technology innovation. Radical innovations are innovations that embody a new technology that results in a new market infrastructure (Garcia & Calatone, 2002).

They often don't address a recognized demand but instead create a demand previously unrecognized by the consumer (Garcia & Calatone, 2002).

Radical innovations are recognized by the initiation of new (technological) knowledge and a new marketing strategy. They require organizational practices, technologies or knowledge that are not aligned with the organizational skills and capabilities (Niganaraja, 2008). These radical innovations are based on a different set of engineering and scientific principles and often lead to new markets, potential applications and even redefinition of an industry, forcing organizations to ask themselves a new set of questions, to draw on a new technological and commercial skills, and to employ new problems solving approaches (Niganaraja, 2008).

Incremental innovations on the other hand can be defined as 'products (or processes) that provide new features, benefits or improvements to the existing technology in the existing market' (Garcia & Calatone, 2002). These incremental innovations refer to (minor) changes to the existing products, process or services, they are not based on totally new knowledge, they do not require considerable skills and ingenuity that have significant economic consequences overtime (Hendersen & Clark, 1990).

2.2 Concept of Micro, Small and Medium Enterprises (MSMEs)

The definitions of micro, small and medium enterprises vary differently in different countries and are not uniform in their size and shape. Different writers both academics and practitioners have attempted to define MSMEs in different

perspectives. Today, these definitions are based on a number of criteria which vary over time and across geographical locations. Some countries use turnover of the company to determine the size of an enterprise, whereas some use fixed investment or the number of employees (Abereijo et al., 2007). The definition of enterprise size varies among researchers as well as writers. Some define MSMEs in terms of their legal status and method of production, others attempt to use the capital assets, labour and turnover level (Rahman, 2001). In fact the definitions defer in the context of the economic development which takes place in those countries. For example, anenterprise that can be regarded as micro or small in an economically advanced country like the United State of America or Germany, given their high level of capital intensity and advanced technology, maybe classified as medium or even large in developing countries like Nigeria or Ghana (Nnanna, 2001). Definition also changes over time owing to changes in price levels, advances in technology or other considerations. Even in the same country, different institutions may adopt different definitions depending on their policy focus.

European Union (2003) defines Micro, Small and Medium sized enterprises according to their staff head count and turnover or annual balance sheet total. A medium sized enterprise is defined as an enterprise which employs fewer than 250 persons and whose annual turnover does not exceed EUR 50 Million or whose annual balance sheet total does not exceed EUR 43 Million (Nnana, 2001). A Small enterprise is defined as an enterprise which employs fewer than 50 persons and whose annual turnover and or balance sheet total does not exceed EUR 10

Million (Nnana, 2001). However, a microenterprise is defined as an enterprise which employs fewer than 10 persons and whose annual turnover and or annual balance sheet total does not exceed EUR 2 million (OECD, 2005a).

In the United States, a different model is used, but the stated goals and core values are similar. Here, a microenterprise is defined as a business with five or fewer employees (Ahmed, 1998). Many of these businesses have no employees other than the self-employed owners. Additionally, such microenterprises generally need less than 35,000 dollars in loan capital and do not have access to the conventional commercial banking sector credit. The basis of microenterprises in the US is entrepreneurship recognizing a fundamental right of people to apply their individual talents, creativity and hard-work to better their lives (Ahmed, 1998).

Hallberg (2000) cited in Dongondaji (2006) also describes SMEs as a very heterogeneous group which include a wide variety of enterprises, village handicraft makers, small machine shops, restaurants, and computer software enterprises that possessed a wide range of sophistication and skills, and operated in very different markets and social environments. Hallberg (2000) added that SMEs owners might not be poor, some are dynamic, innovative and growth oriented, others are traditional lifestyle enterprises that are satisfied to remain small. Hallberg (2000) concludes that in some countries, SMEs owners and workers are (or are perceived to be) dominated by members of particular ethnic groups, such as the native Pribumi in Indonesia or indigenous groups in Bolivia.

According to Sanni (2009) small businesses do not conform to any neat parameters because much of their activities depend on the industry in which they operate and also the personalities and aspirations of those in charge of these businesses. These factors vary from manufacturers to retailers, professional managers, high growth, high start-ups that are funded by venture capitalists to self-financed trade men and women for the purpose of making a living.

The difference in the various definitions usually centers on the notion that enterprises differ in many ways in terms of capital structure, sales activities and number of employees within several country contexts. For instance, in a study by Harrisson and Huttington (2000) on bank financing for SMEs across 45 countries, the banks were asked to provide their own definition of small and medium sized enterprises. In particular, banks were asked to provide a range in terms of sales, assets, or employees. Most banks (85%) define small sized enterprises in terms of annual sales between 200,000 and 4 million U.S dollars and medium sized enterprises as those with sales between 2 and 16 million dollars. Thus the average mid - point of the range for small enterprise is 2 million dollars and for medium sized is 9 million dollars.

In Nigeria, like other developing economies, the classification, in addition to “small” and” medium” includes “micro” scale enterprises. The definition of small scale industries also varies from time to time and according to institutions. For instance, the Central Bank of Nigeria (CBN) (2011) defines a small or medium scale enterprises as any manufacturing or service enterprise whose business

turnover does not exceed five hundred thousand naira (N500,000) and or the turnover did not exceed N5.0M. In the 1990 budget, the Central Bank of Nigeria (CBN) also defined small/medium scale enterprises, for the purpose of Commercial Bank Loans, as those enterprises with annual turnover not exceeding N500,000 and for merchant Bank loans, those enterprises with capital investments not exceeding N2m (excluding cost of land or a maximum of N5m) (CBN, 2011).

For instance, it has been noted in the literature that a small enterprise can be defined along three dimensions, in terms of either employment or investment or turnover, or a combination of any two, or all of the above (Atkin & Lowe, 1997). Specifically, in Nigeria, ministries, research institutions, agencies, private sector institutions, etc use different definitions which involve the above three dimensions (Oyefuga, Siyanbola, Afolabi & Dada, 2008). Notwithstanding, Abereijo et al. (2007) argue that small enterprises in the Nigerian context are best defined as those with fewer than 1000 employees and below 50 million naira in assets. The lower limit for this characterization (in terms of employment) beyond which a enterprise is regarded as microenterprise is 10 employee (Oyefuga, et al., 2008).

Ekiugbo (2008) observed that the definition given above seems to agree with the definition of SMEs offered by the Manufacturers Association of Nigeria (MAN). The 1992 review by the National Council on Industrial Standards defined SMEs as enterprises with total cost (including working capital but excluding cost of

land) exceeded N31 million but not exceeding N3,150 million, with a labour size of between 11 and 100 employees (CBN, 2011).

The National Policy on MSMEs adopts a classification based on the dual criteria of employment and assets (excluding land and buildings)by Small and Medium Enterprises Development Agency of Nigeria (SMEDAN, 2012) as follows:

Classification Adopted by SMEDAN for National Policy on MSMEs size

CATEGORY	**EMPLOYMENT**	**ASSETS (N million) (excluding land and buildings)**
1 Micro enterprises	Less than 10	Less than 5
2 Small enterprises	10-49	5 – less than 50
3 Medium enterprises	50-199	50- less than 500

Source: SMEDAN, 2012

From the literature reviewed so far, one can realize that most of the definitions in use depend on the purposes for which those definitions are required to serve and the policies which govern the MSMEs sector. However, for the purpose of this study, the definition used by the World Bank (2014) in conducting the survey, the dataset of which this study has applied, has been adopted. The World Bank (2014) definesa microenterprise as any enterprise with less than 5 employees; a small enterprise as an enterprise with between 5 and 19 employees; and medium enterprise as the one with between 20 and 99 employees. These definitions have been adopted for this study because, the dataset was collected on the basis of theses classifications.

2.3 Theoretical Framework

This subsection deals with Schumpetrian's (1934) theory of economic development, Rogers' (1983) diffusion of innovation theory, Drucker's (1985) creative imitation theory and International trade theory.

2.3.1 Schumpetrian's (1934) Theory of Economic Development

A Theory of innovation is fundamentally a theory of change. Innovation research is typically concerned with understanding how innovation emerges, develops, grows, and how it is displaced by other innovations (Hockerts, 2003). Innovation studies regularly make citations on the work of Schumpeter (1934), which is the representative of the Austrian school of innovation theory. Schumpeter's (1934) theory of economic development delivers a broad interpretation of innovation. It comprehends the introduction of a new product, process method, the discovery of a new resource, material or semi-manufactured article, the conquest of new markets and building of new organization (Drucker, 1985).

Schumpeter's (1934) theory posits that innovation in business is the major reason for increased investments and business success. By innovation he means, the changes in the methods of production and transportation, production of a new product, change in industrial organization, opening up of a new market etc. The innovation does not mean invention rather it refers to the commercial applications of a new technology, new material, new methods and new sources of energy (Drucker, 1985).

In Schumpetrian general theory, innovation is a process and outcome of creative destruction and is directed at developing new combinations of resources (Drucker, 1985). Whereas Schumpeter (1934) speaks of creative destruction, more recent researchers focus on utilizing chances (Kotler, 1991), goal oriented innovation (Drucker, 1985) and risk taking behavior (Kuczmarski, 1996). In order for an innovation to be effective, or even successful, it must result in a significant change, preferably an improvement in a real product, process or service compared with previous achievements (Amabile, 1996).

According to Schumpeter (1934), cyclical process in business is almost exclusively the result of innovation in the organization, both industrial and commercial (Drucker, 1985). In order to further explain his business cycle theory of innovation he developed a model in two stages, i.e first approximation, and second approximation. The first approximation lays emphasis on the primary impacts of innovative ideas while the secondary approximation deals with the subsequent responses obtained from the application of the innovation.

Schumpeter's (1942) hypothesis is that market power is a necessary condition for innovation. The Schumpeterian hypothesis also states that large enterprises having market power are in a better position to innovate than small enterprises (Amabile, 1996). However, an alternative hypothesis is that small enterprises can also be more innovative because they maybe more flexible with respect to adjusting research plans or in the implementation phase of innovations (Amabile, 1996).

Small enterprises may also find it easier to adjust employee incentives to provide optimal innovative efforts and faster their opportunities (Acs & Audretsch, 1987).

Schumpeter (1934) vividly characterises innovation as industrial mutation which incessantly revolutionises the economic structure from within, destroys the old one, creates a new one. This process of creative destruction is the essential fact about capitalism.

2.3.2 Rogers' (1983) Diffussion of Innovation Theory

Rogers (1983) describes innovation-diffussion process as an uncertainty reduction process and he proposes attributes of innovations that help to decrease uncertainty about the innovation. Attributes of innovations include five characteristics of innovations which are relative advantage, compatibility, complexity, trialability, and observability. Rogers (1983) argues that individual perceptions of these characteristics predict the rate of adoption of innovations. He defines the rate of adoption as the relative speed with which an innovation is adopted by members of a social system. That is, the number of individuals who adopted the innovation for a period of time can be measured as the rate of adoption of the innovation.

Rogers (1983) defines diffusion as the process in which an innovation is communicated through channels over time among the members of a social system. He offers the following description of an innovation, that an innovation is an idea, practice, or project that is perceived as new by an individual or other units of adoption. An innovation may have been invented a long time ago, but if an individual perceives it as new, then it may still be an innovation for him. To

Rogers (1983), the newness characteristics of an adoption is more related to the three steps (knowledge, persuasion, and decision) of the innovation-decision process. As expressed in this definition, innovation, communications channels, time, and social system are the four key components of the diffusion of innovations (Medlin, 2001).

Uncertainty is an important obstacle to the adoption of innovations Rogers (1983). Innovation's consequences may create uncertainty. Consequences are the changes that occur in an individual or a social system as a result of the adoption or rejection of an innovation (Rogers, 1983). To reduce the uncertainty of adopting the innovation, individuals should be informed about its advantages and disadvantages to make them aware of all its consequences. Moreover, Rogers claimed that consequences can be classified as desirable versus undesirable (functional or dysfunctional), direct versus indirect.

Rogers (1983) argues that innovations offering more relative advantage, compatibility, simplicity, trialability, and observability will be adopted faster than other innovations. Getting a new idea adopted even when it has obvious advantages is difficult, however innovators should be prepared to cope with unprofitable and unsuccessful innovations, and a certain level of uncertainty about the innovation.

However, much studies from a broad variety of disciplines have used diffussion of innovation theory as a framework. Dooley (1999) and Stuart (2000) mention several of these disciplines as Political Science, Public Health, Communications,

History, Economics, and Education, and argue that Rogers' diffussion of innovation theory has been a widely used theoretical framework in the area of technology diffusion and adoption. According to Medlin (2001) and Parisot (1995), Rogers (1983) diffusion of innovations theory is the most appropriate for investigating the adoption of technology in higher education and educational environments. Much diffusion research involves technological innovations. Therefore Rogers (1983), usually uses the word technology and innovation as synonymous. For Rogers (1983) a technology is a design for instrumental action that reduces the uncertainty in the cause-effect relationships involved in achieving a desired outcome.

2.3.3 Drucker's (1985) Creative Imitation Theory

According to Drucker (1985) entrepreneurs in less developed countries (LDC) are not truly innovators in the traditional Schumpeterian sense. They rarely produce brand new products rather they imitate the products and production processes that have been invented mostly by the developed countries. To Drucker (1985), therefore, entrepreneurship in LDCs is creative imitation. This takes place when the imitators better understand how an innovation can be applied, used or sold in their particular market niches, to win their own countries and neighbors. Kusiak (2007) opined that in Nigeria this brand of entrepreneurship abounds in the South East among the Igbos as revealed by Naffziger and Mueller (1999). These brands of entrepreneurs imitate and adapt products of innovation. To Drucker (1985) what underscores entrepreneurship is change, the entrepreneurs always search for change, responds to it and exploits it as an opportunity.

2.3.4 International Trade Theory

The growing importance of trade liberalization, economic integration and interaction between trade and innovation have received increasing attention in the literature (Grossman & Helpman, 1990). In the literature the principles of growth theory have been transposed to the two-country case, taking explicitly into account the differences in factor endowments and prices between the trading partners. According to Leger and Swaminathan (2006), the determinants of innovation under international trade are similar to the ones in the different branches of economics.

Intended information transfer takes place through technology transfer and or licensing and therefore international property rights (IPRs) are needed to define and protect the objective of the transaction and serve as a supplementary source of revenue for the patent-holder (Leger & Swaminathan, 2006). Using a panel of developed and developing countries to investigate the impact of patent strength on technology transfer from the USA, Yang and Maskus (2001) use reduced form econometric equation relating the volume of USA licensing to measure technology protection and other variables in license nations. The model is applied to data for 23 countries in a panel covering 1985, 1990 and 1995, the result reveal a stronger patent laws to have a positive and significant effect on innovation.

On the other hand, unintended transfers occur through spillovers either from foreign direct investments (FDI) or trade flows. Total factor productivity in industrialized countries is found to be positively affected by incoming foreign

research and development (R&D), especially for more open countries but less for G7 countries (Coe & Helpman, 1995).

Higino (2005) differentiates between industrialized and developing countries using a panel data of 47 developed and developing countries from 1970 to 1990. The result of the ordinary least squares model shows market size and infrastructure as the most important determinants of innovation for developing countries, while high-tech imports, human capital and R&D expenditures are more important for innovation in developed countries. Laura (2010) using a cross-sectional dataset for a sample of 146 enterprises with homogeneous goods, 349 enterprises with reference-priced goods and 649 enterprises with differentiated goods, he hypothesised that the effect of technological innovation on trade can vary according to technological achievement by generating a non-linear relationship between technological innovation and trade. The results of the ordinary least squares, pseudo poison maximum likelihood (PPML) methods and Harvey methodologies conducted indicate a significant positive and non-linear effect of innovation on export performance, which indicates that there are thresholds for positive signs to occur. To foster exports, countries have to consider not only acquisition and assimilation capabilities, but also transformation and exploitation capabilities once a minimum level of potential absorptive capacity has been achieved (Laura, 2010).

From the literature reviewed, it is evident that intended and unintended technology transfers significantly affect the performance of domestic innovation,

but again, country characteristics, like the level of domestic absorptive capacity have to be taken into account (Leger & Swaminantan, 2006).

For this study, Schumpeter's (1934) theory of economic development will be adopted because it is widely accepted in the modern economy and it is used to determine the level of innovation and its impact.

2.4 Theoretical Literature

This section reviews some views on innovation from the perspectives of three selected branches of economics. Institutional economies, Evolutionary economics, and Industrial economics.

2.4.1 Institutional Economics

Institutional economics is a school of economics that emphasizes the importance of non-market factor (social institutions) in influencing economic behavior. In this case, economic analysis is being subjected to consideration of sociological factors, history and institutional development.

North (1989) see institutional economics as an attempt to incorporate a theory of institution into economics. He develops a framework for explaining how institutions change and become more efficient over time.

Institutional economics sees externalities as important characteristics of innovation. Property rights are defined to internalize externalities, and, in the case of innovation, they ensure that the benefits from an invention are incentives for additional innovation (Demsetz, 1967). However, the environment in which these

rights exist is decisive, since it determines the quality of the rights and hence the extent to which they reduce transaction costs and correct for the public good market failure (Williamson, 2000).

Formal institutions i.e. government institutions, labour unions, religious organization and informal institutions, like all types of activities, social, cultural, political and economic that are not officially established influence the innovation process (Eaton &Kartums, 1999). Waguespack, Birnir & Scroeder (2005) using a cross sectional data of 300 enterprises to investigate the relationship between technological development and political stability in Latin America and the Caribbean and applying ordinary least squares regression model, the result reveal that the stability of political institutions, and the institutional environment to be an important factor in explaining the propensity to innovate.

Formal institutions that are significant to innovation are intellectual property right (IPRs) and the related legal organizations necessary for their enforcement which are part of the institutional environment (Leger & Swaminathan, 2006). The relationship between IPRs and innovation has been a crucial task for policy makers to use because of the conflicting results from developed and developing nations. Comparing the determinants of innovation for LDCs and industrialized countries, Higino, (2005) examines the role of IPRs and FDI in determining a country's rate of innovation and economic growth. The empirical analysis was conducted using a unique panel data of 47 developed and developing countries from 1970 to 1990, the results of the ordinary least squares model suggest that

IPRs have a positive and significant impact on innovation in industrialized countries, but that the effect is negative or insignificant in LDCs.

From the literature, however, institutional economics points to the importance of internalizing externalities through IPRs or other mechanism in order to ensure the appropriateness of the returns to innovation. Williamson (2000); Pagano and Rossi (2004) argues that transaction cost and environments in which the enterprise operates are expected to affect the incentives effect of IPRs. However, the role of formal and informal institutions should be taken into consideration in studying innovation especially in LDCs where empirical evidence is mixed.

2.4.2 Evolutionary Economics

Evolutionary economics deals with the study of processes that transform economy for enterprises, institutions, industries, employment, production, trade and growth within, through the actions of diverse agents from experience and interactions, using evolutionary methodology (Edquist, 1997).

In evolutionary economics, the concept of continuity is crucial and it relates to the dependence of current performance on earlier decisions and actions (Scott, 2001). However, such continuity is expressed through the development of routines that reduce learning and other transactions costs. It is argued by Arrow (1962b) that through the execution of routines and other day to day activities, a learning process takes place. Learning by doing and learning by using add to the development of implicit knowledge that is difficult to transmit (Ruttan, 2001).

To Nelson and Winter (2002), though development of routine reduces learning and other transaction costs, they however cause resistance to change and hence can slow innovation or its adoption in the medium and long run. On the other hand the knowledge accumulated is instrumental for the absorption and use of inter-enterprise spillovers (Ruttan, 2001).

The basic assumptions of evolutionary economics appear to reflect more adequately on the processes and environment characterizing innovation.

2.4.3 Industrial Economics

Schumpeter (1942) explains the role of economic agents (inventor and entrepreneur) in technical advancement. He defines entrepreneur as one who sees how to fulfill currently unsatisfied needs or perceives a more efficient means of doing what is already being done and receives profits as a reward.

In industrial economics, two important determinants of innovation have been identified, market structure and enterprise size. According to Arrow (1962a) a free enterprise economy is expected to under invest in invention and research because it is risky. On the other hand he argues that monopoly power acts as a strong disincentives to further innovation, compared to perfect competition. These considerations support the view that government intervention is needed for financing R&D and that a enterprise that takes into account its private and not the social benefits, might not necessary be the ideal fundamental unit of organization in invention.

According to Biemens (1992) R&D activity is a catalyst for innovative industrial activities and ultimately it is responsible for the growth in productivity and total revenue. The share of labour engaged in R&D is found to be closely related to enterprise size in a high-tech group of enterprises. The magnitude of the expenditure on R&D in the group of enterprises is by far larger than that of individual owned enterprises (Biemens, 1992).

The size of the enterprise is therefore an important characteristic that must be considered to explain an enterprise innovation. According to Schumpeter (1942) larger enterprises have a significant advantage with respect to innovation. An industrial organization of large monopolistic enterprise offers decisive welfare advantages and larger enterprises are able to develop market reputation, achieve economies of scale, diversity etc. However, the efficiency gains due to size are found to disappear after a certain critical size (Schumpeter, 1972).

Balding and Sabounn (1999) argue that perfect competition can be the structure most conducive to innovation and this position contradicts Schumpeter's view that perfect competition cannot be compatible with innovation. In a perfectly competitive setting extraordinary profit due to innovation would immediately disappear through rivals imitative activities.

Thus, size has been a fundamental variable. The narrative review of the relationship between the size of the enterprise and innovation, based on the pool of theoretical and empirical research accumulated to date, shows how diversified results are and this makes it difficult to draw general conclusion.

For this study, school of industrial economics hasbeen adopted because of the tremendous progress in the emerging field of industrial dynamism among MSMEs. The analysis of birth, growth and decline of enterprises and industries and the factors affecting them has generated a very rich empirical and theoretical literature. And most of these contributions have recognized the central role of innovation for enterprises and industries.

2.5 Review of Empirical Literature

This section reviews empirical literature on the determinants of innovation, the relationship between innovation and enterprises' performance and a review of other determinants of enterprises' performance.

2.5.1 Determinants of Innovation

The key variables identified by the literatureas the determinants of innovation among MSMEs include an enterprise's size, age, foreign ownership, top manager's/owner's skill, top manager's/owner's experience, expenditure on R&D, exposure to foreign trade, and employee's skill.

2.5.1.1 Enterprise's size

One of the factors frequently related to the innovative capability of an enterprise is its size, by using number of employees as its most commonly used proxy. Under different conditions, enterprise size could be positively or negatively related to innovation, these positions have been supported by a large number of empirical studies which have reported positive, negative or even no significant

relationship between an enterprise size and its capacity to innovate (Klomp & Van Leeuwen, 2001).

The main reason for such ambiguous findings maybe industry-specific characteristics. Lee (2003) analyses the determinants of innovation in the Malaysian manufacturing enterprises using logistic regression model on a cross-sectional dataset, for a sample of 310 manufacturing enterprise. Findings from the study show that enterprise size is more likely to increase anenterprise innovative capability.

Marques and Ferreira (2009) identify the factors that contribute to the building of innovative capacity using cross-sectional dataset for a sample of 1307 enterprises drawn from the manufacturing industry in the Beira interior region of Portugal. The results of the ordinary least squares regression analysis reveal that as the size of an enterprise increases, its innovative capacity also increases.

Andrea and Mario(2006) use community innovation survey (CIS 2) data at the industry level for 22 manufacturing enterprises, broken down into three enterprise size classes, for eight European countries. Ordinary least squares regression model and error component model have been employed in the study, and the findings reveal that enterprise size has a significant positive influence on both product and process innovations.

Love and Ganatokis (2013) also analyse data from a representative survey of UK new technology industry. The results of probit regression analysis for a sample of

412 enterprises reveal that as enterprise size increases, anenterprise innovative capacity is more likely to increase.Andrea and Mario (2006) also use cross-sectional dataset from Ethiopia that comprises 1000 enterprises with ten and fewer workers, and apply logit estimation method, and find that enterprises larger in size in manufacturing sector are more likely to engage in innovative activities. This maybe because large enterprises have stronger cash flows to fund innovation, higher assets to use as collateral for loans and a larger volume of sales.

Harris, Rogers and Siouclis (2003) investigate enterprise-level innovation using panel probit estimation based on the data taken from the Confidentialised Unit Record File for the Business Longitudinal Survey of 3757 Australian enterprises. The authors find that larger enterprises are more likely to innovate. Acs and Audretsch (1987) investigate the difference in the market structure of the determinants of innovation between large and small enterprises in United States of America industry. Using cross-sectional dataset for samples consisting of 172 innovative and 42 highly innovative industries and applying logistic regression model in estimating the difference between large and small enterprise innovative rates, they find that large enterprises are more likely to have the relative innovative advantage in industries that are capital intensive. The study also reveals that larger enterprises are more likely to innovate in industries which are more concentrated and have higher entry barriers while the opposite holds for enterprises characterized by low entry barriers and higher degree of competition.

Nazarov and Akhmedjonov (2011) use enterprise level data for 1400 enterprises in 25 transition countries and apply logit regression model to examine the determinants of enterprise innovation amongst enterprises in Eastern Europe and the Former Soviet Union. The results indicate that larger enterprises are more likely to have some innovative advantages over small enterprises that maybe manifested in easier access to external resources and particularly funds, exploitation of economies of scale and scope.

Using cross-sectional dataset for a sample of 1878 enterprises, Rothwell and Dodgson(1994) investigate the differences between small, medium-sized and large enterprises regarding their performance in the introduction of new products and processes in Netherland. The results of the logit regression analysis suggest that larger enterprises are more likely to innovate. This maybe because they have innovative advantage in a rapidly growing market. A similar study conducted by Artige (2011) using cross-sectional dataset for a sample of 516 enterprises localised throughout continental Spain using ordinary least squares regression analysis, reveals that the larger the enterprise, the higher the probability that the enterprise will engage in innovation.

There are, however, a number of factors that suggest small enterprises may have an advantage. Small enterprises maybe faster at recognizing opportunities. They maybe more flexible with respect to adjusting research plans or in the implementation phase of innovations. Small enterprises may also find it easier to adjust employee incentives to provide optimal innovative efforts. The findings of

Acs and Isberg (1991) using cross-sectional dataset for a sample of 172 enterprises in United Kingdom and applying logistic regression estimation model suggest that smaller enterprises are more likely to have to be innovative than larger ones.

Furthermore, Adeyeye *et al.* (2015) use cross-sectional survey dataset for a sample of 1000 manufacturing enterprises to investigate micro-level determinants of innovation in the Nigeria manufacturing sector. The ordinary least squares regression results show that the size of manufacturing enterprises in Nigeria does not significantly influence the introduction of any type of innovation.

2.5.1.2 Enterprise Age

There could be a positive relationship between MSMEs age and their capability to innovate, as older enterprises would be expected to have accumulated more experience in learning how to improve their efficiency than younger ones. However, a negative relationship between enterprise age and the capability to innovate might also be observed. In a study conducted by Shefer and Frenkel (2005) using cross-sectional dataset for a sample of 209 industrial enterprises in the northern part of Isreal using logit regression analysis, the results reveal that younger enterprises are more likely to invest in research and development than the older and well-established ones.

Afful (2010) also investigates the determinants of innovation within the context of the apparel industry, using cross-sectional dataset for a sample of 50 apparel enterprises selected from Accra metropolis. The author uses evolutionary

framework and logistic model in the analysis of the data collected. The results reveal that age of anenterprise is more likely to positively influence process innovation but negatively influence product innovation.

Other scholars also identify the age of anenterprise as a factor affecting innovation. Fazlzandech and Moshiri (2010) have made an investigation into the factors that influence innovation in the science park of Iran using cross-sectional dataset for a sample 40 small enterprises. The results of the logistic regression analysis reveal that the most likely important factor is the lifetime of the organization.

Similarly, Marques and Ferreira (2009) identify the factors that contribute to the building of innovative capacity. The study was based on cross-sectional questionnaire-based data from a sample of 1307 drawn from manufacturing industry in the Beira interior region of Portugal. The results of the ordinary least squares regression analysis reveal that the age of anenterprise is a factor that has a significant negative influence on its innovative capacity. This shows that younger enterprises have a greater propensity to innovate and that as they grow older, they gradually become less innovative.

Mulu (2009) also uses a large set of microenterprises cross-sectional survey dataset from Ethiopia that comprises 1000 enterprises with ten and fewer workers. The results of logit estimation method show that coefficient of anenterprise age is positive and significantly related to innovative capability. But taking a quadratic value of age into the model, the results reveal non-linear significant negative

relationship between innovation and enterprise age. The concave relationship between enterprise age and innovativeness also suggests that innovative activity increases at an early age of an enterprise but tends to decline beyond a certain age. The positive relation between age and innovation activity at an early age might be due to accumulated business experience and market knowledge. However, this advantage might not last long.

However, Musa and Adamu (2017) to investigate the determinants of firms' innovation in Nigeria using enterprise survey dataset conducted by the World Bank between 2014 and 2015 for a sample of 2676 manufacturing enterprises. The results of the probit and tobit regression models indicate that an enterprise age does not have any statistical significant influence on innovation practices of manufacturing MSMEs in Nigeria.

2.5.1.3 Foreign Ownership

Studies such as Falk (2008) and Sadowki and Rasters (2006) hypothesize foreign ownership to be positively related to MSMEs capability to innovate, as foreign-owned enterprises can employ assets owned by the foreign partners, thus providing competitive advantages. Forexample, in terms of accessing financial support or technological know-how. However, the significance of foreign ownership may depend on the share of ownership. Parent companies may restrict the transfer of enterprises-specific assets to companies operating in another country if they do not hold a significant controlling interest over those enterprises. Guadalupe*et al.* (2010) argue that the parent companies of

multinational enterprises acquire enterprises in foreign countries that they consider to be more conducive for product and process innovations and adoption of new technologies.

Falk (2008) investigates the relationship between foreign ownership and innovation activities using enterprise-level data of the third Community Innovation Survey (CIS) covering twelve European countries. Probit estimates based on 28,000 enterprises show that foreign-owned enterprises are more likely to be innovative than domestic enterprises, particularly in the New EU Member States. Furthermore, using the fractional logit model, the findings reveal that in the New EU Member States, foreign ownership has a positive and significant impact on the share of market novelties as well as on the share of new products in turnover.

Similarly, Sadowki and Rasters (2006) examine the distinctive contributions of foreign subsidiaries and domestic enterprises to innovation in Dutch manufacturing industry by applying logistic regression analysis on enterprise level dataset for a sample of 4780 enterprises obtained from the Community Innovation Survey (CIS-2) in Netherlands.The results of the study indicate that foreign subsidiaries are more innovative, and are more likely to introduce 'imitative' as well as 'real' innovations compared to domestic enterprises.

However, Dachs and Ebersberger (2007) use probit regression and kernel-based matching approach as non-parametric test to investigate whether foreign ownership influences the innovative behaviour of an enterprise. After controlling

for other variables that influence innovative behaviour they discover that there is no significant impact of foreign ownership on innovation. Membership in a multinational enterprise group significantly helps to overcome different obstacles in the innovation process, such as the lack of financial resources, the lack of technological and market information or organisational problems. This advantage, however, does not transfer into a higher innovative input or output. Similarly, Lee (2003) uses cross-sectional dataset for a sample of 320 enterprises in the Malaysia manufacturing sector by applying logit model, and finds that the extent of local versus foreign ownership is not an important determinant of innovation.

2.5.1.4 Top Managers/Owner's Skill

The top managers/owner's skill maybe the best resource for leadership in innovation and a driving force for innovation in MSMEs (Okpara 2011). Many small business owners due to their passion for their business, concern for their customers and non- stop market pressures, innovate on a continuous basis to survive and thrive (Fazlzandech and Moshiri, 2010).

The results of the logit regression conducted by Nazarov and Akhmedjonov (2011) on cross-sectional dataset for a sample of 1400 enterprises across transition economies of Eastern Europe and the Former Soviet Union reveal that the more educated entrepreneurs and employees of an enterprise are, the more innovative the enterprises are likely to be. The results also show that the estimated coefficients for human capital variables are positive and statistically significant,

and the skill level of the workforce and presence of worker training programme are positively associated with innovative capability of enterprises.

Robson, Haugh and Obeng (2008) use cross-sectional dataset for a sample of 496 entrepreneurs in Ghana and apply logistic regression model, and find that the level of innovation is significantly related to the educational level of the entrepreneurs. That is, educated owners are more likely to innovate than less educated ones. Marques and Ferreira (2009) also identify the factors that contribute to the building of innovative capacity by using cross-sectional questionnaire-based dataset for a sample of 1307 enterprises drawn from manufacturing industry in the Beira interior region of Portugal. The results of the ordinary least squares regression analysis reveal that the higher the qualification of the entrepreneur the greater the enterprises innovative capacity.

Okpara (2011) also examines the factors that determine the innovation of enterprises in Nigeria. He uses survey method to gather cross-sectional dataset from 211 small business owners and managers located in some selected cities in Nigeria. The results of the ordinary least squares regression analysis indicate a significant positive relationship between entrepreneurial skill and innovative behaviors of small businesses.

Ogundele, Akingbola and Akinlabi (2012) investigate the intensity of entrepreneurial training and skill as strategic determinants of innovation in Nigeria. They apply cross- sectional dataset from 250 entrepreneurs from five recognized Local Government Areas in Lagos state of Southern Western Nigeria.

Ordinary least squares regression analysis has been used to test the relationship between the entrepreneur skills and innovation. They find that entrepreneur skill is significantly related to the innovative behaviors of an enterprise.

However, contrary to most of the reviewed works, Ashebre, Kahsay and Asayehegn (2013) use cross-sectional dataset for a sample of 70 enterprises and investigate innovative practices of electromechanical manufacturing small and medium enterprises in Makelle city byapplying the logit regression model. The findings of the study indicate that manager's/owner's skill does not bring any significant effect on the innovative activities of the enterprises.

Similarly, Muller and Murman (2014) investigate the workforce composition of young firms and product innovation using panel dataset for a sample of 15300 German start-ups firms between 2005 and 2012.The results of the probit regression analysis indicate a significant negative relationship between owners' skill and innovative capability of the young firms.

2.5.1.5 Top manager/Owner's experience

Previous studies (Drucker, 1985;Afful, 2010; Marques and Ferreira, 2009; Wignaraja, 2008; Mohammed and Nzelibe, 2013) sought to assess the influence that the business owners experience can have on anenterprise's innovative capacity, as the enterprising spirit and driving force behind the organisation's innovative behavior. Wignaraja(2008) investigates the links between ownership, innovation, and exporting in electronics enterprises in three late industrializing East Asian countries(China, Philipines and Thailand) using a cross-sectional

dataset for a sample of 807 enterprises and applying probit regression analysis. The econometric results reveal a significant positive relationship between business owner's experience and innovative behavior of enterprises.

Afful (2010) also investigates the determinants of innovation within the context of the apparel industry, using cross-sectional dataset for a sample of 50 apparel enterprises from Accra metropolis. The author uses evolutionary framework and logistic model in the analysis of the data collected. The results indicate that enterprises having their owners with more experience are more likely to be innovative than those having their owners with little experience.

Marques and Ferreira (2009) identify factors that contribute to the creation of innovative business capacity using a cross sectional dataset for a sample of 1307 manufacturing enterprises in Beira Interior, Portugalby applyingordinary least squares regression analysis. The finding of thestudy reveals that experience of owners of business has a significant positive effect on innovative capacity.

Mohammed and Nzelibe (2013) investigate the performance of SMEs as a catalyst for employment generation and wealth creation in Nigeria using a cross-sectional dataset for a sample of 150 enterprises. The results of the ordinary least squares regression analysis reveal a significant positive relationship between manager/ business owner's experience and innovativeness of enterprises.

Ashebre et al. (2013) investigate innovative practices of electromechanical manufacturing small and medium enterprises in Makelle city, Ethiopia, using

cross-sectional dataset for a sample of 70 enterprises. The results of the logit regression employed reveal that owners experience does not have any statistical significant influence oninnovation practices ofthese electromechanical manufacturing SMEs.

2.5.1.6 Expenditure on Research & Development (R&D)

Shefer and Frenkel (2005) compare innovative behavior of industrial enterprises at regional and national level in both Germany and Israel using multinominal logit model on a cross-sectional dataset collected from 400 enterprises from both the hi-tech and the traditional industries. The findings of the study support the hypothesis that expenditure on R&D is a good surrogate for the probability of the enterprise to innovate.

In a related study, Mengstu, Gebremeske and Desta (2013) use cross-sectional dataset to investigate the innovative activities of a sample of 70 electromechanic SMEs located in the Makelele city, Tigrai, Ethiopia by using binary logistic regression model. The results reveal that those electromechanical manufacturing enterprises that investment in research and development and corroborate with technology support centers are found to be more innovative in their ventures.

Furthermore, Faloye (2015) uses cross-sectional dataset for a sample of 1247 enterprises to examine the determinants of innovation in SMEs in South-Western Nigeria, and applies factor analysis in form of principal component and ordinary least squares models, and finds that the extent of investment in R&D is one of the most important factors that influence innovation in SMEs in the study area.

However, contrary to most of the reviewed studies, Benhabib, Berrached and Senouci (2016) use cross-sectional dataset for a sample of 118 Algerian SMEs to examine the key determinants of innovation using structural equation modeling. The results of the study indicate no significant relationship between R&D and innovative behavior of SMEs in the study area.

Furthermore, the results of the binary logistic regression analysis conducted by Lee (2004) on a cross-sectional dataset for a sample of 749 enterprises in the Malaysian manufacturing sector indicate that R&D doesnot have any statistical significant influence oninnovative capability of these enterprises.

2.5.1.7 Exposure to Foreign Trade

Furthermore, exposure to foreign trade is considered as one of the factors influencing enterprise innovative capabilities. Love and Ganotakis (2013) use cross-sectional dataset for a sample of 412 enterprises selected from the high tech-sector population in UK, and the result of ordinary least squares analysis reveals a significant positive link between SMEs ability to export and their ability to innovate. This finding is consistent with the learning-by-exporting hypothesis that when countries engage in trade, knowledge is exchanged between the companies in each of the trading partners. Knowledge is transferred internationally, both embodied in the flow of traded goods, services and skilled labour, and also through technological transfers amongenterprises.

In the same vein, Afful (2010) uses cross sectional dataset collected on fifty apparel enterprises selected from Accra metropolis. The author uses evolutionary framework and logistic regression model in analysing the data collected. The results indicate that the share of export is positively related to product and process innovation. Furthermore, Ayyagari, Beck and Demirgüç-kunt (2003) investigate the determinants of enterprise innovation amongover 19,000 enterprises across 47 developing economies using logit regression analysis. They find that enterprises that engage in export of their product are more likely to innovate than their counterparts..

Love and Ganatokis (2013) also analyse a cross-sectional dataset from a representative survey of UK new technology industry using probit regression model. The result of the probit regression analysis on 412 enterprises suggests a significant positive relationship between innovation and exporting.Furthermore, Artige (2011) uses cross-sectional data from 516 enterprises localised throughout continental Spain using ordinary least squares regression analysis, and the results of study reveal that there is a significant positive relationship between **exposure to foreign trade** and innovative capacity of manufacturing enterprises in Spain.

Marques and Ferreira (2009) also investigate the factors that contribute to the building of innovative capacity using cross-sectional dataset for a sample of 1307 enterprises drawn from manufacturing industry in the Beira interior region of Portugal. However, the results ofordinary least squares regression analysis reveal

that the extent of the enterprise's openness to the external environment does not have any significant influence on innovative capacity of an enterprise

However, using cross-sectional dataset for a sample of 749 enterprises, Lee (2004) investigate the determinants of innovation in the Malaysian manufacturing sector. The results of the binary logistic regression suggest a negative correlation between the propensity to innovate and exposure to foreign trade.

2.5.1.8 Employees Skill

The literature on innovation has well established the importance of skills to innovation and has acknowledged that a lack of skills is the greatest obstacle to innovation in a wide range of industries and countries (Hyland, 2006).

Educational/training programmes for employee is a fundamental determinant of innovation. The knowledge and skills of employees are often seen as a precondition for high innovation (Freeman, 1992). The presence of formal education and training programmes to keep up the knowledge and skill level may enhance product innovation in small enterprises.

Using cross-sectional dataset for a sample of 700 self-employed workers in Andalusia (Spain), Isidoro, Juan and Martinez (2012) investigate the determinants of innovation in small business. They distinguish between three levels of factors affecting the innovative activities of the self-employed. The results of the ordinal logistic regression procedure show that employee's skill is more likely to have a significant positive influence on innovations.

The results of the logit regression conducted by Nazarov and Akhmedjonov (2011) on cross sectional enterprise level dataset for a sample of 1400 enterprises across transition economies of Eastern Europe and the Former Soviet Union reveal that enterprises having educated entrepreneurs and employees are more likely to be innovative. The results also show that the skill level of the workforce and presence of worker training programme are positively associated with innovative behavior of enterprises.

Nahlinder (2010) argues that ideas from employees are indirect measures of innovativeness in business because they are creative solutions to existing problems and that creativity is an essential initial stage in the process of innovation. Employees' commitment to realize the innovative potentials of their ideas is also important. Similarly, Silva and Leitao (2009) use cross-sectional dataset for a sample of 275 enterprises to investigate cooperation in innovation practices among enterprises in Portugal and apply logistic regression model, and find that the qualification of personnel, in terms of higher levels of education has a positive and significant effect on the propensity for enterprises to innovate.

However, Hyland (2006) examines the role of formal education and work experience in manufacturing enterprises using a probit model. Heuses a cross-sectional dataset for a sample of 420 enterprises in Germany that contains information about corporate innovation activities and the qualification of employees in terms of formal education and work experience. The probit estimation results reveal that large share of highly skilled employees is not likely

to increase the innovative capacity of enterpises. Meaning that having employees with higher levels of education may not be sufficient enough to enhance innovative capability of enterprises.

2.5.2 The Relationship between Innovation and MSMEs' Performance.

Measuring the effect of innovation activities on enterprises' performance has been an active area for research. There are large number of empirical studies available measuring the effect of innovation (product and process) on performance at the enterprise level (Griliches, 1995), and the literature still does not provide a unique answer in terms of the magnitude of this impact.

Many scholars have studied the relationship between innovation and performance (Calantone, *et al.*, 2002; Cainelli, *et al.*, 2006) and found a significant positive relationship between the two variables. Calantone *et al.* (2002)use cross-sectional dataset for a sample of 534 plants in manufacturing industry in Guangdong Province, China, and apply ordinary least squares model, the results indicate that innovation measured by the rate of adoption of innovations by an enterprise and as the organization's willingness to change, is significant and positively related to enterprise performance. Therefore, enterprises with a high level of innovation have higher levels of productivity than those with a low level of innovation.

Innovation is also an important determinant of individual performance constructs, such as profitability (Leiponen, 2005). It has been argued that there exists a clear difference in profitability between enterprises with a high level of innovation and those with a low level of innovation (Cefis & Ciccarelli, 2005).

According to Gunday *et al.* (2011) innovation is considered as an essential component of competitiveness, embedded in the organizational structure, processes, products, and services within anenterprise. They explore the effects of the organizational, process, product, and marketing innovations on the different aspects of anenterprise's performance based on an empirical study covering 184 manufacturing enterprises in Turkey using structural equation model. The results of the structural equation modelreveal a significant positive effect of innovation on enterprise performance in manufacturing industries. Similarly, Hassan*et al.* (2013) explore the effects of innovation types including product, process, marketing and organizational innovation on different aspects of enterprises' performance in Pakistani manufacturing companies using a cross-sectional dataset collected through survey questionnaires from 150 companies. The results of the ordinary least squares regression analysis reveal a significant positive effect of innovation types on enterprise performance.

Moreover, Ho, Pham, and Tom (2001) use panel dataset for a sample of 250 enterprises between 2007 and 2009 to determine the relationship between innovation and enterprise productivity in Vietnam's SMEs. The finding of the Cobb-Douglas production function and fixed effects model indicate that innovation has a significant positive effect on enterprise's productivity.

Similarly, Kuswanto,Roshi, Abdul, and Ghorbani (2012) investigate the impact of distribution channel innovation on SMEs performance in Indonesia using a

cross-sectional dataset for a sample of 120 manufacturing SMEs in Yogyakarta, the special province of Java, Indonesia and its surrounding areas. The results of the ordinary least squares regression analysis show that innovation in assortment, information sharing and transportation coordination has a significant positive relationship with enterprises' performance.

In addition, Engel *et al.* (2002) using cross-sectional dataset of 4000 enterprises drawn from the largest databank on craft business in Germany and applying ordinary least squares analysis to investigate the relationship between innovation output and employment and sales turnover growth, the estimation result of ordered probit model show that innovation has a significant positive influence on sales growth for small enterprises, but not larger ones.

Salim and Sulaiman (2011) also carry out a research to investigate the effect of organizational innovation on companies' performance. The study hypothesises that organizational innovation is positively related to companies' performance. Cross-sectional data were collected via electronic survey from 115 small and medium enterprises operating in the ICT industry in Malaysia, and ordinary least squares regression model was used to test the hypotheses under study. The finding supports the hypothesis that organisational innovation has a significant positive influence on enterprise performance.

Waloba and Ngugi (2013) also investigate the type of the innovation practiced by small and medium enterprises in Kenya from integrated perspectives of its effect on growth of garment enterprises in Nairobi, Kenya. They use cross-sectional

dataset for a sample of 31 entrepreneurs/managers of garment businesses in the study area, and by applying descriptive statistics and ordinary least squares methods. The study finds out that among the types of innovation analysed, marketing innovation contributed most to the growth of garment SMEs in the study area. It is also established that all types of innovation are being practiced in the sector and that innovation is critical for SMEs to become and remain competitive in the global market.

In a related research, Marques and Ferreira (2009) use questionnaire-based cross-sectional dataset for a sample of 1307 enterprises drawn from manufacturing industry in the Beira interior region of Portugal to investigate the influence of innovation on enterprise's performance. Using ordinary least squares regression model, the study reveals that the greater the enterprise innovative capability, the better is its performance with competitive advantage.

Cohen and Kleper (1996) also study 107 SMEs in Ireland, using cross-sectional dataset and applying ordinary least squares regression analysis, and find that innovation is statistically significant and positively associated with overall enterprises' financial and operational performance.Examining how innovation affects business performance in small and medium-sized enterprises (SMEs) in Nigeria, Olughor (2015) also uses a cross-sectional dataset collected from 200 respondents of six SMEs companies based in Nigeria. He applies ordinary least squares method, and finds that innovation has a significant positive influence on business performance.

Furthermore, Onwumere and Ozioma (2015) use cross-sectional dataset for a sample of 120 enterprises to investigate innovative capability among small and medium scale leather manufacturing enterprises in Abia state, Nigeria. The results of the probit regression analysis reveal that innovation has a positive and significant effect on the performance (profit) of the enterprises.

In addition, Nham, Nguyen, Pham & Nguyen. (2016) use cross-sectional dataset for a sample of 118 Vietnam firms to investigate the effects of innovation on firm's performance of supporting industries by applying factor analysis and ordinary least squares regression. The results of the study reveal a significant positive effect of process, marketing and organisational innovation types on enterprise performance.Which means the larger the level of process, organization and marketing innovation activities, the higher would be the level of innovative performance of enterprises

Despite the fact that it is evident from the literature that innovation has a considerable impact on enterprises performance by producing an improved market position that conveys competitive advantage and superior performance (Walker, 2004). Large number of studies focusing on the innovation-performance relationship provide a positive appraisal of higher level of innovation resulting in an increase in enterprises performance (Damanpour & Evan, 1984; Dos Santos & Peffers, 1995; Calantone *et al.*, 2002), there are also some studies indicating a negative link or no link at all (Subramanian & Nilakanta, 1996).

Undesirable or negative effects of innovation have not been given much attention in innovation theory and studies. Two reasons were suggested by Rogers (1983). One is that innovation research seems to be built on a fundamental value that "innovation is good". This limits the ability of decision makers and change agents to anticipate unintended undesirable effect. Another reason for the lack of studies on indirect effect could be inappropriate research methods. Longitudinal studies (Rogers, 1983) and studies where innovation is the independent variable (Anderson, Carsten & Nijstad 2004) are rarely done by innovation scholars. Measurement problems due to cultural relativism or complexity (Rogers, 1983) have also been suggested as part of the reasons.

However**,** Evangelista and Savona (2003) apply probit regression analysis on Italian time series data for the period of 1965 to 1997 and discovered that ICT innovation in large service enterprise decreases employment in overall Italian service sector. Similarly, Koeller (1995) studies of manufacturing industries in Italy uses logistic regression model on time series data during the period of 1960 to 1992 to examine the negative effect of innovation on manufacturing industries. The research reveals that large enterprise innovationincreases industry concentration and it also reduces SMEs probability to invest in capital assets.

2.5.3 Other Determinants of MSMEs' Performance

This subsection deals with review of other determinants of MSMEs' performance. Such determinants include: enterprise's size, owners/managers skills, employees' skills and training, access to finance, government policy and support.

2.5.3.1 Access to Finance

Lack of capital or financial resources may serve as a major barrier to MSMEs and entrepreneurs success who usually have to mobilize their own capital or their own resources to establish or expand their businesses (Harvie & Lee, 2008). In addition, MSMEs in developing countries have difficulties in accessing bank loans as a consequence to their high risk for failing loans, low profitability and lack of collateral required by banks (Harvie & Lee, 2008). For many MSMEs in Nigeria, access to finance and capital appears to be difficult. This maybe as a consequence of weak banking institutions, lack of capital market and inefficient legal framework regarding credit and collateral assessment. Financing of MSMEs and access to finance play a crucial role in the growth process and development of the enterprises (World Bank, 2004).

According to Fatoki (2011), lack of capital seems to be the primary reason for business failure and is considered to be the greatest problem facing micro and small business owners. This suggests that financing is extremely important in the context of enterprise performance and restructuring. Access to sufficient capital and the adoption of appropriate bankruptcy legislation are of fundamental importance in order to enable restructuring under transition (Harvie & Lee, 2008).

Ahmad, Ahmad, Kahut, and Murtaza (2012) investigate the determinants of growth of small and medium-sized enterprises in Pakistan using cross sectional data for a sample of 158 enterprises. The results of the Pearson correlation analysis show that access to finance is positively associated with the growth of

SMEs. In a similar study carried out by Jasra, Asifkhan, Hunjra, Rahman and Azam (2011) to examine the determinants of business success of small and medium enterprises in Pakistan using cross-sectional dataset for a sample of 240 enterprises, and applying ordinary least squares regression method, the results indicate that there is a significant and positive relationship between access to finance and business success.

Fatoki (2011) also evaluates the impact of access to finance on the performance of SMEs in South Africa using cross-sectional data for a sample of 122 enterprises and applying ordinary least squares method. The result of the study reveals that there is a significant positive relationship between access to finance and the performance of SMEs. Similarly, using cross-sectional data for a sample of 195 enterprises, Uddin and Bose (2013) investigate the factors affecting the success of SMEs in Khulna City, Bangladesh, using ordinary least square regression method. The results suggest that access to finance has a significant positive influence on the success of SMEs.

A similar study conducted by Kinyua (2014) using cross sectional data for a sample of for 262 enterprises to identify the factors affecting the performance of small and medium scale enterprises in the Jua Kali Sector in Nakuru Town of Kenya, and applying pearson moment correlation and ordinary least square regression, finds that access to finance has a significant positive effect on performance of SME.

Okpara (2011) also investigates the factors constraining the growth and survival of SMEs in Nigeria. The author uses questionnaire method in collecting cross-sectional data from 211 small business owners and managers located in the cities of Aba, Onitsha, Abuja, and Lagos in Nigeria. He applies ordinary least square regression analysis and finds that access to finance has a significant and positive effect on small business growth and survival in Nigeria.

However, contrary to most of the reviewed works, Mach and Wolken (2011) use panel data for a sample of 4000 SMEs to examine the effects of access to credit on SMEs survival over the period of 2004 to 2008, and applying probit regression model. The findings of the study indicate a significant negative influence of access to finance on the performance of SMEs in the study area.

2.5.3.2 Government Policy/Support

The importance of MSMEs to the economy of a country indicates how important it is to have government policies that support them, including regulations that enable them to operate efficiently and regulations that reduce their administrative costs (Harvie & Lee, 2008). Although there have been initiatives by governments to promote and support MSMEs in order to enhance their development and reduce poverty, there is still a lack of laws and genuine administrative procedures such as accessibility to assistance from the government agencies.

According to World Bank research, complex tax systems, low level of trust in the judicial system, and the need to pay bribes to access public services, represent major barriers, especially in South East Europe (World Bank, 2004).Using cross-

sectional data for a sample of 220 enterprises, Mohammad, Peou and Ali (2010) examine the moderating effect of government policy on entrepreneurship and growth performance of small and medium enterprises (SMEs) in the city of Phnom Penh in Cambodia. The authors apply ordinary least square regression analysis and find a significant positive relationship between government policy and performance of MSMEs.

In another study conducted by Uddin and Bose (2013) to determine the factors affecting the success of SMEs in Bangladesh, from Khulna City using cross-sectional data for a sample of 195 enterprises and applying ordinary least squares analysis, the authors find that government support has a significant and positive influence on the success factors of SMEs. Furthermore, Thaimuta and Moronge(2014) use cross-sectional data for a sample of 232 enterprises to examine the factors affecting the performance of Matatu paratransit venture in small and medium enterprises (SMEs) in Nairobi Kenya, and the results of the ordinary least squares regression analysis indicate that government policies have a significant positive influence on the performance of Matatu paratransit sector in Nairobi, Kenya.

In a related study, Ahmad et al. (2012) investigate the new determinants of growth of small and medium-sized enterprises in Pakistan using cross-sectional data for a sample of 158 enterprises by applying pearson correlation analysis. The finding reveals that government support (access to public infrastructure) has a significant positive association with growth of SMEs. Furthermore, Kinyua

(2014) identifies the factors affecting the performance of small and medium scale enterprises in the Jua Kali Sector in Nakuru Town of Kenya, using a cross-sectional dataset for a sample of 262 MSMEs and applying pearson moment correlation and ordinary least squares model. The finding of the study indicates that access to government support has a significant positive effect on the performance of MSMEs.

Meso *et al.* (2005) examine the effect of business development services on performance of SMEs in Kenya using cross-sectional data for a sample of 150 enterprises in Nairobi Kenya, and applying ordinary least square regression analysis, and find that government support has a significant and positive influence on the performance of the enterprises. However, Ofoegbu, Akanbi and Joseph (2013) examine the effect of contextual factors on the performance of SMEs in Nigeria, in Ilorin metropolis, using cross- sectional data for a sample of 140 enterprises and applying ordinary least squares analysis. The author finds that Government policy has a significant negative influence on SMEs performance.

Moreover, Okpara (2011) investigates the factors constraining the growth and survival of SMEs in Nigeria using cross-sectional data for a sample of 211 small business owners and managers located in the cities of Aba, Onitsha, Abuja and Lagos in Nigeria. The author applies ordinary least square method and finds that access to government support is negatively related with small business performance.

2.5.3.3 Enterprise Size

Studies on the effect of anenterprise size on performance have generated mixed results ranging from those supporting a significant positive relationship among these variables to those on the contrary. Additionally, under the same sample of the enterprises, this relationship maybe positive over some ranges of enterprises' size and negative for others. A significant positive relationship between an enterprise's size and performance has been found by Vijayakumar and Tamizhselvan (2010) using different measures of an enterprise's size (sales and total assets) and profitability (profit margin and profit on total assets) while applying ordinary least squares regression on a sample of 15 companies operating in South India.

Papadogonas (2007) conducts analysis on a longitudinal dataset for a sample of 3035 Greek manufacturing enterprises for the period 1995-1999. After dividing enterprises into four size classes he applies ordinary least squares regression and finds that for all the enterprises, enterprises' performance is positively influenced by enterprise size. Majmumdar (1997) also uses cross-sectional data for a sample of 1020 enterprises in India, and applies ordinary least squares analysis to investigate the impact of anenterprise's size on its profitability and productivity. While controlling for other variables that can influence enterprise performance, he finds evidence that larger enterprises are more profitable.

In a study conducted by Muzenda (2014) to investigate the conceptual model of the determinants of performance of tourism sector among SMEs in South African

using cross- sectional data for a sample of 151 SMEs. The results of the Cramer's V coefficients obtained from the Chi-square test indicate that there is a significant association between enterprise size and SMEs performance.

Lee (2009) examines the role that enterprise size plays in performance. He uses fixed effect dynamic panel model on a panel dataset and performs analysis on a sample of7158 US publicly-held enterprises during the period of 1987-2006. The results of the study show that anenterprise's size has a significant positive effect on profitability.

Similarly, Shehu, Aminu, Mat, Nasiru, Johnson, Tsagem and Maitama (2013) conduct a study to investigate the mediating effect among some determinants of SMEs performance in Nigeria. The study uses of cross-sectional dataset that consists of a sample of 198 manufacturing SMEs operating in Kano State, Nigeria, and applies Structural Equation Modelg (SEM). The findings of the study indicate that there is a significant positive relationship between an enterprise's size and MSMEs performance.

However, Islam, Khan, Obaidullah and Allam (2011) assess the effect of entrepreneur and enterprise's size on the success of MSMEs in Bangladesh by using a questionnaire to collect cross-sectional dataset for a sample of 300 MSMEs. Using one-way analysis of variance, the findings of the study indicate enterprise's size is not a significant factor in determining the business success of MSMEs in Bangladesh.

Similarly, Amato and Burson (2007) use cross-sectional dataset for a sample of 195 enterprises drawn from internal revenue service (IRS) in US to investigate enterprise's size and profit relationship for enterprises operating in the financial services sector. The results of the correlation matrix and ordinary least squares conducted reveal no significant influence of an enterprise's size on its performance.

2.5.3.4 TopManagers'/ Owners'Experience

The competence of MSMEs manager/owner maybe a determinant of survival or failure of an enterprise (Silva & Leitao, 2009). The root cause of either MSME failure or poor performance is almost invariably a lack of management attention to strategic issues such as human resources management (Okpara, 2011).

In a study conducted by Uddin and Bose (2013) to investigate the factors affecting the success of SMEs in Khulna City, Bangladesh using cross-sectional data for a sample of 195 SMEs, the results of the ordinary least squares indicate that owners' skill has a significant positive influence on the success of SMEs in Bangladesh.

In a related literature, Zindiye (2008) investigates the factors affecting the performance of SMEs in the manufacturing sector of Harare, Zimbabwe using cross-sectional dataset through survey questionnaires from 170 SMEs. The results of ordinary least squares regression reveal that manager/owners' experience has a significant positive effect on the performance of SMEs.

Kinyua (2014) also examines factors affecting the performance of small and medium scale enterprises in the Jua Kali Sector in Nakuru Town of Kenya. The study uses cross-sectional dataset for a sample of 262 SMEs by applying Pearson moment correlation to determine the strength of association among factors affecting the performance of SMEs. The findings of the study indicate that owners' experience has a positive and significant association withthe performance of SMEs in Kenya.

Similarly, using cross-sectional dataset for a sample of 232 enterprises, Thamuta and Moronge (2014) examine factors affecting the performance of Matatu paratransit venture in small and medium enterprises (SMEs) in Nairobi County, Kenya by applying ordinary least squares regression model. The findings reveal a significant positive effect of owners' skill on the performance of Matatu paratransit sector in Nairobi county, Kenya.

In a similar study conducted by Islam et al. (2011) in Bangladesh, using cross-sectional dataset for a sample 300 MSMEs and applying ordinary least squares regression analysis, the findings indicate thatowners' and or top managers' experience has a significant positive impact on business success of MSMEs in Bangladesh.

Using cross-sectional dataset for a sample of 198 enterprises, Shehu *et al.* (2013) investigate the mediating effect between some determinants of SMEs performance in Nigeria using structural equation modeling (SEM). The findings

of the study suggest that there is a significant positive relationship between owner/manager's experience and SMEs performance.

Ugheoke, Isa and Noor (2014) also investigate the impact of strategic human resource management (SHRM) on the performance of small and medium scale enterprises using cross-sectional data for a sample of 250 SMEs in Lagos, Nigeria. The authors apply ordinary least squares and find that there is a significant positive relationship between owner or managers' skill and enterprises' performance.

However, Moorthy, Tan, Choo, Wei, Ping and Leong (2012) assess the factors affecting the performance of SMEs in Malaysia using cross-sectional datasetfor a sample of 300 enterprises by applying Pearson product moment correlation coefficient and ordinary least square regression analysis.The findings of their study suggest that there is a significant negative relationship between owner/manager's experience and an enterprise performance.

Similarly, Okpara (2011) investigates the factors constraining the growth and survival of SMEs in Nigeria using cross-sectional dataset for a sample of 211 small business owners and managers located in the cities of Aba, Onitsha, Abuja, and Lagos in Nigeria. Using ordinary least squares in analyzing the dataset, the findings indicate thatowner's skill has a significant negative influence on small business performance.

2.5.3.5 Gender

Several studies(such as, Krishnan and Park, 2005;Shao and Liu (2015) have been conducted to establish the relationship between gender and company performance, but findings of these studies are mixed. Smith, Smith and Verner (2005) investigate the relationship between women in top management and enterprise performance using a panel dataset of 2500 Danish enterprises with more than 50 employees over the period of 1993-2001 by applying ordinary least squares regression model. The results of the study suggest that the proportion of women in top management has no significant positive influence on enterprise performance.

Similarly, Shao and Liu (2015) use a panel dataset collected from the ExecuComp database concerning 1500 US enterprises over the period of 1992 to 2013 to evaluate whether CEOs gender affects enterprise performance using ordinary least squares regression model. The findings of the study show that the gender of CEOs has no significant effect on enterprise performance.

However, Krishnan and Park (2005) investigate the impact of representation of women on top management team on organization performance using cross-sectional dataset for a sample of 679 enterprises from the 1998 fortune 1000 list of top US companies by applying ordinary least regression model. The results indicate a significant positive relationship between the proportion of women in top management team and organization performance.

Similarly, Krishnan and Parson (2008) use panel dataset for a sample of 500 US enterprises over a period of 1996-2000 and apply *t* test to investigate whether there is a significant difference in profit between enterprises with more women as senior management and those with more men.The findings inidicate that enterprises with more women in senior management are more profitable and have higher risk adjusted stock returns after initial public offerings than those with fewer women in the management ranks.

Furthermore, Oba and Fodio(2013) investigate boards' gender mix as a predictor of financial performance in Nigeria using panel dataset for a sample of 30 quoted companies for the period of 2005-2007 by applying ordinary least squares regression model.The findings indicate that female presence on a board has a significant positive effect on enterprises financial performance.

In addition, Garba and Abubakar (2014) investigate the relationship between board diversity and financial performance of insurance companies in Nigeria using panel dataset for a sample of 12 listed insurance companies for a period of 6 years, 2004 to 2009. Using ROA, ROE and TOBIN's Q as measures of enterprise performance and applying feasible generalised least squares (FGLS) and random effects estimators, the author find of that gender diversity has a significant positive influence on insurance companies' performance. This indicates that an increase in the number of female directors on the boards of insurance companies in Nigeria will enhance their performance.

In addition, Abubakar, Garba, Abdullahi and Maishanu (2011) investigate the relationship betweencorporate board gender diversity and firms' performance in Nigeria by using panel dataset for a sample of 82 firms listed on the Nigerian Stock Exchange for the period 2004-2009, and applying pooled-ordinary least squares, fixed effects and random effects estimators. The findings reveal that gender diversity has a significant and positive influence on firms' financial performance in Nigeria.

However, Anh and Khanh (2017) investigate the impact of board gender diversity on enterprise performance using panel dataset for asample of 880 listed enterprises in 10 developed countries covering a nine-year period by applying ordinary least squares regression analysis. The findings indicate thatgender diversity has a significant negative effect on enterprises performance.

Similarly, Akpan and Amran (2014) examine the relationship between board characteristics and company performance using panel datasetfora sample of 90 quoted companies listed on the Nigeria stock exchange from 2010-2012. The results of the ordinary least squares analysis indicate a significant negative relationship between board gender diversity and enterprise performance.

Ajunwa, Okoyenzu and Nwakoby (2012) investigate the impact of corporate board diversity on the financial performance of Nigerian quoted enterprises using a panel of 122 quoted enterprises for the period 1991-2005. Applying fixed effect generalized least square regression, the authors find that gender diversity has a significant negative link with enterprises' performance.

Wolfers (2006) uses the ExecuComp data base for 1500US enterprises over the period of 1992-2004 to identify 64 female CEOs and 4175 male CEOs. The results of the ordinary least squares show no significant relationship female headed enterprises and profitability

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter deals with the research methodology and discusses the methods that underpin analysis of the data collected for this study. It specifically treats research design,sources and type of data, sample size and sampling method, variables measurement, method of data analysis, pre-estimation test and post-estimation test.It also deals with theoretical and empirical specification of the models.

3.1 Research Design

Research design is a plan that guides a researcher in conducting a study so that he/she can collect evidence that either supports or refutes a claim about a phenomenon (Awotunde & Ugoduluwa, 2004). Given the objectives of this study, survey design has been applied to achieve them.

A survey is the method of collecting information by asking a set of pre-formulated questions in a predetermined sequence in a structured or unstructured questionnaire to a sample of individuals drawn to be representative of a defined population (Blaxter, Hughes & Tight, 2001).The main strength of the survey approach is that it can be used for both descriptive and exploratory purposes and allow for direct contact between the researcher and the respondents in the process of collecting data for a study (Singleton & Straits,1993). Another advantage of this approach is that it can be used to obtain detailed and precise information about large heterogeneous population. A research design consists of sampling technique, sample size and method of data collection.

3.2 Type and Sources of Data

This thesis utilizes Nigeria 2014 Enterprises Survey cross-sectional dataset. The survey was conducted by the World Bank. The survey was conducted in Nigeria between April 2014 and February 2015 as part of enterprise survey roll-out, an initiative of the World Bank. The survey used standardised instruments of survey and a uniform consistent method of sampling in order to abate the instances of measurement error and also produce datasets that will be usable and acceptable across different world economies.

The objective of the survey was to obtain feedback from enterprises on the state of the private sector as well as to help in building a panel of enterprise data that will make it possible to track changes in the business environment overtime.

The enterprises survey uses two instruments, manufacturing questionnaire and service questionnaire and were administered on selected business owners and top managers. Most of the questions objectively ascertain characteristics of a country's business environment, while others assess the respondents' opinion on what are the obstacles to enterprise growth and performance.

3.3 Sample Size and Sampling Technique

The sampling technique applied for the enterprise survey was stratified sampling. In stratified sampling, all population units are grouped within homogeneous stratum and simple random sampling technique is applied to select the objects of interest within each stratum. This approach allows computing estimates for each

of the stratum with a specified level of precision while population estimates can also be estimated by properly weighting an individual observation.

The survey covered a sample of 2676 enterprises using stratified sampling technique.Enterprises were stratified by sector of activity, enterprise size and geographical location. The degree of stratification by sector of activity is determined by the size of the economy as measured by the Gross National Income (GNI). Enterprise size has been stratified on the basis of number of employees. On geographical location, enterprises have been stratified based on the distribution of non-agricultural economic activity of the country which takes place mostly in the main urban economic centres of the country. The survey got its sampling frames using data compiled from National Bureau of Statistics(NBS) and using local and Municipal business registers.

The MSMEs manufacturing sector in Nigeria is the primary sector of interest of this study. The Manufacturing Enterprise survey questionnaire was administered on owners and managers of selected enterprises through face-to-face interviews. Having managed the data properly and dropping the missing values, despite the fact that theWorld Bank use standardised instruments of survey and a uniform consistent method of sampling stratification in sampling enterprises covering the study, the researcher considers dropping some of the enterprises that donot have full information on the required variables for analysis. A total number of 504 manufacturing MSMEs comprising 144 microenterprises, 305 small enterprises

and 55 medium enterprises have constituted the sample size for this study. Therefore, 504 enterprises constitute the sample size of this study.

3.4 Variables Measurement.

In a methodology section, there is often a need to indicate how the variables captured in the study are measured (Gupta, 1999).

Measurement of Dependent variable for Determinants of Innovation

Innovation variable is built on the enterprise's assessment of innovation at the enterprise level. Innovation is defined in four different ways in this study. Four types of innovation considered are, product/service innovation, process innovation, marketing innovation and organizational innovation and their measurements are adopted from the works of Afful (2010) Garba and Kraemer-Mbula (2018) and Mengstu et al. (2013). Product/service innovation is measured as a dummy variable taking the value of 1 when an enterprise introduced any new or significantly improved product or services in the last 3 years and 0 otherwise. Process innovation is measured as a dummy variable taking the value of 1 when an enterprise introduced new or significantly improved methods of manufacturing or producing goods or services in the last 3 years and 0 otherwise. Marketing innovation is measured as a dummy variable taking the value of 1 when an enterprise introduced new or significant changes in sales or distribution methods in the last 3 yearsand 0 otherwise. Likewise, organisational innovation is measured as a dummy variable taking the value of 1 when an enterprise

introduced new or significantly improved knowledge management system and skill in the last 3 years and 0 if otherwise.

Measurement of Explanatory Variables for Determinants of Innovation

Here, innovation is postulated to be a function of enterprise-specific characteristics.

Enterprise size: Innovation is postulated to be a function of enterprise-specific characteristics, one of such characteristics is enterprise size. Relatively large enterprises are assumed to have greater access to the resources needed for investment in, or adoption of, a new technology. Larger enterprises are more likely to have the financial resources required for purchasing and installing new technology and maybe better able to attract the necessary human capital and other resources (Shefer & Frenkel, 2005). The size of enterprises in manufacturing MSMEs is mostly measured by the number of employees engaged (Ayyagari et al., 2003). In this study therefore, enterprise size is measured as number of employees of an enterprise, following the work of Ayyagari et al. (2003).

Age of an enterprise: The lifetime of an organization is another factor for innovation. There could be a relationship between MSMEs age and its capability to innovate, as older enterprises would be expected to have accumulated experience in learning how to improve their efficiency than younger ones. As companies become older, the knowledge generated and incubated through experience will increase their innovation capability (Fazlzadeh & Moshiri, 2010). This is measured as natural logarithm of the number of years since the enterprise

began operation, in the country, adopted from the work of Marques and Ferreira (2009).

Extent of foreign ownership: From the literature reviewed, foreign ownership is seeing to be positively related to MSMEs capability to innovate, as foreign owned enterprise can employ assets owned by the foreign partners to their advantage. Based on the available data from the previous studies, this variable is a qualitative variable, therefore, it is measured as dummy variable. The measurement of this variable has beenadopted from the work of Oum, Narjoko and Harvie (2014). A foreign owned enterprise is measured as a dummy variable taking a value of 1 if it reports that a foreign company owns at least 50% of its capital and 0 otherwise.

Top manager's/owner's skill: The Top manager's or owner's skill is the best resource for leadership in innovation. Based on the available data from the previous studies, Top Manager/Owner skill is a qualitative variable, therefore, Lieponen (2005) benchmarking has been adopted. The variable is measured as a dummytaking a value of 1, if the manager/owner holds a minimum of first degree or HND, and 0 otherwise.

Top manager's/owner's experience: Another important factor considered in the study is the impact of experience of owners of business on enterprise's innovative ability. Studies such as (Drucker, 1985; Afful, 2010; Marques and Ferreira, 2009; Wignaraja, 2008; Mohammed and Nzelibe, 2013) indicate that business owners with more experience tend to be more innovative than those with little experience. Owner's experience is measured as the number of years of working experience in

the business (Wignaraja, 2008). This study adopts the measurement applied by Wignaraja (2008) by using years of working experience in the sector by a top manager as a proxy for experience.

Expenditure on Research and Development (R&D): This constitutes a major part of the innovation process (Tiwari, Buse & Herstatt, 2007) and is often found to be a significant determinant of innovation (Andey et al., 2003). Expenditure on R&D is necessary to create the new knowledge required to develop innovations and it has an important interplay in developing enterprise's competitiveness (Mengstu et. al., 2013). Abereoje et al. (2007) measured expenditure on R&D as percentage of sale revenue allocated for R&D. In this study, the variable is measured as a dummy variable taking a value of 1if an enterprise spent on R&D in the past three years, and 0 if otherwise.

Employee's skills/training: The literature on innovation has well established the importance of skills to innovation and acknowledged that a lack of skills by employees is one of the obstacles to innovation in a wide range of industries and countries (Keller, 2009). Enterprises require an adequate pool of skilled manpower to be able to innovate. Leiponen (2005) uses education level of employees as the most common measure of skills. He uses university as benchmark to separate skilled and unskilled workers. Based on the available data from the literature survey and following the work of Lieponen (2005), employees' skills is measured as a dummy variable taking a value of 1 if an employee holds a minimum of a first degree / HND, and 0 otherwise.

Exposure to foreign trade: Exposure to foreign trade and innovation are likely to be inter-related. Exposure to foreign trade is hypothesized as enhancing enterprises' innovation capability through both export and import channels (Keller, 2009). In general, innovative enterprises may seek to exploit overseas markets, suggesting that the causality may run from innovation to export. It is also possible that enterprises that export also have access to improved knowledge flows and, possibly, higher incentives (Hobday, 1995). Based on the available data from the literature survey, this variable is a qualitative variable, therefore, it is measured as dummy variablein line with the work of Rogers (1995). The variable is measured as a dummy taking a value of 1 if an enterprise exports its products, and 0 otherwise. Hence it will be interesting to observe the relation between exposure to foreign trade and innovation.

Measurement of Dependent Variable for Effect of Innovation on Enterprises' Performance

Performance according to Hornby (2000) is described as an action or achievement considered in relation to how successful it is. Performance is measured differently and is consistently monitored from the organization context (Jamil & Mohamed, 2011). Looking at the Hornby (2000) definition, it can be reasonably concluded that performance is synonymous to success. What connotes performance varies from one organization to another. Prior to 1980s, financial indicators were the sole measurement rod of performance such as: profit, return on investment, sales per employee and productivity (Pasanen, 2006). Shortly after1980s till date, attentions have been shifted from financial to less tangible and non- financial

measures of performance, which includes: Just in-time delivery (JITD), total quality management (TQM), communication, trust, stakeholder satisfaction, competitive position and quality of product (Pasanen, 2006). Garrigos-Simon, Marques and Narangajavana (2005) also categorise performance measurement into four, namely: (1) Profit which includes: return on assets, return on investment and return on sales; (2) Growth in term of: sales, market share and wealth creation; (3) Stakeholder satisfaction which include customers satisfaction and employees satisfaction; and (4) Competitive position which include: overall competitive position and success rate in launching new product.

In several studies, the word performance and success are used interchangeably (Pasanen, 2006). Sandberg, Vinberg and Pan (2002) stress that performance is the ability to contribute to job and wealth creation through enterprise start-up, growth, and survival. According to Pasanen (2006) success is often equated with the achievement of defined and measurable goals or objectives in all sectors of human life, which maybe subjective (non-financial nature) as well as objective (financial nature).

Micro, small and medium enterprises (MSMEs) growth is often closely associated with enterprises overall success and survival (Pasanen, 2006). Growth has been used as a simple measure of success in business and has also been suggested as the most appropriate indicator of the performance for surviving MSMEs (Storey, 2003). However the most frequently used measures of performance are enterprise's output and profit (Pasanen, 2006).

Enterprise output/capacity utilization has also been used as a performance measure in the works of (Pasanen, 2006), and (Leiponen, 2005). However, all the aforementioned proxies are traditional measures of performance, but one of the modern measures of performance is customers responsiveness which has been adopted in this study.

One of the modern measures of an enterprise performance is customer satisfaction (responsiveness). According to Beckett and Dang (1992) and Goldhar and Lie (1991), high customer responsivenesss translates into greater customer retention, leading to sustainable comparative advantage. Similarly, Angelova and Zekiri (2011) arque that, customer satisfaction leads to repeated purchase of an enterprise products.

Therefore, customer satisfaction or responsiveness is measured in this study as a dummy variable taking a value of 1 if during the past 3 years an enterprise experienced a significant increase in the demand for its product or services, 0 otherwise. This proxy has been adopted in this study because Johnson and Kaplan (1987) argue that, traditional performance measures do not reflect the changes that appear in the competitive conditions and strategies of the modern organisations.

Measurement of Explanatory Variables for Determinants of Enterprises Performance

Product/service innovation: This is measured by both the introduction of new goods and significant improvements in the existing goods or services. Product innovation is a dummy variable taking a value of 1 when a company introduced any new or significantly improved product or services in the past 3 years and 0 if otherwise. This is in line with the work of Afful, (2010) and Mengstu et al. (2013).

Process innovation: Process innovation is measured as a dummy variable taking a value of 1 when a company introduced new or significantly improved methods of manufacturing or producing goods or services in the past 3 years and 0 otherwise. This is in conformity with the works of Afful, (2010) and (Mengstu et al. (2013).

Marketing innovation: This is also measured as a dummy variable taking a value of 1 when a company introduces new or significant changes in sales or distribution methods in the past 3 years and 0 if otherwise. This is in line with the works of Afful (2010) and Mengstu et al. (2013).

Organisational innovation: This is measured as a dummy variable taking a value of 1 if a company introduces new or significantly improved management system and skill in the past 3 years and 0 if otherwise Afful (2010) and Mengstu et al. (2013).

Access to finance\credit: This variable is measured as a a dummy variable taking a value of 1 if an enterprise has access to sources of finance to fund its business, and 0 if otherwise. This is adopted from the work of Oum*et al.* (2014), and also in conformity with the available data from the literature survey.

Top manager/Owner experience: The manager's or owner's experience is the best resource for enterprise performance. For Manager/Owner's experience Drucker (1985) and Wignaraja (2008) indicate that business owners with more experience are more likely to perform more than those with little experience. Owner's experience is measured as the number of years of working experience in the business (Wignaraja, 2008)

Government policy/support: The justification for government support is that market failure can hinder MSMEs access to information, finance, technology, and human resources. Therefore, government support has been used as a proxy for government policy in line with Oum et al. (2014) taking a value of 1 if an enterprise received any support from the government, and 0 otherwise.

3.5 Method of Data Analysis

Both descriptive and inferential statistical methods were applied in the analysis.

3.5.1 Descriptive Analysis

Data were described or summarised using descriptive statistics such as mean, minimum and maximum to meaningfully describe the true nature of the dataset.

3.5.2 Inferential Analysis

Since innovation and performance measures as dependent variables in innovation and performance models are dummy variables, categorical dependent variable estimator in the form of robust logistic regression has been applied. The robust logistic model, due to its generic application, versatile nature and appropriate interpretation for the effect of the explanatory variables (Hailperm & Visintainer, 2003) has been applied in the presence of heteroscedacity.Furthermore, robust logistic model has been applied because it is the most common model used in studies of factors of innovation capability (Kaufmann & Tödtling, 2000; Silva & Leitao, 2007).

3.5.2.1 Pre–Estimation Tests

There are several assumptions that have to be fulfilled for regression model to be valid. Therefore, test for Normality, Multicollinearity and Heteroscedasticity have been conducted in this study.

3.5.2.2 Test for Normality. This has been tested to determine whether the residuals are normally distributed, using Geary's test for normality. The results from the tests in Tables 4.2.1.1 and 4.2.1.2 show that the residuals have normal and identical distribution.

3.5.2.3 Multicollinearity

Multicollinearity refers to the situation where there is either an exact or approximately exact linear relationship among some or all explanatory variables of a regression model (Yaffee, 2002a). Multicollinearity exists when the

independent variables are highly correlated, so there is the need to check for this problem as part of the data screening process.

Multicollinearity test has been performed to find out if the independent variables included in the estimation are not correlated. This has been conducted using variance inflation factor and tolerance value using Stata version 14. The results of multicollinearity test in Tables 4.2.1.5 and 4.2.1.6 reveal absence of multicollinearity problems in all the regression models.

3.5.2.4 Heteroscedasticity

Heteroscedasticity occurs when the variance of the disturbance term is not the same for all observations (Yaffee, 2002b). Very often what causes heteroscedasticity maybe due to the fact that some important variables are omitted from the models. Heteroscedasticity is primarily common in cross sectional data such as the one used in this study. The reason is that in cross sectional data, we generally deal with members of a population at a given point in time. Grejser langrange multiplier heteroscedasticity test has been run to detect heteroscedasticity problem. Consequently, heteroscedasticity has been detected and robust logistic regression has been applied.

3.6 Model Specification

Categorical dependent variable model in the form of robust logistic regression used by Lee (2003) to examine the determinants of innovation and influence of innovation on the performance of MSMEs in the manufacturing sector has been adopted for this study. This model predicts that age of an enterprise, top

manager's/owner's skill extent of foreign ownership, enterprise size, experience of the owner of business and can determine innovation. Other variables like expenditure on R&D, access to financial resources which havealso been proven by other studies as determinants of innovation have also been captured in this study.

Theoretical Econometric Models

Innovation and performance models are specified as follows:

Innovation Model:

The propensity to innovate is modeled as:

$y_i = \beta_{0+} \beta_i X_i + \mu_i$.....(1)

However, in a binary outcome model, the dependent variable

y_i takes one of these two values;

yi= {1 if an enterprise i innovates, 0 otherwise}

$\beta_{o=}$ the constant parameter as an intercept of the model

x_i is a vector of exogenous explanatory variables

μ_i is a stochastic error term

β_i is a vector of the estimated parameters

Performance Model:

$y_i = \alpha_{0+} \alpha_i X_i + \mu_i$.....(2)

yi= Dependent variable (1 if in the past 3 years an enterprise experienced a significant increase in the demand for its products or services, 0 otherwise)

$\alpha_{0=}$ the constant parameter as an intercept of the model

x_i is a vector of exogenous explanatory variables

μ_i is a stochastic error term

α_i is a vector of the estimated parameters

Empirical Models

This subsection deals with specification of the two models (for determinants of innovation and also for MSMEs' performance) estimated in this study.

Empirical Innovation Modelsfor testing Hypotheses one to four.

For innovative ability of MSMEs, four logistic regression models have been estimated according to the types of innovation. The probability of innovative capability has been determined by the following factors: Enterprise size (ENTSIZE), age of anenterprise (ENTPAGE), extent of foreign ownership (FOREINOWN), manager/owner's skill (OWNSKIL), manager/owner's experience (OWNEXPER) expenditure on R&D (R and D),Exposure to foreign trade (EXPOT) and employee's skill (EMPSKIL). Robust logistic regression model has been applied to test hypotheses one to four. According to (Kaufmann & Tödtling, 2000, Silva & Leitão, 2007), logistic regression is an approach commonly used in investigating factors of innovation capability.

The full regressionequationsare shown below.

$$PRODIN_i = \beta_0 + \beta_1 ENTSIZE_i + \beta_2 ENTPAGE_i + \beta_3 FOREINOWN_i + \beta_4 OWNSKIL_i + \beta_5 OWNEXPER_i + \beta_6 RandD_i + \beta_7 EXPOT_i + \beta_8 EMPSKIL_i + \mu_i \quad (3)$$

$$PROCIN_i = \beta_0 + \beta_1 ENTSIZE_i + \beta_2 ENTPAGE_i + \beta_3 FOREINOWN_i + \beta_4 OWNSKIL_i + \beta_5 OWNEXPER_i + \beta_6 RandD_i + \beta_7 EXPOT_i + \beta_8 EMPSKIL_i + \mu_i \quad (4)$$

$MKTIN_i = \beta_0 + \beta_1 ENTSIZE_i + \beta_2 ENTPAGE_i + \beta_3 FOREINOWN_i + \beta_4 OWNSKIL_i + \beta_5 OWNEXPER_i + \beta_6 RandD_i + \beta_7 EXPOT_i + \beta_8 EMPSKIL_i + \mu_i$ ..... (5)

$ORGIN_i = \beta_0 + \beta_1 ENTSIZE_i + \beta_2 ENTPAGE_i + \beta_3 FOREINOWN_i + \beta_4 OWNSKIL_i + \beta_5 OWNEXPER_i + \beta_6 RandD_i + \beta_7 EXPOT_i + \beta_8 EMPSKIL_i + \mu_i$ .....(6)

Where:

$PRODIN_i$ = Measure of product/service innovation

$PROCIN_i$ = Measure of process innovation

$ORGIN_i$ = Measure of oganisational innovation

$MKTIN_i$ = Measure of marketing innovation

ENTSIZE= Enterprise size

ENTPAGE= Age of anenterprise

FOREINOWN= Extent of foreign ownership

OWNSKIL= Manager's/ Owner's skill

OWNEXPER= Managers'/ Owners' experience

R and D= Research and development

EXPOT= Exposure to foreign trade.

EMPSKIL= Employee's skill

Empirical performance Models for testing Hypotheses five & six:

These models predict that innovation type (PRODIN, PROCIN, MKTIN and ORGIN), enterprise size, owners'/managers' experience, gender of owner of an enterprise, government policy and access to financial resources are the factors affecting MSMEs performance.

Robust logistic regression model has been employed to regress dependent variable (enterprise's performance) on a set of independent variables, which include innovation types (PRODIN, PROCIN, MKTIN and ORGIN),access to finance (FINACCESS),government policy/subsidy (EXPSUB) enterprise size (ENTSIZE), Owners'/managers' experience (OWNEXPER), owner's gender (OWNGEND).

Robust logistic models are expanded as follows:

$INCRDDDUM_i = \alpha_0+\alpha_1 PRODIN_i + \alpha_2 FINACCESS_i + \alpha_3 EXPSUB_i + \alpha_4 ENTSIZE_i + \alpha_5 OWNEXPER_i + \alpha_6 OWNGEND_i + \mu_i$…… (7)

$INCRDDDUM_i = \alpha_0+\alpha_1 PROCIN_i + \alpha_2 FINACCESS_i + \alpha_3 EXPSUB_i + \alpha_4 ENTSIZE_i + \alpha_5 OWNEXPER_i + \alpha_6 OWNGEND_i + \mu_i$…….(8)

$INCRDDDUM_i = \alpha_0+\alpha_1 MKTIN_i + \alpha_2 FINACCESS_i + \alpha_3 EXPSUB_i + \alpha_4 ENTSIZE_i + \alpha_5 OWNEXPER_i + \alpha_6 OWNGEND_i + \mu_i$…… (9)

$INCRDDDUM_i = \alpha_0+\alpha_1 ORGIN_i + \alpha_2 FINACCESS_i + \alpha_3 EXPSUB_i + \alpha_4 ENTSIZE_i + \alpha_5 OWNEXPER_i + \alpha_6 OWNGEND_i + \mu_i$……(10)

Where: $INCRDDDUM_i$ =Enterprise's Performance (a dummy variable taking a value of 1 if during the past 3 years an enterprise experienced a significant increase in the demand for its products or services, 0 otherwise).

$PRODIN_i$=Product/service innovation,

$PROCIN_i$=Process innovation,

$ORGIN_i$=Organizational innovation,

$MKTIN_i$=marketing innovation,

α_0 is a constant parameter which is the value of dependent variable when all the independent variables are 0.

α_1, α_2, α_3, α_4, α_5, α_6 α_7 are the estimated coefficients of the independent variables, μ_i is the error term which takes care of the other factors that might influence enterprise performance but not captured in the model.

3.7 Post–Estimation Tests

Post-estimation test has been conducted in the form of F-statistic test for the adequacy of the model. The results of which are explained in chapter four.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION, AND DISCUSSION OF RESULTS

This chapter dwells on the data presentation, analysis and interpretation of results. It presents descriptive and inferential statistical analyses used to test all the hypotheses presented in the previous chapter.

4.1 Data Presentation and Analysis

This section deals with both quantitative and qualitative descriptive data analysis as well as inferential statistical analysis.

4.1.1Descriptive Analysis and Interpretation of Results

This subsection presents the descriptive statistics for quantitative and qualitative variables for better understanding of nature of the variables under study.

Table 4.1.1: Results of descriptive analysis of quantitative variables for the whole sample of enterprises

Variable	Number of Observations	Mean	Minimum	Maximum
Enterprise size	504	9	0	72
Enterprise age	504	14.5	0	64
Top manager's/owner's experience	504	13.03	1	54

Source: Generated by the author from Nigeria Enterprise Survey 2014 dataset, using Stata version 14.

Table 4.1.1 presents the results of the descriptive analysis of the quantitative variables for the whole sample of enterprises. The analysis has been in the form of mean, minimum and maximum. The total number of observations covered in the study was 504 enterprises.

From the results in Table 4.1.1, the mean number of employees as a proxy for enterprise size for the whole sample stood at 9, with a minimum of 0 and a maximum of 72 employees. The results indicated that there were some enterprises with no any employee with exception of the owner and there were some of them with up to a maximum of 72 employees. The findings indicate that MSMEs are another source of generating employment in Nigeria.

The results in Table 4.1.1 further revealed the mean number of years since the enterprise began operation as a proxy for enterprise agestood at 14.5, with a minimum of 0 and a maximum of 64 years. The results therefore indicated that the average age of enterprises in the whole sample was 14.5 years, while some of them have been in existence for the past 64 years. However, some of them were not up to a year old.

For Manager's/owner's experience for the whole sample, the results in Table 4.1.1 revealed the mean number of years of working experience of a manager/owner in the business as a proxy for manager/owners' experience which stood at 13.03 years, with a minimum of 1 and a maximum of 54 years. This indicated that some owners of the enterprises had 1 year of working experience while some of them had up to 54 years of working experience.

Table 4.1.2: Results of descriptive analysis of quantitative variables for microenterprises only

Variable	Number of Observations	Mean	Minimum	Maximum
Enterprise size	144	3	0	4
Enterprise age	144	14.4	1	49
Top manager's/owners'experience	144	13.7	1	50

Source: Generated by the author from Nigeria Enterprise Survey 2014 dataset, using stata version 14.

Table 4.1.2 presents the results of the descriptive analysis of the quantitative variables for micro enterprises only. The analysis has been in the form of mean, minimum and maximum. The total number of microenterprises covered in the study was 28.

From the results in Table 4.1.2, the mean number of employees as a proxy for enterprise size for the microenterprises stood at 3 employees, with a minimum of 0 and a maximum of 4 employees. The results indicated that there were some microenterprises with no employee with exception of the owner while some of them with up to a maximum of 19 employees.

The results in Table 4.1.2 further revealed the mean number of years since a microenterprise began operation as a proxy for enterprise agestood at 14.4 years, with a minimum of 1 year and a maximum of 49 years. This indicated that there were some microenterprises with 1 year of establishment, while some have been in existence for the past 49 years.

The descriptive analysis of the quantitative variable for microenterprises in Table 4.1.2 further revealed the mean number of years of working experience of a manager/owner in the business as a proxy for manager's/owner's experience as 13.7, with a minimum of 1 year and a maximum of 50 years of accumulated experience. This revealed that some owners of the microenterprises had 1 year of working experience while some of them had up to 50 years of working experience.

Table 4.1.3: Results of descriptive analysis of quantitative variables for small enterprises only

Variable	Number of Observations	Mean	Minimum	Maximum
Enterprise size	305	9	5	19
Enterprise age	305	13.9	0	64
Top managers'/owners' experience	305	12.4	1	50

Source: Generated by the author from Nigeria Enterprise Survey 2014 dataset, using Stata version 14.

Table 4.1.3 Presents the results of the descriptive analysis of the quantitative variables for small enterprises only. The analysis has been in form of mean, minimum and maximum. The total number of small enterprises covered in the study was 330.

From the results in Table 4.1.3 the mean number of employees as a proxy for enterprise size for the small enterprise stood at 9, with a minimum of 5 and a

maximum of 19 employees. This revealed that there was no small enterprise without an employee while some of them have had up to 19 employees.

The results in Table 4.1.3 further revealed the mean number of years since the enterprise began operation as a proxy for enterprise age stood at 13.9, for small enterprise only, with a minimum of 0 and a maximum of 64 years. The result therefore revealed that the average age of enterprises in the small enterprises was 13.9 years while some of them have been in existence for the past 64 years. However, some of them were not up to a year old.

The descriptive analysis of the quantitative variable for small enterprises in Table 4.1.3 also revealed the mean number of years of working experience in the business as a proxy for manager/owner's experience stood at 12.4 years, with a minimum of 1 year and a maximum of 50 years of accumulated experience. This indicated that some owners of the small enterprises had 1 year of working experience while some of them had up to 50 years of accumulated working experience.

Table 4.1.4: Results of descriptive analysis of quantitative variables for medium enterprises only

Variable	Number of Observations	Mean	Minimum	Maximum
Enterprise size	55	29	20	72
Enterprise age	55	18.0	4	58
Top managers'/owners' experience	55	14.6	1	54

Source: Generated by the author from Nigeria Enterprise Survey 2014 dataset, using Stata version 14.

Table 4.1.4 presents the results of descriptive analysis of the quantitative variables for medium enterprises. The analysis has been in the form of mean, minimum and maximum. The total number of medium enterprises covered in the study was 146.

From the results in Table 4.1.4, the mean number of employees as a proxy for enterprise size for the medium enterprises stood at 29, with a minimum of 20 and a maximum of 72 employees. The results indicated that there was no any medium enterprise without any employee, and there were some of them with up to 72 employees.

The results in Table 4.1.4, further revealed the mean number of years since the enterprise began operation as a proxy for enterprise age stood at 18, with a minimum of 4 and a maximum of 58 years. The results revealed that the average age of a medium enterprise covered ranged from 4 to 58 years. This indicated that the average age of a medium enterprises covered was 18 years, while some of them have been in existence for the past 58 years.

For manager's/owners' experience for medium enterprises covered, the results in Table 4.1.4 revealed the mean number of years of working experience in the business as proxy for manager/ owners' experience stood at 14.6, with a minimum of 1 and maximum of 54 years. This indicated that some owners of enterprises had only 1 year of working experience while some of them had up to 54 years of working experience.

Table 4.1.5 present the results of descriptive analysis for qualitative variables captured in this study. From the results in Table 4.1.5, it is evident that 291

enterprises representing 57% of the total enterprises engaged in product/service innovation (new or significantly improved goods and services), 308 of them representing 61.11% were involved in process innovation (new or significantly improved methods of manufacturing or producing goods and services), 288 of them, representing 57.14% engaged in marketing innovation (significant changes to the design or packaging of goods and services or changes in sales or distribution method), 228 of them representing 45% engaged in organizational innovation (new or significantly changes in an enterprise relation with other enterprises or public institution). This suggested that majority of the enterprises engaged deeply in all types of innovation with exception of organizational innovation, in which only 45.24% of them engaged in innovation. For the foreign ownership holding, 6 of the enterprises representing 1.19% had foreign ownership, suggesting that only small proportion of the enterprises were owned by foreigners.

For the top managers'/owners' skill, 141, representing 27.98% of the enterprises top managers/owners had a degree/HND and above qualification, indicating that only a few number of thetop managers/owners possessed higher academic qualification. However, 85 enterprises representing 16.87% engaged in R&D, suggesting that only a small proportion of the enterprises invested in research and development. The descriptive analysis also indicated that 127 enterprises representing 25.20% of them engaged in exportation of their products, suggesting that a small percentage of the enterprises engaged in exportation of their products and services. Furthermore, 141 enterprises, representing 27.98% of the sample

have had their employees having a degree/HND and above qualification, suggesting that only few enterprises engaged employees with higher academic qualifications.

Table 4.1.5: Results of descriptive analysis of qualitative variables for the whole sample of enterprises

	Number of Observations	Frequency	%
Product/service innovation	504	291	57.74
Process innovation	504	308	61.11
Marketing innovation	504	288	57.14
Organizational innovation	504	228	45.24
Foreign ownership	504	6	1.19
Top manager's/owner's skill	504	141	27.98
Top manager/owners'gender	504	58	11.51
Research and development	504	85	16.87
Exposure to foreign trade	504	127	25.20
Employees'skill	504	141	27.98
Access to finance	504	53	10.52
Government support/subsidy	504	4	0.79
Customers' responsiveness	504	405	80.36

Source: Generated by the author from Nigeria Enterprise Survey 2014 dataset, using Stata version 14.

Furthermore, 53 of the enterprises, representing 10.52% of the sample had access to finance, suggesting that very few of them had access to credit. However, only 4 enterprises representing 0.79% of the sample had access to government support/subsidy. This suggested that only few enterprises received government support/subsidy. Moreover,58 enterprises, representing 11.51% have had their top managers as females. This suggested that females were underrepresented in the management of MSMEs in Nigeria.The descriptive analysis also revealed that405 enterprises representing 80.36% of the total enterprises had experienced a positive

customers' responsiveness, suggesting that majority of the enterprises experienced significant increase in the demand for their products or services.

Table 4.1.6 presents the results of qualitative descriptive analysis of the 144 microenterprises. From the results in Table 4.1.6, 75 of the microenterprises representing 52% of the total of the microenterprises engaged in product/service innovation (new or significantly improved goods and services), 86 of them representing 59.72% were involved in process innovation (new or significantly improved methods of manufacturing or producing goods and services), 77 of them representing 53.47% engaged in marketing innovation(introduced any new or significant changes in the sales or distribution methods in the last 3 years), 67 of them representing 46.53% engaged in organizational innovation(introduced new or significantly improved management systems and skills in the last 3 years). This suggested that majority of them engaged deeply in all types of innovation with exception of organizational innovation, for which only 46.53% of them engaged in it.

For the foreign ownership holding, 2 of the enterprises representing 1.39% had foreign ownership, suggesting that only small proportion of the microenterprises were owned by foreigners. Fortop managers'/owners' skill, 33, representing 22.92% of the microenterprises top managers/owners that had a degree/HND and above as their highest qualification, suggesting that only fewtop managers/owners of the microenterprise possessed higher academic qualifications.

However, 24 of the microenterprises representing 16.67% engaged in R&D, suggesting that only fewer of them invested in research and development. The results of the descriptive analysis also indicated that 51 microenterprises, representing 35.42% of the total microenterprises engaged in exporting their products, suggesting that a small percentage of them engaged in exportation of their products and services. Similarly, 45 of the microenterprises, representing 31.25% of them have had their employee's having a degree/HND and above, suggesting that only few of them engaged employees with higher academic qualifications. Furthermore, 16 of the microenterprises representing 11.11% of the sample had access to finance, this indicated that a small proportion of them had access to credit. Furthermore, the results indicated that only 1 microenterprise representing 0.69% had access to government support/subsidy, suggesting that majority of them did not receive government support/subsidy to boost their businesses. Similarly, 20 microenterprises, representing 13.89% of the total microenterpriseshave had their top managers as females.

Table 4.1.6: Results of the descriptive analysis of qualitative variables for microenterprises only

	Number of Observations	Frequency	%
Product/service innovation	144	75	52.08
Process innovation	144	86	59.72
Marketing innovation	144	77	53.47
Organizational innovation	144	67	46.53
Foreign ownership	144	02	1.39
Top manager's/owner's skill	144	33	22.92
Top managers'/owners'gender	144	20	13.89
Research and development	144	24	16.67
Exposure to foreign trade	144	51	35.42
Employees'skill	144	45	31.25
Access to finance	144	16	11.11
Government support/subsidy	144	1	0.69
Customers' responsiveness	144	114	79.17

Source: Generated by the author from Nigeria Enterprise Survey 2014 dataset, using Stata version 14.

This suggested that females were underrepresented in the management of microenterprises.The descriptive analysis also revealed that114 microenterprises, representing 79.17% of the total microenterprises had experienced customers' responsiveness, suggesting that a larger number of the microenterprises experienced significant increase in patronage from the customers for their products or services.

Table 4.1.7presents the results of qualitative descriptive analysis of the 305 small enterprises captured in this study. The results in Table 4.1.7 show that 183 small

enterprises, representing 60% of the total number of small enterprises engaged in product/service innovation (new or significantly improved goods and services),186 of them representing 60.98% were involved in process innovation (new or significantly improved methods of manufacturing or producing goods and services), 178 of them, representing 58.36% engaged in marketing innovation (introduced any new or significant changes in the sales or distribution methods in the last 3 years), 132 of them representing 43.28% engaged in organizational innovation (introduced new or significantly improved management systems and skills in the last 3 years). This suggested that majority of the small enterprises engaged deeply in all types of innovation with exception of organizational innovation for which only 43.28% of them engaged in it.

Table 4.1.7: Descriptive analysis of qualitative variables for small enterprises only

	Number of Observations	Frequency	%
Product/service innovation	305	183	60.00
Process innovation	305	186	60.98
Marketing innovation	305	178	58.36
Organizational innovation	305	132	43.28
Foreign ownership	305	4	1.31
Top manager's/owner's skill	305	81	26.56
Top managers'/owners'gender	305	29	9.51
Research and development	305	52	17.05
Exposure to foreign trade	305	65	21.31
Employees'skill	305	79	25.90
Access to finance	305	32	10.49
Government support/subsidy	305	2	0.66
Customers' responsiveness	305	245	80.33

Source: Generated by the author from Nigeria Enterprise Survey 2014 dataset, using Stata version 14.

Furthermore, 4 of the small enterprises representing 1.31% had foreign ownership, suggesting that only small number of the small enterprises were owned by foreigners. For top managers'/owners' skill, 81, representing 26.56% of the small enterprises top managers/owners had a degree/HND and above as their highest qualifications, suggesting that only fewtop managers/owners of these small enterprises possessed higher academic certificates. However, 52 small enterprises, representing 17.05% engaged in R&D, suggesting that only few of them invested in research and development.

The results of the descriptive analysis also indicated that 65 small enterprises, representing 21.31% of them engaged in exportation of their products, suggesting that a small percentage of the small enterprises engaged in exportation of their products and services.

However, 79 small enterprises representing 25.90% have had their employees having a degree/HND and above as their highest qualifications, suggesting that only a proportion of the small enterprises engaged employees with higher academic qualifications. Furthermore, 32 of the small enterprises, representing 10.49% of the sample had access to finance, suggesting that very few of them had access to credit. However, only 2 small enterprises representing 0.66% had access to government support/subsidy, suggesting that only a very few of this category of small enterprises received government support/subsidy. The results also indicated that 29 small enterprises, representing 9.51% have had their top managers as females. This suggested that females were also underrepresented in the

management of small enterprises.The descriptive analysis also shows that245 small enterprises representing 80.33% of them experienced customers' responsiveness, suggesting that majority of the small enterprises enjoy greater customer retention.

Table 4.1.8presents the results of qualitative descriptive analysis of the 55 medium enterprises. From the results in Table 4.1.8, 33 of the medium enterprises representing 60% of the total of the medium enterprises engaged in product/service innovation (new or significantly improved goods and services), 36 of them representing 65.45% were involved in process innovation (new or significantly improved methods of manufacturing or producing goods and services), 33 of them representing 60% engaged in marketing innovation(introduced any new or significant changes in the sales or distribution methods in the last 3 years), 29 of them representing 52.73% engaged in organizational innovation(introduced new or significantly improved management systems and skills in the last 3 years). This suggested that majority of them engaged in all types of innovation identified in this study. For the foreign ownership holding, none of the medium enterprises had foreign ownership, suggesting that no single medium enterprise was owned by foreigners. Fortop managers'/owners' skill, 27, representing 49.09% of the medium enterprises' top managers/owners had a degree/HND and above as their highest qualification, suggesting that a sizeable number of thetop managers/owners of medium enterprises possessed higher academic qualifications. However, 9 medium

enterprises, representing 16.36% of them engaged in R&D, suggesting that only few medium enterprises invested in research and development.

Table 4.1.8: Results of the descriptive analysis of qualitative variables for medium enterprises only

	Number of Observations	Frequency	%
Product/service innovation	55	33	60.00
Process innovation	55	36	65.45
Marketing innovation	55	33	60.00
Organizational innovation	55	29	52.73
Foreign ownership	55	0	0.00
Top manager's/owner's skill	55	27	49.09
Top managers'/owners'gender	55	9	16.36
Research and development	55	9	16.36
Exposure to foreign trade	55	11	20.00
Employees'skill	55	17	30.91
Access to finance	55	5	9.09
Government support/subsidy	55	1	1.82
Customers' responsiveness	55	46	83.64

Source: Generated by the author from Nigeria Enterprise Survey 2014 dataset, using Stata version 14.

The results of the descriptive analysis also indicated that 11 enterprises, representing 20% engaged in exportation of their products, suggesting that a small percentage of the medium enterprises engaged in exportation of their products and services. Also, 17medium enterprises representing 30.91% have had their

employees having a degree/HND and above as their highest qualifications, suggesting that only a small proportion of the medium enterprises engaged employees with higher academic qualifications. Furthermore, 5 of the medium enterprises, representing 9.09% of the sample had access to finance. This indicated that very few of them had access to credit. However, only 1medium enterprise representing 1.82% had access to government support/subsidy, suggesting that majority of them did not receive government support/subsidy to boost their businesses. In addition, 9 medium enterprises, representing 16.36% have had their top managers as females. This suggested that females were not adequately represented in the management of medium enterprises.The results of the descriptive analysis also revealed that55 medium enterprises representing 46% of them had experienced customers' responsiveness, suggesting that only small number of the enterprises experienced significant increase in the demand for their products or services.

4.2:Inferential Analysis and Interpretation of Results

This subsection deals with inferential analysis in the form of pre-estimation tests (such as normality test, heteroscedascity test and multicollinearity test), regression analysis and interpretation of results.

4.2.1: Pre–estimation Tests and Interpretation of Results

Table 4.2.1.1. presents the results of Geary non–normality testsfor innovation models. The null hypothesis of the test is that the residuals are not statistically different from the theoretical normal distribution.

Table 4.2.1.1: Results of Geary Non–normality Tests for Innovation Models

H_0: Residuals are not statistically different from the theoretical normal distribution

Product/Service Innovation Model	Process Innovation Model	Marketing Innovation Model	Organizational innovation Model
-0.2984	0.4170	1.2747	1.5037
(0.8614)	(0.8118)	(0.5287)	(0.4715)

Source: Computed by the author from Nigeria Enterprise Survey 2014 dataset using Stata Version 14 Note: The figures in parentheses are P-values.

Since the p-values of the computed Geary non–normality tests for innovation models are not significant, it indicates that distributional normality of residuals is not violated, that is, the residuals are normally distributed.

Table 4.2.1.2: Results of Geary Non–normality Tests for Performance model

H_0: Residuals are not statistically different from the theoretical normal distribution

Product/Service Innovation Model	Process Innovation Model	Marketing Innovation Model	Organizational innovation Model
-0.7688	-0.722	-0.6518	-0.7222
(0.6808)	(0.6969)	(0.7219)	(0.610)

Source: Computed by the author from Nigeria Enterprise Survey 2014 dataset using Stata Version14.

Note: The figures in parentheses are p-values.

From the results of Geary Non–normality tests for performance models in Table 4.2.1.2 it is indicated that the normality of residuals is not violated because the residuals are not statistically different from the theoretical normal distribution.

Table 4.2.1.3: Results of Glejser Lagrange Multiplier Heteroscedascity tests for Innovation Models

H_0: Heteroscedasticity

Product/Service Innovation Model	Process Innovation Model	Marketing Innovation Model	Organizational innovation Model
25.9077	26,0902	25.6940	11.4855
(0.004)***	(0.004)***	(0.004)***	(0.3210)

Source: Computed by the author from Nigeria Enterprise Survey 2014 using Stata Version 14.

Note: The figures in parentheses are P-values, significant at 1% (***).

Table 4.2.1.3 presents the results of heteroscedascity tests. From the results, it is clear that product/service innovation, process innovation and marketing innovationmodels suffer heteroscedascity problem, as a result of this normal logistical regression cannot be applied. Consequently, robust logistic regression has been applied. However, the result of the computed heteroscedascity tests for organizational innovation model indicated that the model is free of heteroscedascity problem, therefore normal logistic regression has been applied to

find the relationship between organizational innovation and the set of independent variables.

Table 4.2.1.4 presents the results of heteroscedascity test for performance models. From the results of the computed heteroscedascity test, it is obvious that all of the performance models suffer heteroscedascity problem, therefore robust logistic estimator has been applied as a solution.

Table 4.2.1.4: Glejser Lagrange Multiplier Heteroscedascity Tests Results for Performance Models

H_0: No Heteroscedascity

Product/Service Innovation Model	Process Innovation Model	Marketing Innovation Model	Organizational innovation Model
151.2051 (0.0000)***	115.1147 (0.0000)***	169.1665 (0.0000)***	143.1465 (0.0000)***

Source: Computed by the author from Nigeria Enterprise Survey 2014 dataset using StataVersion 14.

Note: The figures in parentheses are p-values, significant at 1% (***).

Table 4.2.1.5: Results of Multicollinearity Tests for Innovation Models

MODEL	1			2			3			4		
	Product / service innovation			Process innovation			Marketing innovation			Organizational innovation		
	VIF	TV	CI	VIF	TV	CI	VIF	TV	CI	VIF	TV	CI
Enterprisesize	5.79	0.17	2.14	5.79	0.17	2.16	5.79	0.17	2.14	5.81	0.17	2.13
Enterprisesize squared	5.59	0.18	2.38	5.58	0.18	2.37	5.58	0.18	2.37	5.58	0.18	2.35
Enterpriseage	8.49	0.12	2.45	8.49	0.12	2.46	8.49	0.12	2.42	8.50	0.12	2.38
Enterpriseage squared	7.46	0.13	2.91	7.46	0.13	2.92	7.47	0.13	2.91	7.46	0.13	2.89
Owner's/ top manager's skill(dummy)	1.11	0.90	2.23	1.11	0.90	2.23	1.12	0.89	3.20	1.11	0.90	3.18
Owner's experience	1.67	0.60	3.40	1.67	0.60	3.40	1.67	0.60	3.45	1.67	0.60	3.53
Research and development(dummy)	1.15	0.87	4.55	1.14	0.87	4.78	1.14	0.88	4.69	1.16	0.86	4.16
Exposure to foreign trade (dummy)	1.11	0.99	6.40	1.11	0.90	6.38	1.12	0.89	6.28	1.14	0.88	6.19
Employee's skill (dummy)	1.12	0.89	10.78	1.12	0.90	10.80	1.12	0.89	10.76	1.14	0.88	10.71
Foreign ownership (dummy)	1.04	0.96	3.02	1.04	0.96	3.01	1.04	0.96	2.96	1.04	0.96	3.00

Source: Computed by the author from Nigeria Enterprise Survey 2014 dataset using Stata Version 14.
Note: VIF (Variance inflation factor),TV (Tolerance value) andCI (Condition index)

Tolerance value measures the proportion of the variability in the corresponding independent variable that is independent of the other independent variable in the model.The close the value is to zero, the more severe is the multicollinearity, the close the value is to one the lower the severity of multicollinearity. Tolerance value ranges from 0 to 1 and since the Tolerance value for all the computed variables are closer to one, with exception of age and size of enterprise and their squared values, the computed multicollinearity test reveals no severity of multicollinearity.

The Variance Inflation Factor (VIF) estimates how much the variance of a regression coefficient is inflated due to multicollinearity in the model. In general, a VIF above 10 indicates high correlation and a cause for concern. However, the results of the computed VIF indicate clearly that the variance inflation values are all below 10, therefore there is no evidence of multicollinearity. In the same vein, the computed condition index which is a measure of the multicollinearity in a regression design matrix (i.e the independent variables) suggests that there is no multicollinearity problem since all the values are less than 10, with exception of one.

Table 4.2.1.6: Results of Multicollinearity Tests for Performance Models

MODEL	1			2			3			4		
	VIF	TV	CI	VIF	TV	CI	VIF	TV	CI	VIF	TV	CI
Product/service innovation(D)	1.10	0.91	1.99									
Process innovation(D)				1.08	0.93	2.00						
Marketing innovation(D)							1.11	0.90	2.00			
Organizational innovation(D)										1.11	0.90	1.98
Access to finance(D)	1.03	0.97	2.12	1.02	0.98	2.13	1.01	0.99	2.12	1.04	0.96	2.11
Government support/ subsidy(D)	1.02	0.97	2.26	1.02	0.98	2.27	1.02	0.98	2.24	1.03	0.98	2.21
Enterprise size	5.46	0.18	2.33	5.47	0.18	2.33	5.46	0.18	2.30	5.46	1.18	2.32
Enterprise size squared	5.44	0.18	4.47	5.44	0.18	3.63	5.44	0.18	3.39	5.44	1.18	3.10
Owners gender(D)	1.02	0.98	6.57	1.02	0.98	6.60	1.04	0.96	6.55	1.03	0.97	6.50
Top manager/owners experience	1.03	0.96	4.49	1.04	0.96	4.47	1.04	0.97	4.61	1.03	0.97	4.29

Source: Computed by the author from Nigeria Enterprise Survey 2014 dataset using Stata Version 14.
Note: VIF (Variance inflation factor),TV (Tolerance value) andCI (Condition index)

Tolerance value test results suggest that the models have no multicolinearity threat. Tolerance value ranges from 0 to 1 and since the tolerance values for all the computed variables are close to 1 with exception of enterprise size and its squared values, the computed multicollinearity tests reveal no severity of multicollinearity.

Variance Inflation Factor also has been employed as a means of checking for multicollinearity for all the variables. From the results, it is clear that the variance inflation factor values are all below 10, therefore, there is no evidence of

multicollinearity. In the same vein, the condition index results also indicate there is no problem of multicollinearity among the independent variable and that all variables could be included in the same model.

4.2.2: Regression Analysis and Interpretation of Results

Table 4.2.2.1: Robust Logistic Regression Results of Innovation Models for the Whole Sample

Independent variables	**Dependent variable = Innovation Types**			
	1	2	3	4
	Product / service innovation	Process innovation	Marketing innovation	Organisational innovation
Enterprise size	1.039	1.037	1.033	1.048
	(1.51)	(1.43)	(1.30)	(1.72)*
Enterprise size squared	-1.000	-1.000	-1.000	-1.000
	(-0.92)	(-0.89)	(-0.64)	(-0.66)
Enterprise age	-0.990	-0.991	-0.993	-0.981
	(-0.38)	(-0.31)	(-0.24)	(-0.68)
Enterprise age squared	1.000	1.000	-1000	1.000
	(0.54)	(0.11)	(-0.65)	(0.19)
Foreign ownership	4.155	-0.704	4.261	1.189
(dummy)	(1.21)	(-0.44)	(1.35)	(0.19)
Manager's/Owner's	-0.864	1.005	1.526	1.250
skill(dummy)	(-0.66)	(0.02)	(1.92)*	(1.03)
Manager's/owner's	1.000	1.013	1.010	1.00
experience	(0.01)	(0.99)	(0.74)	(0.18)
Research and	2.491	2.310	2.023	2.665
development(dummy)	(3.09)***	(2.80)***	(2.44)**	(3.53)***
Exposure to foreign trade	1.366	1.127	1.735	2.219
	(1.35)	(0.52)	(2.38)**	(3.45)***
Employees skill(dummy)	1.629	1.603	1.602	2.290
	(2.14)**	(2.07)**	(2.08)**	(3.73)***
Pseudo R^2	0.045	0.036	0.054	0.09
Wald chi-square	28.97***	22.06***	35.55***	65.85***
Log pseudo likelihood	-327.747	-324.774	-325.466	-314.134
No. of observation	504	504	504	504

Source: Computed by the author from Nigeria Enterprise Survey 2014 dataset using Stata Version 14.
Note: Significant at 10% (*), 5% (**), 1% (***). The figures in parentheses are z–values.

Table 4.2.2.1 presents the results of robust logistic regression analysis of innovation models for the whole sample. From the results of model 1 in Table 4.2.2.1, the coefficient of enterprises that spend on research and development (R&D) is statistically significant at 1% level. The positive sign of this variable indicates that the higher the enterprises expenditure on R&D, the more likely it is to make remarkable improvement or changes in its products or services. Specifically, for a unit increase in the enterprises expenditure on R&D, the expected log odds of product innovation increases by 2.491. This suggests that enterprises should develop the habit of spending on R&D to increase their entrepreneurial activities that will strengthen the continuity of innovation.

The positive sign of the coefficient of an employee's skill in model 1 of Table 4.2.2.1 indicates that employees with more skills are more likely to promote product innovation than those with little skill. This variable is significant at 5% level. Specifically, for a unit increase in the skill of an employee, the expected log odds of product innovation increase by 1.629.This suggests that the higher the skills of an employee of an enterprise the greater the enterprise innovative capability.

However, from e robust logistic regression results in model 1 of Table 4.2.2.1, it is clear that enterprise size, enterprise age and their quadratic values, extent of foreign ownership, manager's/owner's skill, manager's/owner's experience as well as exposure to foreign trade. are unlikely to promote manufacturing MSMEs ability to enhance product innovation in Nigeria. Nonetheless, the model is statistically adequate at 1% level of significance despite the fact that the Pseudo

R^2 is too low (0.045). And since the objective of the study is not to obtain a high R^2*perse* but rather to obtain dependable estimates of the true population regression coefficients and draw statistical inferences about them, low R^2 value is not a problem.

From the result of model 2 in Table 4.2.2.1, it is obvious that the coefficient of enterprises that spend on R&D is also statistically significant at 1% level. The positive sign of this variable implies that as expenditure R&D increases, the probability of process innovation capability of an enterprise increases. In a specific term, a unit increase in the manufacturing MSMEs expenditure on R&D results in an increase of 2.310 of the expected log odds of process innovation. This indicates that spending on R&D is a good surrogate for the probability of the enterprise to innovate.

Following the same tune, the positive sign of the coefficient of employee's skill in model 2 of Table 4.2.2.1 indicates that employees with more skills are more likely to promote process innovation than those with little skill. The coefficient of employee's skill is statistically significant at 5% level. Specifically, a unit increase in the skill of an employee results in an increase of 1.603 of the expected log odds of process innovation. This indicates that employee's skill is a determining factor of the enterprise process innovative capacity.

Looking at the diagnostic statistics of model 2 in Table 4.2.2.1, the Wald chi2 value of 22.06 is significant at 1 % level. Therefore, the model is statistically significant despite the fact that pseudo R^2 is low (0.036). It is also obvious from

results that enterprise size, enterprise age, and their quadratic values foreign ownership, top manager/owners experience, exposure to foreign trade. are unlikely to promote process innovation in manufacturing MSMEs in Nigeria.

The results of model 3 in Table 4.2.2.1 indicate that skill of the top managers/owners of an enterprise is statistically significant at 10% level. The positive sign of the coefficient indicates that an enterprise with top managers/owners that have higher skill is more likely to engage in marketing innovation than those with top managers/owners having little or no skill. Specifically, for a unit increase in the skill of a top manager/owner of an enterprise, the expected log odds of marketing innovation increases by 1.526. This suggests that skill of a top manager/owner is a resource for leadership in marketing innovation and a driving force for marketing innovation in manufacturing MSMEs in Nigeria.

The positive sign of the coefficient of R&D of model 3 in Table 4.2.2.1 also indicates that the higher the enterprise expenditure on R&D the more likely it is to make a remarkable improvement in marketing innovation. The enterprise expenditure on R&D is statistically significant at 5% level. Specifically, a unit increase in the enterprise expenditure on R&D results in an increase in the expected log odds of marketing innovation by 2.032. This implies that there is a significant positive relationship between expenditure on R&D and marketing innovation among manufacturing MSMEs in Nigeria.

Furthermore, exposure to foreign trade is more likely to influence enterprise ability to engage in marketing innovation. From the results in model 3 of Table 4.2.2.1, exposure to foreign tradeis statistically significant at 5% level. The positive sign of this variable indicates that the higher the enterprise exposure to foreign trade, the more likely it is to have a remarkable improvement in its marketing innovation. Specifically, a unit increase in the enterprise exposure to foreign trade is more likely to increase the expected log odds of marketing innovation by 1.735.This suggests that exposure to foreign trade is a driving force for marketing innovative capability of manufacturing MSMEs in Nigeria.

Moreover, the coefficient of employee's skill in model 3of Table 4.2.2.1 is also positive and significant at 5% level. Specifically, a unit increase in the skill of an employee is more likely to increase the expected log odds of marketing innovation by 1.602. This suggests that enterprises require adequate pool of skilled manpower to be able to promote marketing innovation.

However, despite the fact that the Pseudo R^2(0.054)computed for model 3 in Table 4.2.2.1is low, the result indicates that the model is adequate and statistically significant at 1% level. It could also be drawn from the result of model 3 in Table 4.2.2.1, that the coefficients of enterprise size, enterprise age and their quadratic values are not statistically significant. The results of the model also reveal that foreign ownership and owner's experience are unlikely to enhance MSMEs ability to promote marketing innovation in Nigeria.

From the result of model 4 in Table 4.2.2.1, the estimated coefficient of enterprise size is positive and significant at 10% level. Statistically, for a unit increase in the size of an enterprise, the expected log odds of organisational innovation increase by 1.048**.**Indicating that enterprise size is an important factor for the extent to which manufacturing MSMEs can engage in organisational innovation. This suggest that the bigger the size of an enterprise, the more likely they are to promote organisational innovation.

The positive sign of the coefficient of R&D of model 4 in Table 4.2.2.1 indicates that the higher the enterprise investment on R&D the more likely it is to make a remarkable improvement in organizational innovation. The enterprise expenditure on R&D is statistically significant at 1% level. Specifically, a unit increase in the enterprise expenditure on R&D results in an increase in the expected log odds of organisational innovation by 2.665. This suggests that an increase in spending on R&D will result to an increase in organizational innovation in manufacturing MSMEs in Nigeria.

In the same vein, the coefficient of exposure to foreign trade in model 4 of Table 4,2,2,1 is also positive and significant at 1% level. Specifically, a unit increase in the enterprise exposure to foreign trade is more likely to increase the expected log odds of organizational innovation by 2.219. This suggest that exposure to foreign trade is an important determinant for organizational innovation.

It could also be drawn from the result of model 4 in Table 4.2.2.1 that the coefficient of employee skill is positive and significant at 1% level. This indicates that employees with more skills are more likely to promote organisational innovation than those with little skills. Specifically, for a unit increase in the skill of an employee, the expected log odds of organizational increases by 2.290.This suggests that the higher the skills of an employee of an enterprise, the greater the enterprise innovative capability.

However, from the robust logistic regression results in model 4 of Table 4.2.2.1, it is obvious that the quadratic values of enterprise size, enterprise age and it squared value, foreign ownership, top managers'/owners' skill, top managers'/owners' experience are unlikely to promote manufacturing MSMEs ability to enhance organizational innovation in Nigeria. However, the model is statistically adequate at 1% level of significant despite the fact that the Pseudo R^2 is too low (0.09). And, since the objective of the study is not to obtain a high R^2 perse, but rather to obtain dependable estimates of the true population regress coefficients and draw statistical inferences about them, the low R^2 value is not a problem.

Table 4.2.2.2 presents the results of robust logistic regression analysis of innovation models for small enterprises only. From the results of model 1 in Table 4.2.2.2 the coefficient of enterprises size is statistically significant at 5% level. The positive sign of this variable also indicates that the bigger the size of microenterprise, the more likely is to promote product/service innovation.

Specifically, a unit increase in microenterprise size is more likely to increase the expected log odds of product/service innovation by 3.010.This suggests that a microenterprise size is an important factor in determining the extent to which a microenterprise can engage in product/service innovation. However, the quadratic value of microenterprise has a significant negative relationship with product/service innovation, indicating that as the size of a microenterprise increases after reaching its peak, it ability to engage in product/service innovation is likely to decrease. This suggests a nonlinear negative relationship between the size of a microenterprise and its ability to engage in product/service innovation.

Table 4.2.2.2: Robust Logistic Regression Results of Innovation Models for Microenterprises

Independent variables	Dependent variable = Innovation Types			
	1	2	3	4
	Product / service innovation	Process innovation	Marketing innovation	Organisational innovation
Enterprise size	3.010	-0.799	2.003	2.085
	(2.09)**	(-0.43)	(1.41)	(1.35)
Enterprise size squared	-0.783	1.088	-0.899	-1.883
	(-0.208)**	(0.73)	(-0.92)	(-1.01)
Enterprise age	1.167	-0.997	1.182	1.043
	(2.26)**	(-0.04)	(2.41)**	(0.66)
Enterprise age squared	-0.996	1.000	-0.996	-0.999
	(-2.28)**	(0.14)	(-2.56)**	(-0.45)
Foreign ownership (dummy)		1.123	-0.781	1.631
		(0.07)	(-0.19)	(0.30)
Manager's/Owner's skill(dummy)	-0.748	2.068	1.609	1.321
	(-0.61)	(1.69)*	(0.97)	(0.58)
Manager's/owner's experience	-0.972	1.006	-0.986	1.001
	(-1.04)	(0.24)	(-0.57)	(0.04)
Research and development(dummy)	2.378	4.717	2.069	7.790
	(1.44)	(2.95)***	(1.12)	(3.04)***
Exposure to foreign trade(dummy)	1.944	1.1502	3.421	2.584
	(1.58)	(0.35)	(2.76)***	(2.20)**
Employees skill(dummy)	3.825	1.534	3.568	3.165
	(3.15) ***	(0.99)	(2.43)**	(2.55)**
Pseudo R^2	0.140	0.102	0.146	0.190
Wald chi-square	25.52***	16.16*	20.88**	37.69***
Log pseudo likelihood	-84.602	-85.079	-80.955	-80.619
No. of observation	142	144	144	144

Source: Computed by the author from Nigeria Enterprise Survey 2014 dataset using Stata Version 14.
Note: Significant at 10% (*), 5% (**), 1% (***). The figures in parentheses are z–values.

It could also be drawn from the results of model 1 in Table 4.2.2.2 that the coefficient of microenterprise age and it quadratic value are significant at 5% level. The positive sign of the coefficient of age of a microenterprise indicates that older microenterprises are more likely to promote product/service innovation than younger enterprises up to a given level of age. The estimated coefficient of the age a microenterprise indicates that a unit increase in the years of a microenterprise will increase the expected log odds of product/service innovation by 0.783. This suggests that a microenterprise number of years of operation is a determining factor in its ability to engage in product/service innovation. But, the quadratic value of enterprise age is negative and significant at 5% level indicating that as a microenterprise age increases and reaches its peak any additional increase in age of the microenterprise is more likely to reduce its ability to engage in product/service innovation.

The coefficient of employee's skill in model 1 of Table 4.2.2.2 is significant at 1% level. The positive sign of this variable also indicates that microenterprise with highly skilled employees are more likely to engage in product/service innovation than those with little skill. Specifically, for a unit increase in the skill of employees, the expected log odds of product/service innovation increase by 3.825. This suggests that manufacturing microenterprises in Nigeria require adequate pool of skilled manpower to be able to promote product/service innovation.

However, from the robust logistic regression results in model 1 of Table 4.2.2.2, it is obvious that foreign ownership, top managers'/owners'experience, top managers'/owners' skill, expenditure on R&D, and exposure to foreign trade are unlikely to promote manufacturing microenterprise ability to enhance product/service innovation in Nigeria. Nonetheless, the Wald chi square value of 12.95 for the adequacy of the model is statistically significant at 1% level despite the fact that the computed Pseudo R^2 is too low (0.40). According to Gujarati (1995), lower R^2 does not mean the model is necessary bad, as long as most of the parameters and chi-square value as a measure of logistic model adequacy are statistically significant.

From the results in model 2 of Table 4.2.2.2, it is clear that the coefficient of top manager/owner skill is statistically significant at 10 % level. The positive sign of this variable shows that microenterprise with highly skilled top manager/owner is more likely to promote process innovation. In specific term, for a unit increase in the top manager/owners skill, the expected log odds of process innovation increases by 2.068. This suggests that skill of a top manager/owner is a resource for leadership in process innovation and a driving force for process innovation in manufacturing microenterprises in Nigeria.

Furthermore, the results of model 2 in Table 4.2.2.2 indicate that expenditure on R&D is statistically significant at 1% level. The positive sign of this variable reveals that the higher the microenterprises expenditure on R&D the more likely they promote process innovation. Specifically, for a unit increase in the

enterprises' expenditure on R&D, the expected log odds of process innovation increase by 4.717. This suggests that manufacturing microenterprises should increase their investment in R&D to enhance their process innovative capability.

However, from the robust logistic regression results in model 2 of Table 4.2.2.2, it is obvious that enterprise size, enterprise age and their quadratic values, foreign ownership, top managers'/owners' experience, top managers'/owners' skill,exposure to foreign trade and employees skills are unlikely to promote manufacturing microenterprises ability to enhance process innovation in Nigeria. Nonetheless, the model is statistically adequate and significant at 10% level despite the fact that the Pseudo R^2 is lower at 0.10.

From the result of model 3 in Table 4.2.2.2, the coefficient of microenterprise age and its quadratic value are both significant at 5% level. The positive sign of the coefficient of age of manufacturing microenterprises indicates that older microenterprises are more likely to promote marketing innovation than younger ones. Specifically, for a unit increase in the years of amicroenterprise will increase the expected log odds of marketing innovation by 2.41. This suggests that manufacturing microenterprises number of years of operation has a significant positive relationship with marketing innovation. The model also indicates that quadratic value of a microenterprise age is negative and significant at 5% level. This suggests that as an enterprise age increases and reaches its peak, any additional increase in age of the enterprise is more likely to reduce marketing innovation capability of the manufacturing microenterprises in Nigeria.

From the results in model 3 of Table 4.2.2.2, exposure to foreign trade is statistically significant at 1% level. The positive sign of this variable indicates that the higher the ability of an enterprise to export, the more likely it is to have a remarkable improvement in its marketing innovation. Specifically, a unit increase in the enterprise exposure to foreign trade is more likely to increase the expected log odds of marketing innovation by 3.421.This indicates that exposure to foreign trade is more likely to influence amicroenterprise ability to engage in marketing innovation, and further suggests that exposure to foreign trade is a crucial factor for marketing innovation capability of microenterprises.

In addition, the coefficient of employees' skill in model 3 of Table 4.2.2.2 is positive and statistically significant at 5% level. This indicates that manufacturing microenterprise with skilled employees are more likely to promote marketing innovation than those with less skilled employees. In specific term, a unit increase in the skill of the employee will increase the expected log odds of marketing innovation by 2.43. This implies that there is a significant positive relationship between employee skill and marketing innovation. It also suggests that manufacturing microenterprise employees must have adequate and required skill to enable the microenterprises to engage in marketing innovation.

Looking at the results of model 3 in Table 4.2.2.2, enterprise size and it squared value,foreign ownership, top managers'/owners' experience, top managers'/owners' skill, and R&D) are unlikely to promote microenterprises ability to engage in marketing innovation in Nigeria. Nonetheless, the model is

statistically adequate and significant at 5% level despite the fact that the Pseudo R^2 is lower at 0.15.

Furthermore, from the results of model 4 in Table 4.2.2.2, the coefficient of spending on research and development (R&D) is positive and statistically significant at 1% level. The positive sign of this variable indicates that the higher the microenterprise expenditure on R&D, the more likely it is to make remarkable improvement in organizational innovation. Specifically, for a unit increase in the microenterprises expenditure on R&D, the expected log odds of organisational innovation increase by 7.790. This suggests that manufacturing microenterprises that develop the habit of spending on R&D will be able to strengthen their organizational structure and innovation.

Also, in model 4 of Table 4.2.2.2 the coefficient of exposure to foreign trade is positive and statistically significant at 5% level, indicating that the higher the enterprise exposure to foreign business, the more likely they engage in organizational innovation.Specifically, a unit increase in the microenterprise exposure to foreign trade is more likely to increase the expected log odds of organizational innovation by 2.584. This suggests that exposure to foreign trade is a crucial factor in determining organisational innovation capability.

The positive sign and significant coefficient of an employee's skill in model 4 of Table 4.2.2.2 indicate that employees with more skills are more likely to promote organisational innovation than those with little skill. This variable is significant at 5% level. Specifically, for a unit increase in the skill of an employee, the expected

log odds of organizational innovation increases by 3.165**.**This suggests that the higher the skill of an employee of a microenterprise, the greater will be the manufacturing microenterprise innovative capability.

Finally, looking at diagnostic test of model 4 on Table 4.2.2.2, the Wald chi-square value of 37.69 as a measure of logistic regression adequacy is statistically significant at 1% level. Thus, the model is adequate. However, other variables in model 4 such as enterprise size, enterprise age and their squared value,foreign ownership, top managers'/owners' experience, top managers'/owners' skill are unlikely to promote microenterprises ability to engage in organizational innovation.

From the results of model 1 in Table 4.2.2.3, the coefficient of expenditure on research and development (R&D) is positive and statistically significant at 5% level. The positive sign of this variable indicates that the higher the small enterprises expenditure on R&D, the more likely it is to make greater improvement or changes in their products or services. Specifically, for a unit increase in small enterprises expenditure on R&D, the expected log odds of product/service innovation increase by 2.583. This suggests that small enterprises should develop the habit of spending onR&D to increase their entrepreneurial activities that will strengthen their product/service innovation capability.

However, from the robust logistic regression results in model 1 of Table 4.2.2.3, it is obvious that enterprise size and it quadratic value, enterprise age, foreign ownership, top managers'/owners' experience, top managers'/owners'

skill,exposure to foreign trade and employees skills) are unlikely to promote manufacturing small enterprises ability to engage in product/service innovation in Nigeria. Nonetheless, the model is statistically adequate and significant at 10% level despite the fact that the Pseudo R^2 is as low as 0.048.And since the objective of the study is to obtain dependable estimates of the true population regression coefficients and draw statistical inferences about them, and not to obtain a high R^2, low R^2 value does not constitute any problem.

Table 4.2.2.3: Robust Logistic Regression Results of Innovation Models for small Enterprises

Independent variables	Dependent variable = Innovation Types			
	1	2	3	4
	Product / service innovation	Process innovation	Marketing innovation	Organisational innovation
Enterprise size	1.325	1.227	1.217	1.362
	(1.56)	(1.11)	(1.02)	(1.64)
Enterprise size squared	-0.988	-0.996	-0.993	-0.990
	(-1.42)	(-0.39)	(-0.78)	(-1.16)
Enterprise age	-0.946	1.110	-0.950	-0.945
	(-1.43)	(2.36)**	(-1.25)	(-1.50)
Enterprise age squared	1.002	-0.999	1.001	1.000
	(1.91)*	(-1.92)*	(1.68)*	(1.27)
Foreign ownership	1.673	4.380		-0.749
(dummy)	(0.41)	(1.92)		(-0.26)
Manager's/Owner's	-0.824	1.635	1,228	1.522
skill(dummy)	(-0.68)	(1.67)*	(0.68)	(1.43)
Manager's/owner's	1.005	-0.967	-0.981	1.002
experience	(0.29)	(-1.70)*	(-1.04)	(0.14)
Research and	2.583	4.199	5.047	2.291
development(dummy)	(2.36)**	(3.91)***	(3.29)***	(2.35)**
Exposure to foreign	1.233	1.037	1.326	2.527
trade(dummy)	(0.65)	(0.11)	(0.84)	(2.95)***
Employees' skill(dummy)	1.205	2.466	1.119	2.083
	(0.61)	(3.01)***	(0.35)	(2.48)**
Pseudo R^2	0.048	0.163	0.070	0.109
Wald chi-square	17.27*	49.27***	19.87**	45.43***
Log pseudo likelihood	-195.43	-168.3	-183.22	-185.93
No. of observation	305	305	301	305

Source: Computed by the author from Nigeria Enterprise Survey 2014 dataset using Stata Version 14.

Note: Significant at 10% (*), 5% (**), 1% (***). The figures in parentheses are z–values.

It is also obvious from the results of model 2 in Table 4.2.2.3 that the coefficient of a small enterprise age is positive and significant at 5% level while its squared value is negative and significant at 10% level. The positive sign of the coefficient of age of manufacturing small enterprise indicates that older small enterprises are more likely to engage in process innovation than younger ones. The estimated coefficient of the age of a small enterprise indicates that a unit increase in the years of establishment of an enterprise will increase the expected log odds of process innovation by 1.110. This suggests that increase in the age of a manufacturing small enterprise is positively related to process innovative capability. But, the quadratic value of a small enterprise age is negative and significant at 10% level, indicating that as amanufacturing small enterprise age increases and reaches its peak any additional increase in age of the enterprise is more likely to reduce its process innovation capability.

The results of model 2 in Table 4.2.2.3 also indicate that skill of the top managers/owners of an enterprise is positive and statistically significant at 10% level. The positive sign of the coefficient indicates that a manufacturing small enterprise with a top manager/owner that has higher skill is more likely to engage in process innovation than the one with a top manager/owner having little or no skill. Specifically, for a unit increase in the skill of atop manager/owner of an enterprise, the expected log odds of process innovation increase by 1.635. This suggests that skill ofa top manager/owner is a driving force for process innovation in manufacturing small enterprises in Nigeria.

From the results of model 2 in Table 4.2.2.3, the coefficient of top managers'/owners' experience is positive and statistically significant at 10% level. The positive sign of this variable indicates that a top manager/owner of a small enterprise with more experience is more likely to engage in process innovation than the one with little experience. Specifically, for a unit increase in a top manager's/owner's experience, the expected log odds of process innovation will increase by 0.967. This suggests that a manufacturing small enterprise requires accumulated working experience of its top manager/owner to be able to promote process innovation.

It could also be drawn from the results of model 2 in Table 4.2.2.3 that the coefficient of spending on R&D is positive and statistically significant at 1% level, meaning that the higher the small enterprise expenditure on R&D the more likely it engages in process innovation. More specifically, for a unit increase inexpenditure in R&D,the expected log odds of process innovation will increase by 4.199**.**This suggests that manufacturing small enterprises should increase their investment in R&D to enhance their process innovative capability.

Moreover, the coefficient of employee's skill in model 2 of Table 4.2.2.3 is positive and statistically significant at 1% level. The positive sign of this variable indicates that small enterprises with highly skilled employees are more likely to engage in process innovation than those with employees having little skill. Specifically, for a unit increase in the skill of employees, the expected log odds of process innovation will increase by 2.466. This suggests that manufacturing small

enterprises in Nigeria require adequate pool of skilled manpower to enhance their process innovation drive.

However, looking at diagnostic test for the adequacy of model 2 in Table 4.2.2.3, the Wald chi-square value of 49.27 is statistically significant at 1% level. Therefore, the model is statistically significant and adequate despite the fact that the pseudo R^2value of 0.163 is low. It is also obvious from the results thatenterprise size and it quadratic value, foreign ownership and exposure to foreign trade are unlikely to promote process innovation in small manufacturing enterprises.

From the results of model 3 in Table 4.2.2.3, it is obvious that the coefficient of spending on R&D is positive and statistically significant at 1% level. The positive sign of this variable implies that as the expenditure of a manufacturing small enterprise expenditure on R&D increases, the probability of marketing innovation increases. In a specific term, a unit increase in the manufacturing small enterprises expenditure on R&D results in an increase of 5.047 of the expected log odds of marketing innovation. This indicates that R&D is a good surrogate for the probability of a small enterprise to engage in marketing innovation.

The diagnostic statistics for the adequacy of model 3 in Table 4.2.2.3, however, indicates that the model is adequate and statistically significant at 5% level despite the fact that the pseudo R^2 is low(0.070).All other variables in model 3 of Table 4.2.2.3, such as, enterprise size and its quadratic value, enterprise age,foreign ownership, top managers'/owners' experience, top managers'/owners'

skill, exposure to foreign trade, employees' skill are unlikely to promote small enterprises ability to engage in marketing innovation.

From the results of model 4 in Table 4.2.2.3,the coefficient of spending on research and development (R&D) is positive and statistically significant at 5% level. The positive sign of this variable indicates that the higher the small enterprises expenditure on R&D, the more likely it is for them to make remarkable improvement in organizational innovation. Specifically, for a unit increase in a small enterprise spending on R&D, the expected log odds of organizational innovation increase by 2.291. This suggests that small enterprises should allocate more funds to R&D to increase their entrepreneurial activities that will strengthen their organizational structure and innovation.

The positive and atatistically significant coefficient of exposure to foreign tradein model 4 of Table 4.2.2.3 indicates that the higher the enterprise exposure to foreign trade, the more likely it is to have a greater improvement in its organizational innovation. This variable is statistically significant at 1% level. Specifically, a unit increase in the enterprise exposure to foreign tradeis more likely to increase the expected log odds of organisational innovation by 2.527.This further suggests that exposure to foreign trade is a crucial factor for organisational innovation capability of a small manufacturing enterprise in Nigeria.

In addition, the positive and significant sign of the coefficient of employees' skill in model 4 of Table 4.2.2.3 indicates that a small enterprise with skilled employees is likely to promote organisational innovation more than the one with less skilled employees. This variable is statistically significant at 5 % level. In specific term, for a unit increase in the skill of the employee, the expected log odds of organisational innovation increase by 2.083. This implies that there is a significantpositive relationship between an employee skill and organisational innovation. It also suggests that small enterprise employees must have adequate and required skill to enable a small enterprise to engage in organisational innovation.

Finally, looking at diagnostic test for the adequacy of model 4 on Table 4.2.2.3, the Wald chi-square value of 45.43 is statistically significant at 1% level, and pseudo R^2value is 0.109. Thus, the model is adequate. The results also reveal thatan enterprise size, age and their quadratic values,foreign ownership, top managers'/owners' experience, top managers'/owners' skill, are unlikely to promote manufacturing small enterprises ability to engage in organisational innovation.

From the results in model 1 of Table 4.2.2.4, It is clear that the coefficients of all the variables (enterprise size, enterprise age and their quadratic values,foreign ownership, top managers'/owners' experience, top managers'/owners' skill, spending on R&D,exposure to foreign trade and employees' skill) are not statistically significant, and unlikely to enhance medium enterprises

product/service innovation. The Wald chi-square of 6.20 is also not significant and the Pseudo R^2 is low (0.086), thus, the model is not statistically adequate.

Table 4.2.2.4: Robust Logistic Regression Results of Innovation Models for Medium Enterprises

Independent variables	**Dependent variable = Innovation Types**			
	1	2	3	4
	Product / service innovation	Process innovation	Marketing innovation	Organisational innovation
Enterprise size	-0993	1.330	1.112	1.171
	(-0.005)	(1.95)*	(0.56)	(0.97)
Enterprise size squared	1.0000	-0.997	-0.999	-0.998
	(-0.17)	(-1.74)*	(-0.46)	(-0.75)
Enterprise age	-0.920	1.080	1.026	-0.928
	(-0.89)	(0.85)	(0.26)	(-0.68)
Enterprise age squared	1.000	-0.998	-0.997	-0.999
	(0.32)	(-1.56)	(-1.70)*	(-0.13)
Foreign ownership (dummy)				
Manager's/Owner's skill(dummy)	2.494	-0.622	-0.316	-0.598
	(1.12)	(-0.70)	(-1.46)	(-0.75)
Managers'/owners' experience	1.072	1.003	1.066	1.014
	(1.54)	(0.08)	(1.29)	(0.30)
Research and development(dummy)	1.664	4.454	11.86	1.977
	(0.41)	(1.48)	(1.86)*	(0.64)
Exposure to foreigntrade(dummy)	1.065	1.632	-0.572	1.356
	(0.06)	(0.52)	(-0.62)	(0.33)
Employees' skill(dummy)	1.007	1.330	1.625	1.444
	(0.01)	(0.34)	(0.52)	(0.52)
Pseudo R^2	0.086	0.143	0.184	0.138
Wald chi-square	6.20	11.27	12.24	10.47
Log pseudo likelihood	-33.82	-32.67	-29.86	-32.807
No. of observation	55	55	55	55

Source: Computed by the author from Nigeria Enterprise Survey 2014 dataset using Stata Version 14.

Note: Significant at 10% (*), 5% (**), 1% (***). The figures in parentheses are z–values.

Furthermore, from the results of model 2 in Table 4.2.2.4, it is clear that a medium enterprise size is an important factor in making a medium enterprise to engage in process innovation. The coefficient of enterprise size and its quadratic values are significant at 10% level. The positive sign of the coefficient of enterprise size indicates that there is a significant positive relationship between manufacturing enterprise size and process innovation. Specifically, for a unit increase in the size of a medium enterprise, the expected log odds of process innovation increase by 1.33. This suggest that the bigger the size of a medium enterprise, the more likely it is to promote process innovation. However, the quadratic value of enterprise size is significant and negative at 10% level indicating that at a point, further increase in enterprise size is unlikely to enhance process innovation among medium manufacturing enterprises in Nigeria. But the model 2 is also not statistically significant.

Along the same line, the results of the model 3 in Table 4.2.2.4 indicate that investment in R&D is statistically significant at 10% level. The positive sign of this variable shows that the higher the manufacturing medium enterprises investment in R&D, the more likely they promote marketing innovation. In specific term, a unit increase in the manufacturing medium enterprises expenditure on R&D will lead tothe expected log odds of marketing innovation to increase by 11.856**.** This suggests that manufacturing medium enterprises should develop the habit of spending onR&D to increase their entrepreneurial activities that will strengthen their market share and continuity of marketing innovation.

From the robust logistic regression results of model 3 in Table 4.2.2.4, it is clear that enterprise size and it quadratic value, enterprise age, manager's/ owner's skill, owner's experience, foreign ownership,exposure to foreign trade as well as employees skill are unlikely to promote manufacturing medium enterprises ability to enhance marketing innovation in Nigeria. However, the model is not statistically significant (Wald chi-square, 12.24 andPseudo $R^2$0.184), and therefore not adequate.

It is also obviousfrom the results in model 4 of Table 4.2.2.4, that the coefficients of all the variables (enterprise size, enterprise age and their quadratic values, foreign ownership, top managers'/owners' experience, top managers'/owners' skill, expenditure on R&D, Exposure to foreign trade and employees skill) are not statistically significant and unlikely to influence manufacturing medium enterprises organizational innovation. Moreover,the Wald chi-square of 10.47 is not statistically significant and Pseudo is low, therefore, it is not statistically adequate.

Table 4.2.2.5 presents the results of robust logistic regression analysis of performance models for the whole sample. From the results of model 1 in Table 4.2.2.5, the coefficient of product/service innovation is positive and statistically significant at 1% level. The positive sign of the coefficient of this variable indicates that product/service innovation is positively related to manufacturing MSMEs performance. Specifically, a unit increase in product/service innovation

is more likely to increase the expected log odds of manufacturing MSMEs performance by 4.066. This suggests that product/service innovation is an important strategy for increasing the performance of manufacturing MSMEs.

Table 4.2.2.5: Results of robust logistic regression analysis of performance models for the whole sample.

Independent variables	**Dependent variables = performance models**			
	1	2	3	4
Product/service innovation	4.066 (5.65)***			
Process innovation		3.26 (4.95)***		
Marketing innovation			4.479 (5.94)***	
Organizational innovation				0.190 (5.34)***
Access to finance	-0.639 (-1.23)	-0.722 (-0.87)	-0.796 (-0.61)	-0.067 (-1.17)
Government support	-0.452 (-0.46)	-0.511 (-0.41)	-0.393 (-0.58)	-0.151 (-0.77)
Enterprise size	1.029 (0.93)	1.027 (0.86)	1.031 (1.00)	0.005 (1.00)
Enterprise size squared	-0.1000 (-0.26)	-0.1000 (-0.20)	-0.1000 (-0.42)	-0.000 (-0.53)
Topmanager's/owner's experience	1.013 (1.00)	1.010 (0.80)	1.015 (1.16)	0.002 (1.11)
Top managers'/owners' gender	1.582 (1.12)	1.556 (1.10)	1.908 (1.52)	0.084 (1.54)
Pseudo R^2	0.082	0.063	0.092	
Wald chi-square	35.50***	29.57***	42.80***	
Log pseudo likelihood	-229.12	-234.078	-226.651	
F. statistic				4.89***
R-squared				0.065
Adjusted R-squared				0.051
Root MSE				0.387
No. of observations	504	504	504	504

Source: Computed by the author from Nigeria Enterprise Survey 2014 dataset using Stata Version 14.

Note: Significant at 10% (*), 5% (**), 1% (***). The figures in parentheses are z–values.

However, looking at the diagnostic test for the adequacyst of model 1 in Table 4.2.2.5, the Wald chi-square value indicates that the model is statistically significant at 1% level with Pseudo R^2 of 0.082. It is also clear from the results that, access to finance, government support/subsidy, enterprise size and its squared value, top managers'/owners' experience and top managers'/owners' gender are unlikely to influence manufacturing MSMEs performance in Nigeria.

From the results of model 2 in Table 4.2.2.5, the coefficient of process innovation is positive and statistically significant at 1% level. More specifically, a unit increase in process innovation is more likely to increase the expected log odds of manufacturing MSMEs performance by 3.23. This suggests that manufacturing MSMEs in Nigeria should engage more in process innovation to increase their performance. However, a look at the diagnostic test results for the adequacy of model 1 in Table 4.2.2.5, theWald chi-square value indicates that the model is adequate and statistically significant at 1% level with Pseudo R^2 value of 0.063. It is also obvious from the results that, access to finance, government support/subsidy, enterprise size and its squared value, top managers'/owners' experience and top managers'/owners' gender are unlikely to influence manufacturing MSMEs performance in Nigeria.

It could also be drawn from the result of model 3 in Table 4.2.2.5 that the coefficient of marketing innovation is positive and statistically significant at 1% level. The positive sign of this variable indicates that marketing innovation is positively related to manufacturing MSMEs performance. In specific term, a unit

increase in marketing innovation capability is more likely to increase the expected log odds of manufacturing MSMEs performance by 4.479. This suggests that marketing innovation is an important strategy for addressing customer's need with the intention of increasing sales of manufacturing MSMEs in Nigeria.

The diagnostic test results of model 3 in Table 4.2.2.5, indicate that the model is adequate and statistically significant at 1% level despite the fact the Pseudo R^2 is low(42.80). All other variables in model 3 of Table 4.2.2.5, such as, access to finance, government support/subsidy, enterprise size and its squared value, top managers'/owners' experience and top managers'/owners' gender are unlikely to influence manufacturing MSMEs performance in Nigeria.

Moreover, from the traditional logistic regression in Table 4.2.2.5, the coefficient of organizational innovation is positive and statistically significant at 1% level. The positive sign of this variable indicates that manufacturing MSMEs that engage in organizational innovation are more likely to enjoy increase in enterprise performance than those that do not engage in organizational innovation. This suggests that manufacturing MSMEs that continuously strengthen theirorganizational innovation capability are more likely to attain business excellence. However, the results of diagnostic test for the adequacy of model 4 in Table 4.2.2.5 indicate that the model is adequate and statistically significant at 1%. It is also obvious from the results that, access to finance, government support/subsidy, enterprise size and its squared value, top managers'/owners'

experience and top managers'/owners' gender are unlikely to influence manufacturing MSMEs performance in Nigeria.

Table 4.2.2.6: Results of robust logistic regression analysis of performance models for microenterprises

Independent variables	**Dependent variables = performance models**			
	1	2	3	4
Product/service innovation	9.237			
	(3.74)***			
Process innovation		2.504		
		(1.86)*		
Marketing innovation			3.604	
			(2.76)***	
Organizational innovation				2.691
				(2.06)**
Access to finance	-0.74	1.38	1.346	1.136
	(-0.35)	(0.43)	(0.39)	(2.06)
Government support				
Enterprise size	1.368	1.097	1.563	1.363
	(0.56)	(0.17)	(0.81)	(0.59)
Enterprise size squared	-0.975	-1.000	-0.929	-0.962
	(-0.18)	(-0.00)	(-0.58)	(-0.31)
Topmanagers'/owners' experience	1.064	1.055	1.059	1.058
	(2.38)**	(1.92)*	(2.03)**	(1.91)*
Top managers'/owners' gender	2.624	2.422	2.261	3.101
	(1.16)	(1.08)	(0.98)	(1.43)
Pseudo R^2	0.211	0.101	0.132	0.105
Wald chi-square	26.90***	15.48**	17.96***	15.12**
Log pseudo likelihood	-57.94	-66.05	-63.76	-65.72
Number of observations	143	143	143	143

Source: Computed by the author from Nigeria Enterprise Survey 2014 dataset using Stata Version 14.

Note: Significant at 10% (*), 5% (**), 1% (***). The figures in parentheses are z–values.

Table 4.2.2.6 presents the results of robust logistic regression analysis of performance models for manufacturing microenterprises. From the results of model 1 in Table 4.2.2.6, the coefficient of product/service innovation is positive and statistically significant at 1% level. The positive sign of the coefficient of this variable indicates that product/service innovation is positively related to a manufacturing microenterprise performance. Statistically, a unit increase in product/service innovation is more likely to increase the expected log odds of a manufacturing microenterprise performance by 9.237. This suggests that product/service innovation is desirable fora manufacturing microenterprises' performance.

Furthermore, from the result of model 1 in Table 4.2.2.6, it is evident that the coefficient of top managers'/owners' experience is positive and statistically significant at 5% level. The positive sign of this variable indicates that a top manager/owner with more experience is more likely to promote an enterprise performance. Specifically, a unit increase in a top manager's/owner's experience is more likely to increase the expected log odds of manufacturing microenterprise performance by 1.064. This suggests that manufacturing microenterprise performance can be stimulated by accumulation of top managers'/owners' experience.

The diagnostic test results of model 1 in Table 4.2.2.6, however, indicate that the model is adequate and statistically significant at 1% level despite the fact that the Pseudo R^2 value is low (0.211).And since the objective of the study is to obtain

dependable estimates of the true population regression coefficients and draw statistical inferences about them, and not to obtain a high R^2, low R^2 value is not a problem. However, all other variables in model 1 of Table 4.2.2.6, such as, access to finance, government support/subsidy, enterprise size and its squared value, and top managers'/owners' gender are unlikely to influence manufacturing microenterprise performance in Nigeria.

In the same vein, the results of model 2 in Table 4.2.2.6 indicate that the coefficient of process innovation is positive and statistically significant at 1% level. More specifically, a unit increase in process innovation capability is more likely to increase the expected log odds of manufacturing microenterprises performance by 2.504.This suggests that as a manufacturing microenterprise engages more in process innovation measures, the higher will be its performance.

It could also be drawn from the result of model 2 in Table 4.2.2.6 that the coefficient of top managers'/owners' experience is positive and statistically significant at 10% level. The positive sign of this variable indicates that a top manager's/owner's experience has a significant positive relationship with a manufacturing microenterprise performance in Nigeria. Statistically, a unit increase in a top manager's/owner's experience is more likely to increase the expected log odds of a manufacturing microenterprise performance by 1.055. This further suggests that top mangers'/owners' experience is an important factor in determining the extent to which an enterprise can attain higher business performance in manufacturing microenterprise subsector in Nigeria.

From thediagnostic test results of model 2 in Table 4.2.2.6, it is clear that the model is adequate and statistically significant at 5% level despite the fact the Pseudo R^2 value of the model is low (0.101). All other variables in model 2 of Table 4.2.2.6, such as, access to finance, government support/subsidy, enterprise size and its squared value, and top managers'/owners' gender are unlikely to influence manufacturing microenterprises performance in Nigeria.

Furthermore, from the results of model 3 in Table 4.2.2.6, the coefficient of marketing innovation is positive and statistically significant at 1% level. The positive sign of this variable indicates that marketing innovation has a significant positive influence on manufacturing microenterprises' performance. In specific term, a unit increase in marketing innovation capability is more likely to increase the expected log odds of manufacturing microenterprises' performance by 3.604. This suggests that marketing innovation is crucial in determining the performance of a manufacturing microenterprise in Nigeria.

Similarly,the coefficient of top managers'/owners' experience in Table 4.2.2.6 is positive and statistically significant at 5% level. In specific term, a unit increase in top manager/owner experience is more likely to increase the expected log odds of manufacturing microenterprise performance by 1.059. This suggests that top managers'/owners' experience is a crucial determinant of performance of manufacturing microenterprises in Nigeria.

From the robust logistic regression results of model 3 in Table 4.2.2.6, it is clear that, access to finance, government support/subsidy, enterprise size and its squared value, and top managers'/owners' gender are unlikely to influence manufacturing microenterprises performance in Nigeria. However, the model is statistically significant at 1% level, despite the fact the Pseudo R^2 value is low (0.13).

Furthermore, from the results of model 4 in Table 4.2.2.6, the coefficient of organizational innovation is positive and statistically significant at 5 % level.Statistically, a unit increase in organizational innovation is more likely to increase the expected log odds of manufacturing microenterprises' performance by 2.691. This suggests that enterprises that effectively integrate and adopt organizational innovation will attain high level of performance than those that do not.

The results of model 4 in Table 4.2.2.6 also show that the coefficient of top managers'/owners' experience is positive and statistically significant at 10% level. The positive sign of this variable indicates that a top manager/owner with more experience is more likely to enhance a microenterprise performance. More specifically, a unit increase in a top manager's/owner's experience is more likely to increase the expected log odds of a manufacturing microenterprise performance by 1.059. This suggests that a manufacturing microenterprise performance can be enhanced by accumulation of a top manager's/owner's experience.

For the diagnostic test results of model 4 in Table 4.2.2.6, the Wald chi-square value of 15.12 is significant at 5 % level. Therefore, the model is adequate and statistically significant despite the fact that Pseudo R^2valueis low (0.036).However, all other variables in model 4 of Table 4.2.2.6, such as, access to finance, government support/subsidy, enterprise size and its squared value, and top managers'/owners' gender are unlikely to influence a manufacturing microenterprise performance in Nigeria.

Table 4.2.2.7 presents the results of robust logistic regression analysis of performance models for manufacturing small enterprises. From the results of model 1 in Table 4.2.2.7, the coefficient of product/service innovation is positive and statistically significant at 1% level. The positive sign of the coefficient of this variable indicates that product/service innovation has a significant positive influence on manufacturing microenterprises performance. In specific term, a unit increase in product/service innovation is more likely to increase the expected log odds of manufacturing small enterprises performance by 3.031. This suggests that product/service innovation is desirable for manufacturing microenterprise to attract new customers in a highly competitive business environment of today.

Table 4.2.2.7: Results of robust regression analysis of performance models for small enterprises

Independent variables	Dependent variables = performance models			
	1	2	3	4
Product/service innovation	3.031			
	(3.59)***			
Process innovation		3.256		
		(3.85)***		
Marketing innovation			4.724	
			(4.87)***	
Organizational innovation				4.203
				(3.85)***
Access to finance	-0.622	-0.633	-0.642	-0.568
	(-1.05)	(-0.90)	(-0.93)	(-1.15)
Government support				
Enterprise size	1.482	1.522	1.483	1.487
	(1.79)*	(1.96)*	(1.84)*	(1.77)*
Enterprise size squared	-0.985	-0.984	- 0.985	-0.984
	(-1.49)	(-1.65)*	(-1.55)	(-1.57)
Topmanager's/Owner's experience	1.004	1.004	1.016	1.009
	(0.28)	(0.30)	(0.94)	(0.53)
Top managers'/owners' gender	1.645	1.707	1.814	1.009
	(0.951)	(1.03)	(1.05)	(0.53)
Pseudo R^2	0.07	0.076	0.111	0.086
Wald chi-square	20.88***	22.05***	29.94***	22.15***
Log pseudo likelihood	-140.22	-139.30	-134.06	-137.87
Number of observations	303	303	303	303

Source: Computed by the author from Nigeria Enterprise Survey 2014 dataset using Stata Version 14.

Note: Significant at 10% (*), 5% (**), 1% (***). The figures in parentheses are z–values.

The coefficient of enterprise size in model 1 of Table 4.2.2.7 has a positive sign and it is statistically significant at 10% level. This shows that a manufacturing small enterprise that is bigger in size tends to perform better than a smaller one.

Specifically, a unit increase in an enterprise size is more likely to increase the expected log odds of a manufacturing small enterprise performance by 1.482.

From the robust logistic regression results of model 1 in Table 4.2.2.7, it is also evident that, access to finance, government support/subsidy, top managers'/owners' experience and top managers'/owners' gender are unlikely to influence a manufacturing small enterprise performance in Nigeria. However, the model is statistically significant at 1% level, despite the fact that the Pseudo R^2 is low (0.07). According to Gujarati (1995), lower R^2 value does not mean the model is necessarily bad, as long as most of the parameters and chi-square value are statistically significant. Therefore, low R^2 value does not constitute any problem.

From the result of model 2 in Table 4.2.2.7, the coefficient of process innovation is positive and statistically significant at 1% level. Statistically, a unit increase in process innovation capability is more likely to increase the expected log odds of a manufacturing small enterprise performance by 3.256. This suggests that a manufacturing small enterprise in Nigeria can enhance its performance by engaging in process innovation.

It could also be drawn from the result of model 2 in Table 4.2.2.7 that the coefficient of a manufacturing small enterprise size that, the larger the manufacturing small enterprise size the better will be its performance. This is because the variable has positive sign and is statistically significant at 10% level. Specifically, a unit increase in an enterprise size is more likely to increase the

expected log odds of a manufacturing small enterprise performance by 1.522. This suggests that a small enterprise size has a significant positive relationship with a manufacturing small enterpriseperformance. However, the results also indicated that the squared value of enterprise size has a significant negative relationship with a manufacturing small enterprise performance. The quadratic value of enterprise age is negative and significant at 10% level, indicating that as a manufacturing small enterprise size increases and reaches its peak, any additional increase in size of the enterprise is more likely to reduce a manufacturing small enterprise performance in Nigeria.

From the robust logistic regression results of model 2 in Table 4.2.2.7, it is also clear that, access to finance, government support/subsidy, top managers'/owners' experience and top managers'/owners' gender are unlikely to influence manufacturing small enterprise performance in Nigeria. However, the model is adequate and statistically significant at 1% level, despite the fact that the Pseudo R^2 value is low (0.076).

Similarly,the results of model 3 in Table 4.2.2.7 indicate that the coefficient of marketing innovation has a positive sign and is significant at 1% level. The positive sign of this variable indicates that marketing innovation is positively related to the performance of a manufacturing small enterprise. Statistically, a unit increase in marketing innovation capability is more likely to increase the expected log odds of a manufacturing small enterprise performance by 4.724. This suggests

that marketing innovation is important factor in triggering a manufacturing small enterprise performance in Nigeria.

The positive sign of the coefficient of enterprise size in model 3 of Table 4.2.2.7 shows that the larger the manufacturing small enterprise, the more likely it is to perform better and it is statistically significant. This variable is statistically significant at 10 % level. More specifically,a unit increase in a small enterprise size is more likely to increase the expected log odds of a manufacturing small enterprise performance by 1.48. This suggests that there is a significant positive relationship between an enterprise size and a manufacturing small enterprise performance.

The diagnostic test results of model 3 in Table 4.2.2.7 however, indicate that the model is adequate and statistically significant at 1% level despite the fact that the Pseudo R^2 value is low (0.111). The model is statistically adequate since the objective of the study is to obtain dependable estimates of the true population regression coefficients and draw statistical inferences about them, and not to obtain a high R^2 value.However, all other variables in model 3 of Table 4.2.2.7, such as, access to finance, government support/subsidy, top managers'/owners' experience and top managers'/ownerss' gender are unlikely to influence a manufacturing small enterprise business performance in Nigeria.

Furthermore, from the results of model 4 in Table 4.2.2.7, the coefficient of organizational innovation is positive and statistically significant at 1% level.Statistically, a unit increase in organizational innovation is more likely to

increase the expected log odds of a manufacturing small enterprise performance by 4.203. This suggests that an enterprise that effectively integrate and adopts organizational innovation will attain high level of performance than the one that does not.

The positive sign of the coefficient of enterprise size in model 4 of Table 4.2.2.7 and its statistical significance show that a manufacturing small enterprise bigger in size tends to perform better than a smallerenterprise. This variable is statistically significant at 10 % level. More specifically, a unit increase in an enterprise size is more likely to increase the expected log odds of a manufacturing small enterprise performance by 1.483. This suggests that enterprise size is a significant factor in promoting the success of a manufacturing small enterprise in Nigeria.

Furthermore, looking at the diagnostic test results of model 4 in Table 4.2.2.8, the Wald chi-squarevalue indicates that the model is adequate and statistically significant at 1% level with Pseudo R^2 value of 0.086. It is also clear from the results that, access to finance, government support/subsidy, top managers'/owners' experience and top managers'/owners' gender are unlikely to influence a manufacturing small enterprise performance in Nigeria.

Table 4.2.2.8: Results of robust regression analysis of performance models for medium enterprises

Independent variables	Dependent variables = performance models			
	1	2	3	4
Product/service innovation	9.820			
	(2.32)**			
Process innovation		9.617		
		(2.46)**		
Marketing innovation			4.988	
			(1.85)*	
Organizational innovation				6.265
				(1.95)*
Access to finance	-0.114	-0.065	-0.080	-0.886
	(-1.80)*	(-1.911)	(-2.07)**	(-2.01)**
Government support				
Enterprise size	-0.427	-0.326	-0.447	-0.419
	(-1.56)	(-2.04)**	(-1.75)*	(-1.48)
Enterprise size squared	1.014	1.019	1.014	1.015
	(1.60)	(2.05)**	(0.63)	(1.52)
Topmanager's/Owner's experience	-0.983	-0.965	-0.959	-0.969
	(-1.73)*	(-0.84)	(-1.08)	(-0.89)
Top managers'/owners' gender	1.636	2.066	1.888	3.069
	(0.54)	(0.67)	(0.69)	(1.26)
Pseudo R^2	0.29	0.286	0.237	0.24
Wald chi-square	12.90*	12.06*	11.57*	11.45*
Log	-16.019	-16.182	-17.292	-17.125
Number of observations	54	54	54	54

Source: Computed by the author from Nigeria Enterprise Survey 2014 dataset using Stata Version 14.

Note: Significant at 10% (*), 5% (**), 1% (***). The figures in parentheses are z–values.

Table 4.2.2.8 presents the results of robust logistic regression analysis of performance models for manufacturing medium enterprise sample. The coefficient of product/service innovationin model 1 of Table 4.2.2.8 is positive and statistically significant at 5% level. The positive sign of the coefficient of this

variable indicates that product/service innovation is positively related to a manufacturing medium enterprise performance. In specific term, a unit increase in product/service innovation is more likely to increase the expected log odds of a manufacturing medium enterprise performance by 9.820. This suggests that product/service innovation is crucial for manufacturing medium enterprise to attract new customers and increase customers retention as a modern measure of performance.

It could also be drawn from the results of model 1 in Table 4.2.2.8 that the coefficient of access to finance has a negative sign and it is statistically significant at 10% level. The negative sign of this variable indicates that, a unit increase in access to finance of a manufacturing medium enterprise is more likely to decrease the expected log odds of a manufacturing medium enterprise performance by 1.114. This indicates that there is a significant negative relationship between enterprise size and the performance of manufacturing medium enterprises in Nigeria. This may suggest that access to finance/credit is more likely to reduce a manufacturing medium enterprise performance in Nigeria. This finding is puzzling, against a priori expectation. This maybe as a result of diversition of the loans gotten for other purposes other than investment in the business.

Moreover, from the results of model 1 in Table 4.2.2.8, it is obvious that the coefficient of top manager/owner experience has a negative sign and is statistically significant at 10% level. The negative sign of this variable indicates

that a medium enterprise with top manager/owner having more experience is more likely to have reduction in performance. Specifically, a unit increase in top manager/owner experience is more likely to reduce the expected log odds of a manufacturing medium enterprise performance by 0.938. This suggests that a manufacturing medium enterprise performance is more likely to be reduced by accumulation of a top manager/owner experience. This finding is also a puzzling one, because it is against a priori expectation.

Looking at the diagnostic test results of model 1 in Table 4.2.2.8, the Wald chi2 value of 12.90 is significant at 10 % level. Therefore, the model is statistically significant despite the fact that Pseudo R^2value is low (0.036).However, all other variables in model 1 of Table 4.2.2.8, such as, access to finance, government support/subsidy, enterprise size and its squared value, and top managers'/owners' gender are unlikely to influence manufacturing medium enterprises' performance in Nigeria.

From the results of model 2 in Table 4.2.2.8, the coefficient of process innovation is positive and statistically significant at 5% level. Specifically, a unit increase in process innovation capability is more likely to increase the expected log odds of a manufacturing medium enterprise performance by 9.617.This suggests that a manufacturing medium enterprise that engages in process innovation is more likely to achieve much business performance than the one that does not.

It could also be drawn from the result of model 2 in Table 4.2.2.8 that the coefficient of enterprise size has a negative sign and it is statistically significant at 5% level. The negative sign of this variable indicates that, a unit increase in the size of a manufacturing medium enterprise is more likely to decrease the expected log odds of a manufacturing medium enterprise performance by 0.326. This indicates that there is a significant negative relationship between enterprise size and the performance of a manufacturing medium enterprise in Nigeria. Model 2 in Table 4.2.2.8 further reveals that the quadratic value of an enterprise size is significantly positive at 5% level, indicating that as an enterprise size increases and reaches its peak, a further increase in the size of a manufacturing medium enterprise will lead to a continuous increase in the performance of a manufacturing medium enterprise performance in Nigeria. Therefore, the size of a manufacturing medium enterprise has a significant nonlinear positive influence on performance.

However, from the robust logistic regression results of model 2 in Table 4.2.2.8, it is clear that, access to finance, government support/subsidy, top manager/owner experience and top managers'/owners' gender are unlikely to influence manufacturing small enterprises performance in Nigeria.Nontheless, the model is statistically significant at 10% level, despite the fact that the Pseudo R^2value is low (0.286).

Similarly, the coefficient of marketing innovation in model 3 of Table 4.2.2.8 has a positive sign andit is significant at 10% level. The positive sign of this variable indicates that marketing innovation is positively related to a manufacturing medium enterprise performance. More specifically, a unit increase in marketing innovation capability is more likely to increase the expected log odds of a manufacturing medium enterprise performance by 9.617. This suggests that marketing innovation is a factor in determining performance of a manufacturing medium enterprise in Nigeria.

The results of model 3 in Table 4.2.2.8 also indicates that the coefficient of access to finance has a negative sign and is statistically significant at 5% level. The negative sign of this variable indicates specifically that, a unit increase in access to finance of a manufacturing medium enterprise is more likely to decrease the expected log odds of its performance by 0.080. This indicates that there is a significant negative relationship between a medium enterprise size and its performance in Nigeria. This suggests that access to finance/credit is more likely to reduce a manufacturing medium enterprise performance in Nigeria. This finding is also puzzling, against a priori expectation.

Also, in model 3 of Table 4.2.2.8, the coefficient of enterprise size has a negative sign and it is significant at 10% level. The negative sign of this variable indicates that an enterprise size has a significant negative relationship with a manufacturing medium enterprise performance. In specific term,a unit increase in an enterprise

size is more likely to decrease the expected log odds of its performance by 0.447. This suggests that an increase in size of a manufacturing medium enterprise is more likely to decrease its performance.

From the diagnostic test results of model 3 in Table 4.2.2.8, the Wald chi-square value of 11.57 is significant at 10 % level. Therefore, the model is adequate and statistically significant despite the fact that Pseudo R^2 valueis low (0.237).However, all other variables in model 3 of Table 4.2.2.8, such as, government support/subsidy, a top manager/owner experience and a top manager's/owner's gender are unlikely to influence manufacturing medium enterprises performance in Nigeria.

From the results of model 4 in Table 4.2.2.8, the coefficient of organizational innovation is positive and statistically significant at 1 % level. In specific term, a unit increase in organisational innovation capability is more likely to increase the expected log odds a manufacturing medium enterprise performance by 6.625. This suggests that a medium enterprise that effectively integrates and adopts organizational innovation is more likely to attain high level of performance than the one that does not.

The results of model 4 in Table 4.2.2.8 indicates that the coefficient of access to finance has a negative sign and is statistically significant at 5% level. The negative sign of this variable indicates specifically that, a unit increase in access

to finance of a manufacturing medium enterprise is more likely to reduce the expected log odds of its performance by 0.886. This indicates that there is a significant negative relationship between an enterprise size and its performance in Nigeria. This suggests that access to finance/credit is more likely to reduce performance of a manufacturing medium enterprise performance in Nigeria. This finding is also puzzling, against a priori expectation.

The summary of the diagnostic results of model 4 in Table 4.2.2.8 indicates that the model is adequate and statistically significant at 10% level despite the fact that the Pseudo R^2 value is low (0.24). However, all other variables in model 4 of Table 4.2.2.8, such as, government support/subsidy, enterprise size, a top manager's/owner's experience and a top manager's/owner's gender are unlikely to influence manufacturing medium enterprises business performance in Nigeria.

4.3 **Discussion of Results**

This study has investigated the determinants of innovation among manufacturing MSMEs in Nigeria and the influence of innovation on their performance. The discussion of results deals with how results of this study are in line with or different from similar studies reviewed in the literature section .The discussion is classified accordinto to the number of objectives of this study stated in the first chapter.

The first objective of this study is to investigate the influence of enterprise size on the innovative capacity of manufacturing MSMEs in Nigeria. From the study's findings for the whole sample, an enterprise size is not found to be statistically significant and positively related to product/service innovation, process innovation and marketing innovation. This finding confirms the study of Acs and Isberg(1991) who find that enterprise size is not significant factor in in determing innovation practices of manufacturing MSMEs. According to Acs and Isberg(1991)increasing the number of experts/employees as a proxy for enterprise size does not haveany significant effect on the enterprise innovation practices. This finding is also in line with the study of Adeyeye et al. (2015) who find that size of manufacturing enterprises in Nigeria does not significantly influence the introduction of any type of innovation particularly, product/service innovation and process innovation.But after disaggregating the sample based on the type of an enterprise, an enterprise size has a significant non-linear negative influence on product/service innovation capability of microenterprises and process innovation for medium enterprises in Nigeria.

However, an enterprise size is found to be statistically and positively related to organizational innovation at 10% level for the whole sample.This indicates that the larger the size of an enterprise the more likely it will integrate and adopt organisational innovation. This finding confirms that of some previous studies like, Maques and Ferreira(2009) and Lee (2003). It also refutes the empirical findings ofAcs and Isberg(1991) andAdeyeye et al. (2015).

The second objective of this study is to investigate the influence of employee's skill on the innovative capacity of manufacturing MSMES in Nigeria. From the study findings for the whole sample, employee's skill is found to have a significant positive relationship with all the four types of innovation identified in this study (product/service innovation, process innovation, marketing innovation and organisational innovation). This indicates that engagement of employees with high qualifications increases the likelihood of MSMEs to build their innovative capability. The literature on innovation has established the importance of skills to innovation and acknowledged lack of skill as the greatest obstacle to innovation in a wide range of industries and countries (Hyland, 2006). The findings of this study confirmthose of some previous researchers like Freeman (1992), Nahlinder (2010), Isidoro et al. (2003). The findings also concur with assertion of Abereijo et al. (2010) who have stressed the fact that the higher the qualification of an enterprise employee, the greater is the enterprise innovative capacity. However, it is contrary to the findings of Hyland (2006) which indicate that highly skilled employees are less likely to increase the innovative capacity, meaning that having employees with higher levels of education may no longer be a sufficient pointer to higher innovative capability. The reason for the contradictory results maybe partly due to the differences in the methodology employed in analyzing the data, the characteristics of MSMEs, and the unique business environment in developed markets and economies where most of these previous researches were conducted. Similarly, after disaggregating the sample based on the type of an enterprise, an

employees skill is more likely to promote all the types of innovation for microenterprises with exception of process innovation. In addition, an employee's skill is more likely to promote process and organizational innovative capability of a small enterprise.

The third objective of this study is to investigate the influence of expenditure on R&D on innovative capability of manufacturing MSMEs in Nigeria. From the study's findings for the whole sample, expenditure on R&D is found to have significant positive relationship with the four types of innovation identified in this study. This indicates that as expenditure on R&D increases, the likelihood of MSMEs to engage in innovation increases. This fact is widely recognized and in conformity with findings of other studies (like, Shefer &Frenkel, 2005; Acs &Andretsch 1987; Mengstu et al 2013). Furthermore, the findingsarealso in line withthose of a study conducted in Nigeria by Faloye (2015) indicating that expenditure on R&D is one of the most important factors that influence innovation in manufacturingMSMEs in Nigeria. However, after disaggregating the analysis based on the type of an enterprise, the findings indicate that expenditure on R&D is not likely to promote innovative capability of a medium enterprises.

The fourth objective of this study is to investigate the influence of the experience of a top managers/owners of enterprises on innovative capability of MSMEs. From the study's findings for the whle sample, managers'/owners' experience is

not found to be significant for all the innovation types identified in this study, (product/service innovation, process innovation, marketing innovation andorganizational innovation). However, these findingsare consistent with those of the work of Ashebre et al. (2013) who findthat managers'/owners' experience does not significantly influence innovation practices of electromechanical manufacturing small and medium enterprises in Makellele, Ethiopia. But they contradictthose of a study conducted in Ghana by Afful (2010). His findings reveal a significant positive relationship between a manager's/owner's experience and innovativeness of an enterprise. The difference between the findings of this study and those of Afful (2010) may not be unconnected with the sample size used in his work,which is smaller than the sample size employed in this study.

The fifth objective of this study is to examine the influence of access to finance/credit on MSMEs' performance. To examine the influence of access to finance/credit on the performance of manufacturing MSMEs, many researchers have identified that lack of capital or financial resources may serve as a major barrier to MSMEs success. Access to finance/credit appears to be difficult, this maybe as a consequence of weak financing system, lack of a well-developed capital market and inefficient legal framework regarding credit and collateral assessment. However, most of the studies (like Ahmad et al., 2012; Fatoki, 2011; Okpara, 2011) on enterprise performance assert that access to finance/credit plays a crucial role in the growth process and performance of MSMEs, which is contrary to the findings of this study. The findings of this study indicate that

access to finance/credit is unlikely to influence manufacturing MSMEs performance in Nigeria even after disaggregating the analysis of the dataset. However, the reason for the contradictory results maybe partly due to the characteristics of MSMEs and the differences in the methodology employed in analyzing the dataset by previous researchers. Ahmed et al.(2012) apply correlation analysis while this study applies robust logistic regression analysis. For Fatoki (2011) he uses a sample size of 122 enterprises and applies OLS while this study uses 504 enterprises.

Finally, the sixth objective of this study is to investigate the influence of tyepes of innovation on MSMEs' performance. The results of the regression analysis for both the whole sampleand the type of an enterprise on the influence of types of innovation on manufacturing MSMEs performance indicate that all the four types of innovation identified in this study are significant and positively related to manufacturing MSMEs' performance. The four types of innovative capacity areproduct/service innovation, process innovation, marketing innovation and organizational innovation.These findingsare consistent with those obtained from previous studies like,(Gunday et al, 2011; Waloba & Nguigi, 2013;Marques & Monteiro- Barata, 2006) and also in agreement with those of a research conducted in Nigeria by (Olughor, 2015).However, Nham et al, (2016) study findings are contrary to those of this study on product innovation.This may not be unconnected with the fact that introducing a "new" product to expand market share can backfire if a company's product ends up eating into the market share of

its other products, leading to a reduction in the product life cycle with little or no sales growth and performance. It is obvious that the findings of the various studies are at variance with those of this study,whichcould be due to the differences in methodology, sample size and scope, and theunique business environment in developed markets and economies where most of the previous researches were conducted.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This chapter presents summary of findings, conclusions, recommendations and suggestions for further researches.

5.1 Summary of Findings

This study investigates the determinants of innovation among manufacturing micro, small and medium enterprises (MSMEs) and effect of innovation on performance of MSMEs in Nigeria. To achieve the objectives of this study, a cross-sectional enterprise survey dataset conducted by the World Bank in Nigeria between April 2014 and February, 2015 has been used.The manufacturing sector is the primary business sector of interest for this study, because manufacturing sector is still the largest sector in terms of export, innovation and productivity growth (Manyinka & Sinclair, 2012).After dropping the missing values from the dataset, a sample of 504 manufacturing MSMEs has been drawn for this study.

Descriptive statistics and inferential methods of analysis have been applied in this study. Descriptive analysis has been carried out in the form of mean, minimum, maximum. However, inferential analysis has been applied in the form of diagnostic tests and robust logistic regression analysis.

The findings of the study have been summarized as follows:

From the descriptive results, it is evident that majority of the MSMEs in Nigeria engaged deeply in all types of innovation with exception of organizational innovation. For the inferential results, for the whole sample, enterprisesize has been found to have no any significant relationship with product/service innovation, process innovation, marketing innovation except for organizational innovation for which it has a positive and statistically significant impact at 10% level for the whole sample. But after disaggregating the analysis, it has a significant nonlinear negative influence on product/service innovation for microenterprises and on process innovation for medium enterprises.

The results from the study alsoindicate that there is a significant positive relationship between an employee's skill and the four types of innovation identified in this study. Meaning that, a skillful employee has a significant positive influence on innovative capability of manufacturing MSMEs in Nigeria.

The study also finds that manufacturing MSMEs in Nigeria that spend more on R&D are more likely to be more innovative than those that do not. Therefore, expenditure on R&D is found to have a significant positive relationship with the four types of innovation identified in this study.

With regard to the influence of a top manager's/owner's experience on innovative capability of manufacturing MSMEs, the findings of this study indicate that it does not have any significant relationship with product/service innovation,

process innovation, marketing innovation as well as organizational innovation in manufacturing MSMEs in Nigeria.

Furthermore, the findings of the study also indicate that access to finance/credit does not have any significant influence on manufacturing MSMEs performance.

Regarding the effects of innovation types on performance, the findings of this study indicate that all the four types of innovation identified in this study,(product/service innovation, process innovation, marketing innovation and organizational innovation) have a significant positive influence on MSMEs' performance in Nigeria, suggesting that they best explain manufacturing MSMEs performance in Nigeria.

5.2 Conclusions

Based on the findings of this study, the following conclusions have been drawn:

An enterprise size does not influence innovative capability of cumulative MSMEs in Nigeria. Therefore, it is not an important factor in determing their innovative capability. But for small and microenterprises specifically, it increases their innovative capability at a given level of expansion. But after reaching a given size, any increase in their size will reduce their product/service innovative capability.

It is also concluded that an employee's skill is an important factor in stimulating innovative capability of MSMEs in Nigeria. This is because, an increase in an

employee's skill increases all types of innovative capability of MSMEs in Nigeria.

From the findings of this study, it is also concluded that expenditure on R&D is a crucial factor in promoting innovative capability of MSMEs in Nigeria. Therefore, MSMEs that are spending more on R&D are more likely to be innovative in all types of innovation than those that spend less on R&D.

However, on the basis of the findings of this study, it is concluded that experience of a top manager/owner of an enterprise is not an important factor in determining the innovative capability of MSMEs in Nigeria. This is because a top manager's/owner'sexperience does not have any significant influence on MSMEs innovative capability.Similarly, it is concluded that access to finance/credit does not improve the performance of MSMEs in Nigeria.

Finally, it is concluded that innovation is an important factor in triggering the performance of MSMEs in Nigeria. This is because all the four types of innovation have a significant influence on the performance of MSMEs in Nigeria.

5.3 Recommendations

Based on the findings of this study, the following policy recommendations are proffered.

Since the findings of the study indicate that employee's skill has a positive and significant influence on all the types of innovation identified in this study, it is

recommended that MSMEs in Nigeria should continue to employ workers with higher qualifications. This may ensure promotion of innovation capability of MSMEs in Nigeria.

Similarly, since expenditure on R&D enhances MSMEs capability to innovate, MSMEs should continue to spend more on R&D in Nigeria.In addition, since innovation triggers MSMEs performance in Nigeria, pursuance and application of factors that influence innovation positively should be ensured in Nigeria. This maybe achieved by promoting research and publication in the area of economics of innovation.

Furthermore, since access to finance/credit does not have any significant impact on MSMEs performance in Nigeria, further studies maybe conducted to investigate why this factor does not have a significant impact on MSMEs performance in Nigeria. This is because there may exist some mediating and moderating factors that may not allow this variable to exert any significant impact.

Finally, since a top manager's/owner's experience does not have any significant impact on innovative capability of MSMEs in Nigeria, some courses on Economics of Innovation should be introduced in Economics and Business education curricular. This is because, the failure of a top manager's/owner's skill to have significant impact on innovative capability of MSMEs maybe as a result of lack of knowledge of Economics of Innovation.

5.4 Suggestions for further Research

Since this study covers only the manufacturing sector, further studies maybe carried out on service and other sectors of the economy. The research can also extended to other sectors to include other variables (such as the firm profit, owners' marital status, owners age, competition and some others) not captured in this study in order to expand the frontier of knowledge.

Another useful area of expansion is disaggregating the analysis to cover the impact of formally and informally acquired skills by employees on innovative capability of MSMEs in Nigeria. This therefore requires the enterprises survey in Nigeria to capture different categories of skill of employees and top managers/owners.This study is only conducted in Nigeria. However, further study can be carried out to cover West Africa countries or Sub-Saharan Africa.

Finally, since this study uses cross-sectional dataset, a study that will make use of panel dataset and apply panel analysis approachesmay shade more light on the determinants of innovation and its impact on MSMEs in Nigeria.

REFERENCES

Abereijo, O., Ilori, O., Taiwo, A., & Adegbite, A. (2007). Assessment of the capabilities for innovation by small and medium industry in Nigeria. *African Journal of Business Management*, 8(2), 18-24.

Abubakar, A. B., Garba,T.,Abdullahi, A. S., & Maishanu, M. M. (2011). Corporate board gender diversity and performance: evidence from Nigerian stock exchange. *The Economic Journal of Nepal*, 34(4), 240-260.

Acs, Z. & Audretsch, D. (1987). Innovation, market structure and firm size. *The Review of Economics and Statistics*,69 (4), 567-574.

Acs, Z & Isberg, C. (1991). Innovation, firm size and corporate finance. *Economic Letters*, 35, 323-326.

Adeyeye, A.D., Jegede, O.O., Oluwadare, A.J.& Aremu, F.S. (2015). Micro-level determinants of innovation: Analysis of the Nigeria manufacturing sector. *Journal of Innovation and Development*, 6 (6), 12-16.

Adner, R., & Levinthal, D. (2001). Demand heterogeneity and technology evolution: Implication for product and process innovation. *Management Science*, 47(5), 611-628.

Afful, B. (2010). Determinants of innovative performance among, micro, small and medium scale enterprises in the Ghanaian Apparel industry. Unpublished M.Sc. dissertation, University of Cape Coast.

Ahmad, M., Ahmad, E., Kahut, M. B. H., & Murtaza, G. (2012). New determination of factors affecting the growth of small and medium-sized enterprises in Pakistan. *Interdisciplinary Journal of Contemporary Research in Business*, *4*(6), 513-530.

Ahmed, P. (1998). Culture and climate for innovation. *European Journal of Innovation Management,* 1(1), 30-34.

Ajunwa, A., Okoyenzu, C., & Nwakoby, I. (2012). Corporate board diversity and firm performance: Evidence from Nigeria. *Journal of Business Finance and Accounting*, 29(5),579-611.

Akande, O. O., & Ojukuku, R. M. (2008). *The impact of entrepreneurial skills on small business performance in Lagos - South-Western Nigeria.World Conference.* Halifax, Nova Scotia: International Council for Small Business.

Akova, B., Ulusoy, G., Payzin, E. & Kaylan, A.R. (1998). New product development capabilities of the Turkish electronics industry. Fifth

International Product Development Management Conference, Como, Italy. May 25-26, 1998.

Akpan, O. K,& Amran, N.A. (2014). Board characteristics and company performance: Evidence from Nigeria. *Journal of Finance and Accounting*, 2(3), 81-89.

Akpotohw, F.C. (2007). Sustaining growth of SMEs through intervention programmes of government: problem and challenges. *Journal of Business Studies and Technology*, 2(4), 4-6.

Al-Ansari, Y. D. (2014). Innovation practices as a path to business growth performance: a study of small and medium sized firms in the emerging UAE market. A Ph.D Thesis at Business School, Southern Cross University.

Amabile, T.M. (1996). Assessing the work environment for creativity. *The Academy of Management Journal*, 5(4), 5-10.

Amato, L. H. & Burson, T. E. (2007). The effects of firm size on profit rates in the financial services. *Journal of Economics and Economic Education Research*,8(1), 67-81.

Anderson, N., Carsten, D., & Nijstad, B.A. (2004). The routinization of innovation research: A constructively critical review of the state-of-the-science.*Journal of Organizational Behavior,* 25(2), 147-152.

Andey,C., Alan, H., & Xiaolan, F. (2003). Innovatability of manufacturing SMEs in the East of England. *Cambridge Journal of Economics,* 10(7), 21-28.

Andrea,V., & Mario, P. (2006). Firm size and innovation in European manufacturing. Kiel working paper No.1284. The Kiel institute for the world economy, Duesternbrooker Weg 24105 Kiel (Germany).

Angelova, B., & Zekiri, J. (2011). Measuring customer satisfaction with service quality using American customer satisfaction model (ACSI Model). *International Journal of Academic Research in Business and Social Sciences*, 1(3), 232-258.

Anh,V.T.,& Khanh, B. P. (2017).Impact of board gender diversity onfirm value: International evidence. *Journal of Economics and Development,* 9(1),14-29.

Arrow, K. J. (1962a). Economic welfare and the allocation of resources for invention. *Review of Economic Studies,* 29, 125-143.

Arrow, K. J. (1962b). The Economic implications of learning by doing. *Review of Economic Studies,* 29, 155-173.

World Bank

Ashebre,M., Kahsay, G. & Asayehegn, D. (2013). A n empirical investigation on innovative practices of electrmechanical manufacturing: The case of small and medium enterprises in Mekelle city, Ethiopia. *International Journal of Business and Behavioural Sciences*, 3(5), 120-138.

Atkin, M. H., & Lowe, F. (1997). Sizing up the small firm: UK and Australian experiences; *International Small Business Journal*, 15(9), 23-30.

Atuahene-Gima,K. (1996). Market orientation and innovation. *Journal of Business Research*,15(35), 93-103.

Awotunde, P.O., & Ugoduluwa, C.U. (2004). *Research Methods in Education*. Jos, Nigeria: Fab Anieh Nig.Ltd.

Ayyagari, M., Beck,T., & Demirguc-kunt,A. (2003). *Small and medium enterprises across the globe: A new Database (No.3127)*.Washington DC: The World Bank,Washington, DC.

Baark, E.K., Antonio, W. L., & Sharif, N. (2011). Innovation sources, capabilities and competitiveness: Evidence from Hong Kong firms. *Journal ofHong Kong University of Science and Technology*, 21(4), 6-12.

Balan, P.,& Lidnay, N. (2010). Innovation capability: Exploring the factors that make up this construct in the service sector. *Journal of Business Studies and Technology*, 2(6) 5-12.

Balding, J.R., & Sabounn, D. (1999) Innovative activity in Canadian food processing establishment:The importance of engineering practices. *International Journal of Technology Management*, 5(8) 12-22.

Beckett, W. K., & Dang, K. (1992). Synchrous manufacturing: New method, new mind-set. *The Journal of Business Strategy*,1(12), 53-56.

Benhabib, A., Berrached, W., & Senouci, B. (2016). Key determinants of innovation in the Algerian SMEs. *Topic in Middle Eastern and African Economies*, 18(1), 183-200.

Biemens, W. (1992). *Managing innovation within networks*. London: Printer publisher.

Blaxter, L., Hughes, C., & Tight, M. (2001). *How to research.* USA: Open University press.

Butyter, D. & Wachowka, M. (2015). Foreign trade and innovation: Evidence from Ukraine. *Journal of International Studies*, 8(1), 173-182.

Burkler, S. A. (1997). The spiritual nature of innovation. *Research and Technology Management*, 4(43), 7-20.

Cainelli, G, Evangelista, R & Savona, M. (2006) Innovation and economic performance in services: A firm-level analysis.*Cambridge Journal of Economics*, 30 (3), 435-458.

Calantone, R. J., Cavusgil, S. T., & Zhao, Y. (2002). Learning orientation, firm innovation capability, and firm performance. *Industrial Marketing Management, 31*(6), 515-524.

CBN (2011) *Monetary circular* No.22. Abuja: Central bank of Nigeria.

Cefis, E., & Ciccarelli, M. (2005). Profit differentials and innovation.*Economics of Innovation and New Technology*, 14, 43-61.

Christenson, C. (1997). *The innovators dilemma*. Cambridge: Harvard Business School press.

Coe, D. T., & E. Helpman. (1995). International R&D spillovers. *European Economic Review,*39, 859-887.

Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, 35(1), 128-152.

Cohen, W., & Klepper, S. (1996). A reprise of size and R&D. *The Economic Journal,* 106, 925-951.

Critical Issues and Implementation Strategies. Paper presented at the Third International Globelics Conference, Orgainised by the Global Network for the Economics of Learning, Innovation and Competence (Globelics) held at the Tshwane University of Technology, Tshwane, South Africa, October 31 to November 4, 2005.

Dachs, B., & Ebersberger, B. (2007). Does foreign ownership matter for the innovation activities of enterprises? Retrieved on 20th March, 2009,http://www.econssearch.net/papers.

Damanpour, F., & Evan, W.M. (1984). Organisational innovation and performance: The problem of organizational lag. *Administrative Science Quarterly*, 29 (3), 392-409.

Day, J. (1998). The value and importance of the small firm to the world economy. *European Journal of Marketing*, 34(10), 1033-1037.

Demsetz, H. (1967). Toward a theory of property rights. *American Economic Review*, 57 (2),347-359.

Dickson, K., & Hadjimonolis, A. (1998). Innovation and networking amongst small manufacturing firms in Cyprus. *International Journal of Entrepreneurial Behavior and Research*, 106, 925-951.

Dierckx, M., & Stroeken, J. (1999).Information technology and innovation in small and medium enterprises. *Journal ofTechnology Forecasting and Social Change*, 22(5), I21-126.

Dongondaji, S.D. (2006). Relationship between firm characteristics and access to formal sector credit: An empirical study of SMEs in Kano. Unpublished Ph.D. Thesis, Department of Economics, Usmanu Danfodio University, Sokoto, Nigeria.

Dooley, K.E. (1999). Towards a holistic model for the diffusion of educational technologies: An integrative review of educational innovation studies. *JournalEducational Technology & Society*, 2(4), 35-45.

Dos Santos, B.L., & Peffers, K. (1995). Rewards to investors in innovative information technology applications: First movers and early followers in ATMs. *Journal of Organisation Science*, 6, 241-259.

Drucker, P. (1985). Creativity: The discipline of innovation.*Harvard Business Review*, 63(3), 67-72.

Duranton, G., & Puga, D. (2001). Nursery cities: Urban diversity, process innovation, and the life cycle of products. *America Economic Review*, 91 (5), 1454-1477.

Eaton, J., & Kartums, K. (1999). International technology diffusion: Theory and measurement. *International economic review*, 40 (3), 537-570.

Edquist, C. (1997). *Systems of innovation technologies, institutions and organization*. London: Frances printer.

Egbetokun, A. A., Adeniyi, A. A., & Siyanbola, W. O. (2012). On the capability of SMEs to innovate: The cable and wire manufacturing subsector in Nigeria. *International Journal of Learning and Intellectual Capital*, 9 (1/2), 64–85.

Ekiugbo, E. (2008). Small and medium scale enterprises and peace-building in the Niger Delta area of Nigeria: A study of Warri Metropolis. *Journal of Business Administration and Management, University of Maiduguri*, 12 (3), 8-16.

Elam, M. (1993). Innovation as the craft of combination: Perspectives on technology and economy in the spirit of Schumpeter. Ph.D thesis Institute of Tema Research, Linkoping University.

Engel, D., Rothgang, M., & Trettin, L. (2002). Innovation and their impact on growth of SME– empirical evidence from craft dominated industries in Germany. A Paper presented at the EARIE 2004 Conference, 2–5 September, Berlin, Germany.

Ettlie, J. E., & Reza, E. M. (1992). Organizational integration and process innovation. *Academy of Management Journal*, 35(4), 795-827.

European Union (2003). User guide to the SME definition. *European Economic Review*. 124, 36.

Evangelista, R., & Savona, M. (2003). Innovation, employment and skills in services: Firm and sectoral evidence. *Structural Change and Economic Dynamics*, 14(4), 449-474.

Fagerberg, J., Mowery, D.C., & Nelson, C. (2005). *The Oxford Handbook of Innovation.* New-York: Oxford University Press.

Falk, M. (2008). Effects of foreign ownership on innovation activities: empirical evidence for twelve European countries. FIW Research Report No. 020. Osterreichisches Institute fur Wirtchaftsforschung, Holland.

Faloye, O. D. (2015). The key determinants of innovation in small and medium scale enterprises in South-Western Nigeria.*European scientific journal*, 11(13), 17-32.

Fatoki, O. O. (2011). The Impact of human, social and financial capital on the performance of small and medium-sized enterprises (SMEs) in South Africa. *Journal of Social Science, 29(3), 193 – 204.*

Fazlzadeh A., & Moshiri M. (2010). An investigation of innovation in small scale industries located in science parks of Iran. *International Journal of Business and Management*, 5(10), 5-14.

Feldman, M., & Audretsch D.B. (1999). Innovation in cities: Science-based diversity, specialization and localized competition. *European economic review, 18(4), 29-38.*

Fillis, I. (2002). An Andulusian dog or arising star? Creativity and the marketing/entrepreneurship interface.*Journal of Marketing Management*, 18 (34), 379-395.

Freeman, C. (1992). *The economics of hope*. London: Printer publisher.

Garcia, R., & Calantone, R. (2002). A critical look at technology innovation typology and innovativeness terminology: A literature review. *The Journal of Product Innovation Management*, 19(2), 110-132.

Garrigos-Simon, F.J.,Marques, D.P., & Narangajavana, Y. (2005). Competitive strategies and performance in Spanish hospitality firms.*International Journal of Contemporary Hospitality Management*, 17(1), 22-38.

Garba, T.& Abubakar, A. B.(2014). Corporate board diversity and financial performance of insurance companies in Nigeria: An application of panel data approach.*Asian Economic and Financial Review*, 4(2), 257-277.

Garba, T., & Kraemer-Mbula, E. (2018). Gender diversity and enterprise innovative capability: The mediating effect of women's years of education in Nigeria. *International Journal of Gender and Entrepreneurship*, 10(4), 290-309.

Goldhar, J. D.,&Lei, D. (1991). The shape of twenty-first century global manufacturing. *The Journal of Business Strategy***,** 12(2), 37-41.

Griliches, Z. (1995). R&D and productivity: Econometric results and measurement issues. In Stoneman, P. (ed.), *Handbook of the economics of innovation and technological change*. Oxford: Blackwell. 52–89.

Grossman, G. M., & E. Helpman. (1990). Trade, innovation, and growth. *American Economic Review*, 80, 86-91.

Guadalupe, M., Kuzmina,O., & Thomas, C. (2010). Innovation and foreign ownership. NBER Working Paper Series, No. 16573.National Bureau of Economic Research,Cambridge, United State of America.

Gujarati, D.N. (1995). *Basic econometrics*, Third Edition. U.S.A: McGraw-Hill, Inc.

Gunday, G., Ulusoy, G., Kilik, K. & Alpkan, L. (2011). Effects of innovation types on firm performance. *International Journal of Production Economics*, 4(8), 662-676.

Gupta, V. (1999). *SPSS for beginners*. USA: JVBooks.

Hailperm, S., & Visintainer, P. (2003). Odd ratio and logistic regression: Further examples of their use and interpretation. *The stata journal*, 3(3), 121-132.

Hallberg, K. (2000). A Market oriented strategy for small and medium enterprises.UNU-MERIT Working Paper 40. United Nations University-Maastricht Economic and Social Research Institute on Innovation and Technology (UNU-MERIT) Netherlands.

Halty-Carrere, M. (1979). *Technological development strategies for developing countries: A review for policy makers*. Montrcal: Institute for research on public policy.

Hamid, M.Y., Bello, K. (2008). The role of SMEs in poverty alleviation and development in Nigeria. *Journal of Business Admnistration and Management,* 2(4), 4-6.

Harris, M.N., Rogers, M. & Siouclis, A. (2003). Modelling firm innovation using panel probit estimators. *Applied Economics Letters,*10, 683-686.

Harrisson, L.E, & Huntington, S.P. (2000). *Culture matters: How values shape human progress*. New York: Basic Books.

Harvie, C., & Lee, B. (2008). *Small and medium enterprises in East Asia.* United Kingdom: Edward Edgar Publishing.

Hassan, M. U.,Saukat, S.,Nawaz, M. S., & Nas, S. (2013). Effects of innovation types on firm performance: an empirical study on Pakistan's Manufacturing Sector. *Pakistan Journal of Commerce and Social Sciences*, 7 (2), 243-262.

Hendersen, R.M, & Clark, K.B. (1990). Architectural innovation: The recognition of existing product technologies and the failure of established firm administrative. *Science Quarterly*, 35(1), 9-30.

Higino, P. (2005). International trade, economic growth and intellectual property rights: A panel data study of developed and developing countries. *Journal of Development Economics, 5* (78) 529-547.

Hitt, M.A., Ireland, R.D., Camp, S.M.,& Sexton, D.L. (2001) Introduction to the special issue on strategic entrepreneurship: Entrepreneurial strategies for wealth creation. *Strategic Management Journal*, 22, 479–491.

Ho, T.M., Pham, D. L, & Tom D.T. (2001). Innovation and productivity of Vietnamese small and medium enterprises: Firm level panel data evident. Division of Quantitative Economics, Ton Duc Thang University.www.doanbrother.com/papers2014/64_Pham%20Dinh%20Long_paper%20submitted%20for%20VEAM%202014.pdf.

Hobday, M. (1995). East Asian latecomer firms: Learning the technology of electronics. *World Development*, 23(7), 1171-1193.

Hockerts, K.N. (2003) Sustainability innovations: Ecological and social entrepreneurship and the management of antagonistic assets. Unpublished M.sc Dissertation, University of St. Gallen, Germany.

Hornby, A.S. (2000). *Oxford advanced learner's dictionary*. New York: Oxford University Press.

Hyland, T. (2006). Vocational education and training under the New Deal: Towards a social theory of lifelong learning in the postschool sector. *Journal of Vocational Education and Training*, 52(3),395-411.

Ilori, M. O., Oke, J. S. & Sanni, S.A. (2000). Management of new product development in selected food companies in Nigeria. *Technovation*, 20 (6), 333–342.

Isidoro, R., Juan, A., & Martinez, R. (2012). Self-employment and innovation: Exploring the determinants of innovative behavior in small businesses. NBER working paper series, NO.16375. National Bureau of Economic Research,Cambridge, United State of America.

Islam, M. A., Khan, M. A., Obaidullah, A. Z. M., & Alam, M. S. (2011). Effect of entrepreneur and firm characteristics on the business success of small and medium enterprises (SMEs) in Bangladesh. *International Journal of Business and Management*, *6*(3), 289-293.

Jamil, C.M., & Mohamed, R. (2011). Performance measurement system (PMS) in small and medium enterprise (SMEs): A practical modified framework.*World Journal of Social Sciences,* 1(3), 200 -212.

Jasra, J.M., Asifkhan, M., Hunjra, A.I., Rehman, R.A.,& I-Azam, R. (2011). Determinants of business success of small and medium enterprises.*International Journal of Business and Behavioural sciences*, 3(5), 24-34.

Jegede, O. O., Ilori, M. O., Sonibare, B. A., Siyanbola, W. O. (2012). An overview of innovation intensity in the indigenous oilfield services firm in Nigeria. *Management,* 2 (5), 214-220.

Johnson, H. T., & Kaplan, R. (1987). *Relevance lost: The rise and of fall of management accounting*. Boston, USA: Harvard University Press.

Kaufmann, A., & Tödtling, F. (2000). Systems of innovation in traditional industrial regions: The case of Syria in a comparative perspective.*Regional Studies,* 34 (1), 29-40.

Keller,W. (2009). International trade, foreign direct investment and technology spillovers. NBER working No 15442. National Bureau of Economic Research,Cambridge, United State of America.

Kinyua, A. N. (2014). Factors affecting the performance of small and medium enterprises in the Jua Kali sector in Nakuru town, Kenya.*Journal of Business and Management,* 16 (1), 80-93.

Klomp, L., & Van Leeuwen, G. (2001). Linking innovation and firm performance: A new approach. *International Journal of the Economics of Business,* 8(3), 343–364.

Koeller, C. T. (1995). Technological opportunity and relationship between innovation outputs and market structure. *Managerial and Decision Economics,* 26, 209-222.

Kotler, P. (1991). Principles of marketing.*International Journal of the Economics of Business,*8(3), 343-361.

Kraemer-Mbula, E., Lorenz, E., Takala-Greenish, L., Jegede, O.O., Garba, T., Mutambala, M., & Esemu, T. (2019). Are African micro-and small enterprises misunderstood? Unpacking the relationship between workorganisation, capability development and innovation. *Int. J. Technological Learning, Innovation and Development*, 11(1), 1–30.

Krishnan, G.,& Parsons, L. (2008).Getting to the bottom line: An exploration of gender and earnings quality. *Journal of Business Ethics*, 78,65–76.

Krishnan, H. A.,& Park, D. (2005). A few good women on top management teams.*Journal of Business Research,* 58(12), 1712-1720.

Kuczmarski, T.D. (1996). What is innovation? The art of welcoming risk. *Journal of Consumer Marketing*, 6(2), 7-11.

Kusiak, A. (2007). Innovation of products and services: Bridging world's economies industrial engineering. A paper presented at 19th International conference on production and Research, 29th July – 2nd August, University of Iowa, Iowa City, USA.

Kuswanto,F., Roshi, M. M., Abdul, R.,& Ghorbani, H. (2012). Impact of distribution channel innovation on the performance of SMEs. *International Business and ManagementJournal*, 5, 52-61.

Kwaido, A. A., (2009). Women entrepreneurs and the development of small scale enterprises in Sokoto metropolis. Unpublished M.sc. Economics dissertation, Usmanu Danfodiyo University, Sokoto, Nigeria.

Laura, M. R. (2010). The effect of technological innovation on international trade. *Journal of Technology Management and Innovation*, 5, (8), 13-29.

Lee, C. (2003). The determinants of innovation in the Malaysian manufacturing sector: An econometric analysis at the firm level. *ASEAN Economic Bulletin,* 21, 319-329.

Lee, C. (2004). The determinants of innovation in the Malaysian manufacturing sector.working paper No.60. Institute for Development Policy and Management, University of Manchester.

Lee. J. (2009). Does size matter in firm performance? Evidence from US public firms.*International Journal of the Economics of Business,* 16(2), 189 – 203.

Leger, A., & Swaminathan, S. (2006). Innovation theories: Relevance and implications for developing countries. Retrieved from http//www.druid.dk/conference/winter2006.

Leiponen, A. (2005). Skills and innovation. *International Journal of Industrial Organization*, 6(2),3-15.

Lin, C. Y., & Chen, M. Y. (2007). Does innovation lead to performance? An empirical study of SMEs in Taiwan. *Management Research News*, *30*(2), 115-132.

Love, J.H., & Ganotakis, P. (2013). Learning by exporting: Lessons from high-technology. *SMEs International Business Review*, 22(1), 1-17.

Mach, T.L., & Wolken, J.D. (2011). Examining the impact of credit access on small firm survivability. *Finance and Economics Discussion Series,* 2011-35. Divisions of Research and Statistics and Monetary Affairs Federal Reserve Board, Washington D.C., USA.

Majmumdar, S. K. (1997). The impact of size and age in firm-level performance: Some Evidence from India. *Review of Industrial Organization*, 3(12), 231 – 241.

Manyinka, J., & Sinclair, J. (2012). Manufacturing the future: The next era of global growth and innovation. Mckinsey Global Institute. Retrieved from https:/www.mckinsey.co.

Marques, C.S., & Ferreira, J (2009). SME innovative capacity, competitive advantage and performance in a traditional industrial region of Portugal. *Journal of Technology Management & Innovation*, 4(4), 17-26.

Marques, C., & Monteiro-Barata, J.(2006). Determinants of the innovation process: An empirical test for the Portuguese manufacturing industry. *Management Research,* 4(2), 113-126.

Medlin, B.D. (2001). The factors that may influence a faculty member's decision to adopt electronic technologies in instruction. An unpublished Ph.D thesis at Virginia Polytechnic Institute and State University.

Mengstu, A., Gebremeskel, K., & Desta, A. (2013). An empirical investigation on innovative practices of electromechanical manufacturing: The case of small and medium enterprises (SMEs). *International Journal of Economics and Finance*, 3(5),104-126.

Meso, P., Musa, P., & Mbarika, V. (2005). Towards a model of consumer use of mobile information and communication technology in LDCs: The case of sub-Saharan Africa. *Information Systems Journal, (15)*, 119-146.

Mohammad, S. M. N., Peou, C., & Ali, J. (2010). Moderating effect of government policy on entrepreneurship and growth performance of small-medium enterprises in Cambodia. *International Journal of Business and Management Science, 3*(1), 57-61.

Moorthy, M. K., Tan, A., Choo, C., Wei, C. S., Ping, J. T. Y., & Leong, T. K. (2012). A study on factors affecting the performance of SMEs in Malaysia. *Academic Research in Business and Social Sciences*, *2*(4), 224-239.

Mohammed, U. D., & Obeleagu-Nzelibe, C. G. (2014). Entrepreneurial Skills and Profitability of Small and Medium Enterprises (SMEs): Resource Acquisition Strategies for New Ventures in Nigeria. Proceedings of 25th International Business Research Conference 13 -14 January, 2014, Taj Hotel, Cape Town, South Africa.

Muller, B., Murman, M. (2014). The workforce composition of young firms and product innovation. Discussion Paper No. 16-074. Centre for European Economic Research.

Mulu, G. (2009). Innovation and micro enterprises growth in Ethiopia. UNU-MERIT Working paper series 053.United Nations University-Maastricht Economic and Social Research Institute on Innovation and Technology (UNU-MERIT) Netherlands.

Musa, A., & Adamu, J. (2017). Determinants of firm innovation in Nigeria. *Kasetsart Journal of Social Sciences*, 7(6), 1-9.

Muzenda, A. A. (2014). Conceptual model of the determinants of performance of tourism sector in small and medium enterprises (SMEs). *International Journal of Business and Management Invention*,2(4), 5-11.

Naffziger, D.W., & Mueller, C. (1999) Strategic planning in small businesses: Processand content realities.*Proceedings of the USASBE/SBIDA Annual NationalConference*.San Diego,CA

Nahlinder, J. (2010). Where are all the female innovators? Nurses as innovators in a public sector innovation project.*Journal of Technology Management and Innovation*, 5 (1), 13-29.

Nazarov, Z., & Akhmedjonov, A. (2011). Education, training and innovation in transition economies. Working paper series 176.RAND centre for the study of aging.

Nelson, R. R. & Winter S.G (2002). Evolutionary theorizing in economics. *Journal of Economic Perspectives,* 16, 23-46.

Niganaraja, G. (2008). FDI and innovation as drivers of export behaviour: Firm level evidence from East Asia. Working Paper Series 061. United Nations University-Maastricht Economic and Social Research Institute on Innovation and Technology (UNU-MERIT) Netherlands.

Nham T., Nguyen N., Pham G., & Nguyen N. (2016). The effects of innovation on firm's performance of supporting industries in Hanoi- Vietnam. *Journal of Industrial Engineering and Management,* 9(2), 413-431.

Nnana O.J. (2001). Marketing small and medium scale industries. A paper presented at the workshop on the small and medium industries equity investment scheme. International Conference Center, Abuja. 10-12 April, 1999.

North D.C. (1989). Institutions and economic growth: an historical introduction. *World Development*, 17(9), 1319-1332.

Oba,V.C.,& Fodio, M.I. (2013). Boards gender mix as a predictor of financial performance in Nigeria: An empirical study. *International Journal of Economic and Finance,* 5(2),170-179.

OECD, (2005a). *Oslo manual:* Guidelines for collecting and interpreting innovation data, third edition. Paris: Organisation for Economic cooperation and DevelopmentOECD,

OECD, (2005b). *Oslo manual:* Guidelines for collecting and interpreting innovation data: The measurement of scientific and technological activities, third edition.Paris: Organisation for Economic Cooperation and DevelopmentOECD,

Ofoegbu, E. O., Akanbi, P. A., & Joseph, A. I. (2013). Effects of contextual factors on the performance of small and medium scale enterprises in Nigeria: A Case Study of Ilorin metropolis. *Journal of Advances in Management & Applied,* 2(2), 1-14.

Ogboru, P. L. (2007). An evaluation of funding arrangement for small and medium scale enterprises in Nigeria. Ph.D Thesis at St Clement University, British West Indies.

Ogundele, O. J. K., Akingbola, W.A.,& Akinlabi, H.B. (2012). Entrepreneurship training and education as strategic tools for poverty alleviation in

Nigeria.*American International Journal of Contemporary Research*,12(1), 148-156.

Okpara, J. O. (2011). Factors constraining the growth and survival of SMEs in Nigeria: Implications for poverty alleviation. *Management Research Review, 34*(2), 156-171.

Olson, E. M., Walker Jr, O. C., & Ruekert, R. W. (1995). Organizing for effective new product development: The moderating role of product innovativeness. *The Journal of Marketing*, 59(1), 48-62.

Olughor, R. J. (2015). Effect of innovation on the performance of SMEs organizations in Nigeria.*Management*, 5 (3), 90-95.

Onwumere, J. P., & Ozioma, E. (2015). Enhancing innovativeness among small and medium scale leather enterprises to boost performance in Abia state, Nigeria. *European-America Journal*, 2(12), 8-12.

Oum, S., Narjoko, D., & Harvie, C. (2014). Constraints of SME innovation, and the role of government support. Discussion Paper series 10. Economic Research Institute for ASEAN.

Oyefuga, I.O., Siyanbola, W.O., Afolabi, O.O., & Dada,O. (2008). SMEs funding: An assessment of an intervention scheme in Nigeria. *Management and Sustainable Development Journal*, 2(4), 12-20.

Oyewale, A. A. (2005). Addressing the Research-Industry Linkage Impasse in Nigeria: the Critical Issues and Implementation Strategies. Paper presented at the Third International Globelics Conference, Orgainised by the Global Network for the Economics of Learning, Innovation and Competence (Globelics) held at the Tshwane University of Technology, Tshwane, South Africa, October 31 to November 4, 2005.

Pagano, U., & Rossi, M.A. (2004). Incomplete contracts, intellectual property and institutional complementarities. *European Journal of Law and Economics,*18, 55-76.

Papadogonas, T.A. (2007). The financial performance of large and small firms: Evidence from Greece.*International Journal of Financial Services Management*, 2(12), 14 – 20.

Parisot, A.H. (1995). Technology and teaching: The adoption and diffusion of technological innovations by a community college faculty. A Ph.D thesis at Montana State University.

Pasanen, M.(2006). SME growth strategies: A comparison of young and long-lived firms.Unpublished Ph.D Thesis. University of Kuopio, Kuopio.

Polder, M., Leeuwen, G.V., Mohnen, P., & Raymond, W. (2010). Product, process and organizational innovation: Drivers, complementarily and productivity effects. Working paper series 40.United Nations University-Maastricht Economic and Social Research Institute on Innovation and Technology (UNU-MERIT) Netherlands.

Porter,M. (1990). *The Competitive Advantage of Nations*. New York: Macmillan.

Pyka, A. (2012). A taxonomy of innovation and services. FZID Discussion Paper No.42. University of Hohenheim Center for Research on Innovation and Services, Germany.

Rahman, S. (2001). A Comparative study of TQM practice and organizational performance of SMEs with and without ISO9000 certification. *International journal of Quality and Reliability Management*, 19(1), 35-49.

Roberts, P. W. (1988). Product innovation, product-market competition and persistent profitability in the US pharmaceutical industry. *Strategic Management Journal, 20* (7), 655-670.

Robson, P. J. A., Haugh, M., & Obeng, B. (2008). Entrepreneurship and innovation in Ghana: Enterprising Africa. *Small Business Economics,* 32 (3), 331–5

Rogers, E. M. (1983). *Diffusion of innovations,* 3rd edition. New York: The Free Press,

Rogers, E.M. (1995). *Diffusion of informations*,4th edition. New-York: The Free Press,

Rothwell, R. & Dodgson, M (1994). Innovation and size of firm, prosperity through entrepreneurship. *Strategic Management Journal*, 2(2), 1-14.

Ruttan, V.W. (2001). *Technology, growth and development: An induced innovation perspective*. New York and Oxford: Oxford University Press.

Sadowki, B.M., & Rasters, G.S. (2006). On the innovativeness of foreign affiliates: Evidence from companies in the Netherland.*Research Policy*, 35(3), 447-462.

Salim, I.M., & Sulaiman, B.M. (2011). Impact of organizational innovation on firm performance: Evidence from Malaysian-based ICT companies. *Business and Management Review*, 1 (5), 12-19.

Sandberg, K., Vinberg, S., & Pan, Y. (2002). An exploratory study of women in micro enterprise; Onner perceptions of economic policy in a rural

municipality: Gender-related difference.*Journal of Small Business and Enterprise Development,* 10(4),408-417.

Sanni, O.O. (2009). Small scale industries, problem of establishing small business enterprises in Nigeria: A case study of Allateef Nigeria limited.*Business Economics and Tourism*, 2(3), 12-14.

Schumpeter, J. (1972). The creative response to economic history. *Cambridge Journal of Economics*, 30 (3), 149-159.

Schumpeter, J. A. (1934). *The theory of economic development*. Cambridge, MA: Harvard University.

Schumpeter, J. A. (1942). *Capitalism, socialism, and democracy.* New York: Harper and Brothers.

Scott, P. (2001). Path dependence and Britain's Coal wagon problem. *Explorations in Economic History*,38, 366-385.

Shao, L., & Liu, Z.(2015). The influence of gender and other characteristics on rural labourers employment patterns in the mountainous and upland areas of Sichuan, China.*Journal of mountain science*, 12(3), 769-782.

Shefer, D., & Frenkel, A. (2005). R&D, firm size and innovation: An empirical analysis. *Technovation*, 25(1),25-32.

Shehu, A. M., Aminu, I. M., Mat, N. K. N., Nasiru, A., Johnson, P. O. M., Tsagem, M. M., & Maitama, K. (2013). The mediating effect between some determinants of SME performance in Nigeria. *Management*, 3(4), 237-242.

Silva, M. J., & Leitão, J. (2007). Determinant factors of innovation capability of Portuguese services firms: A logit model. Proceedings XVII, International RESER Conference on Service competitiveness and cohesion at Tampere, Finland.

Silva, M.J., & Leitao, J. (2009). Cooperation in innovation practices among firms in Portugal: Do external partners stimulate innovative advances? *International Journal of Entrepreneurship and Small Business*, 7(4), 391-40.

Singleton, R.A., & Straits B.C. (1993). *Approaches to social research.* Oxford: Oxford University press.

SMEDAN, (2012).*National policy on micro, small and medium enterprises survey report.* Abuja: Small and Medium Enterprises Development Agency of Nigeria, Abuja.

Smith, N., Smith, V.,& Verner, M. (2005). Do women in top management affect firm performance? A panel study of 2500 Danish firms. *Journal of productivity and performance management*,55(7), 52-67.

Storey, J. D. (2003). A direct approach to false discovery rates.*Journal of the Royal Statistical Society*, 64, 479–498.

Stuart, W.D. (2000). Influence of sources of communication, user characteristics and innovation characteristics on adoption of a communication technology. A Ph. D thesis at the University of Kansas.

Subramanian, A., & Nilakanta, S. (1996). Organisational innovativeness: Exploring the relationship between organisational determinants of innovation, types of innovation, and measures of organisational performance. *Omega*, 24 (6), 631-647.

Teece, D.J. (1988). Capturing value from technological innovation: Integration, strategic partnering, and licensing decision. *Interfaces Journal*, 18 (3), 46-61.

Thaimuta, J. M., & Moronge, M. (2014). Factors affecting the performance of Matatu Paratransit venture in small and medium enterprises in Nairobi County. *International Journal of Current Business and Social Sciences*, 1(2), 1-17.

Tiwari, R., Buse, S.,& Herstatt, C. (2007) Mobile banking as business strategy in Turkey. *Journal of Management of Engineering and Technology*, 37(4),1935-1946.

Tushman, M., & Anderson, A. (1987). Technical discontinuities and organizational environment. *Strategic Management Journal*, 7(12), 110-118.

Uddin, M. R., & Bose, T. K. (2013). Factors affecting the success of SME in Bangladesh: Evidence from Khulna City. *Journal of Management and Sustainability*, *3*(3), 166-172.

Ugheoke, S. O., Isa, M. F. M., & Noor, W. S. (2014). Assessing the impact of strategic human resource management on tangible performance: Evidence from Nigerian SMEs. *International Review of Management and Business Research*, *3*(2), 16-26.

Vijayakumar, A. & Tamizhselvan, P. (2010), Corporate size and profitability: An empirical analysis. *Sadhana-Journal for Bloomers of Research*, 3(1), 44-53.

Waguespack, D.M., Birnir, J.K., & Schroeder,J. (2005). Technological development and political stability: Patenting in Latin America and the Caribbean. *Research Policy*, (34), 1570-1590.

Walker, R. M. (2004). Innovation and organizational performance: Evidence and a research agenda. *Academy of Management Review*, 14(4), 1-6.

Waloba, D. K., & Ngugi, B. (2013). Effect of the type of innovation on growth of small and medium enterprises in Kenya: A case study of garment enterprises in Jericho, Nairobi. *European Journal of Management Sciences and Economics*, 8(12), 49-57.

Williamson, O.E. (2000). The new institutional economics: Taking stock, looking ahead.

Journal of Economic Literature, 38, 595-613.

Wignaraja,G.(2008) FDI and innovation as a drivers of export behavior: firm level evidence

from East Asia, UNU-MERIT working paper #2008-061

Wolf, S. (2007). Encouraging innovation for productivity growth in Africa: Africa trade policy center: Work in progress No. 54. Economic commission for Africa.

Wolfers, J. (2006). Diagnosing discrimination: Stock returns and CEO gender. *Journal of theEuropean Economic Association, 4* (2-3), 531 – 541.

World Bank (2004).*Annual report: Review of small business activities*. Washington DC: The World Bank.

World Bank (2014). *Nigeria Enterprise Survey 2014*. Washington DC: The World Bank.

Wynarczyk, P.,& Thwaites, A.T. (1997) *Economic Performance, Survival and Non-survival of Innovative Small Firms, in New Technology-based Firms in the 1990s*. London: Paul Chapman Publishing Limited.

Yaffee, A.R (2002a).*Getting started with STATA for MS windows: A brief introduction. Statistics, Social science, and mapping group.* New York: New York University.

Yaffee, A.R. (2002b).*Robust regression analysis: Some popular statistical package options. Statistics, social science and mapping group*. New York: New York University.

Yamane, T. (1967). *Statistics: An introductory analysis*, 2nd Edition. New York: Harper and Row.

Yang, G., & K. E. Maskus. (2001). Intellectual property rights and licensing: An Econometric investigation. *Review of World Economics,*137, 58-79.

Zhuang, L., Williamson, D.,& Carter, M. (1999). Innovate or liquidate-are all organizations convinced? A two-phased study into the innovation process.*Management Decision,* 14(23), 62-79

Zindiye, S. (2008). An Empirical investigation into the factors affecting the performance of SMEs in the manufacturing sector of Harare. M.Sc. Commerce at University of Harare Zimbabwe.

APPENDICES

```
. use "C:\Computer 1\Local Disk
C\STATADATAFILE\Students\Nigeria_2014_Enterprise_Survey_full_data_Abdul_F
atai.dta", clear

. do "C:\Users\DELL\AppData\Local\Temp\STD00000000.tmp"
APPENDICE I.
. *Descriptive Analysis:
. *Quantitative variables: entsize b5_entpage b7_ownexper f1_entoutput
. *tabstat entsize b5_entpage b7_ownexper f1_entoutput, stats (mean min
max sd sdmean sum n)
.
. *by a6a_entpscal2, sort: tabstat entsize entsizsquared b5_entpage
b5_entpagesq b7_ownexper f1_entoutput, stats (mean min max sd sdmean sum
> n)
.
. tabstat entsize b5_entpage b7_ownexper f1_entoutput, stats (mean min
max n)

   stats |   entsize  b5_ent~e  b7_own~r  f1_ent~t
---------+--------------------------------------
    mean |  9.305556      14.5  13.02877  72.49206
     min |         0         0         1         0
     max |        72        64        54       100
       N |       504       504       504       504
------------------------------------------------

.
. *by a6a_entpscal2, sort: tabstat entsize b5_entpage b7_ownexper
f1_entoutput, stats (mean min max n)
. by a6a_entpscal2, sort: tabstat entsize b5_entpage b7_ownexper
f1_entoutput, stats (mean min max n)

-------------------------------------------------------------------------
-------------
-> a6a_entpscal2 = 1

   stats |   entsize  b5_ent~e  b7_own~r  f1_ent~t
---------+--------------------------------------
    mean |  2.597222  14.42361  13.67361  63.07639
     min |         0         1         1         0
     max |         4        49        50       100
       N |       144       144       144       144
------------------------------------------------

-------------------------------------------------------------------------
-------------------------------------------------------------------
-> a6a_entpscal2 = 2

   stats |   entsize  b5_ent~e  b7_own~r  f1_ent~t
---------+--------------------------------------
    mean |  8.944262   13.9082  12.44426  77.08197
     min |         5         0         1         0
     max |        19        64        50       100
       N |       305       305       305       305
------------------------------------------------


-> a6a_entpscal2 = 3
```

```
   stats |   entsize  b5_ent~e  b7_own~r  f1_ent~t
---------+--------------------------------------------
    mean |  28.87273  17.98182  14.58182  71.69091
     min |        20         4         1         0
     max |        72        58        54       100
       N |        55        55        55        55
-------------------------------------------------------
. *Descriptive analysis of qualitative variables for the whole sample
. tabulate a6a_entpscal2

Scale of an |
 enterprise |
2; Measured |
  as: Micro |
<5 (1); |
  Small >=5 |
   and <=19 |
   (2); Med |      Freq.     Percent        Cum.
------------+-----------------------------------
          1 |        144       28.57       28.57
          2 |        305       60.52       89.09
          3 |         55       10.91      100.00
------------+-----------------------------------
      Total |        504      100.00

.
. tabulate h1_prodinndm

 Product or |
    service |
 innovation |
 as a dummy |
   variable |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        213       42.26       42.26
          1 |        291       57.74      100.00
------------+-----------------------------------
      Total |        504      100.00

. tabulate h3_procindm1

    Process |
 innovation |
    1 as a |
     dummy |
   variable |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        196       38.89       38.89
          1 |        308       61.11      100.00
------------+-----------------------------------
      Total |        504      100.00


. tabulate h4a_mktindm1

  Marketing |
 innovation |
    1 as a |
     dummy |
   variable |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        216       42.86       42.86
```

```
          1 |        288       57.14      100.00
------------+-----------------------------------
      Total |        504      100.00

. tabulate h5_orgindum

Organisatio |
        nal |
 innovation |
 as a dummy |
   variable |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        276       54.76       54.76
          1 |        228       45.24      100.00
------------+-----------------------------------
      Total |        504      100.00

. tabulate b2b_foreinowndm

         An |
 enterprise |
         is |
foreign-own |
   ed if it |
    reports |
     that a |
    foreign |
    company |
    owns at |
       leas |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        498       98.81       98.81
          1 |          6        1.19      100.00
------------+-----------------------------------
      Total |        504      100.00

. tabulate ngb7_ownskildm

        Top |
managerskil |
l(education |
level) as a |
      dummy |
  variable. |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        363       72.02       72.02
          1 |        141       27.98      100.00
------------+-----------------------------------
      Total |        504      100.00

. tabulate R_and_Ddum

  If in the |
 last three |
  years, an |
 enterprise |
  did spend |
  on formal |
   research |
  and devel |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        419       83.13       83.13
```

```
          1 |         85       16.87      100.00
------------+-----------------------------------
      Total |        504      100.00

. tabulate d8_Expotdm

     Export |
  intensity |
 as a dummy |
   variable |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        377       74.80       74.80
          1 |        127       25.20      100.00
------------+-----------------------------------
      Total |        504      100.00

. tabulate l10_empskildm

  Employee' |
         s |
skills/form |
al training |
 as a dymmy |
   variable |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        363       72.02       72.02
          1 |        141       27.98      100.00
------------+-----------------------------------
      Total |        504      100.00

. tabulate k8_finaccessdm

 Accesss to |
 finance as |
    a dummy |
   variable |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        451       89.48       89.48
          1 |         53       10.52      100.00
------------+-----------------------------------
      Total |        504      100.00

. tabulate ngd9_exptsubsdm

 Government |
policy/subs |
     idy as |
      dummy |
   variable |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        500       99.21       99.21
          1 |          4        0.79      100.00
------------+-----------------------------------
      Total |        504      100.00

. tabulate a15a3_owngendum

  Gender of |
  the owner |
     of an |
 enterprise |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        446       88.49       88.49
```

```
          1 |         58       11.51      100.00
------------+-----------------------------------
      Total |        504      100.00

. tabulate ngf3_incroutpdd

Enterprises |
          ' |
performance |
          . |      Freq.     Percent        Cum.
------------+-----------------------------------
         -9 |          4        0.79        0.79
          1 |        405       80.36       81.15
          2 |         95       18.85      100.00
------------+-----------------------------------
      Total |        504      100.00
. *Descriptive analysis of qualitative variables by scale of an
enterprise:
. by a6a_entpscal2, sort: tabulate h1_prodinndm

------------------------------------------------------------------------------
------------------------------------------------------------------------
-> a6a_entpscal2 = 1

 Product or |
    service |
 innovation |
 as a dummy |
   variable |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |         69       47.92       47.92
          1 |         75       52.08      100.00
------------+-----------------------------------
      Total |        144      100.00

------------------------------------------------------------------------------
------------------------------------------------------------------------
-> a6a_entpscal2 = 2

 Product or |
    service |
 innovation |
 as a dummy |
   variable |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        122       40.00       40.00
          1 |        183       60.00      100.00
------------+-----------------------------------
      Total |        305      100.00

------------------------------------------------------------------------------
------------------------------------------------------------------------
-> a6a_entpscal2 = 3

 Product or |
    service |
 innovation |
 as a dummy |
   variable |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |         22       40.00       40.00
          1 |         33       60.00      100.00
------------+-----------------------------------
```

```
      Total |         55      100.00

. by a6a_entpscal2, sort: tabulate h3_procindm1

-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
-> a6a_entpscal2 = 1

    Process |
 innovation |
    1 as a |
     dummy |
   variable |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |         58       40.28       40.28
          1 |         86       59.72      100.00
------------+-----------------------------------
      Total |        144      100.00

-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
-> a6a_entpscal2 = 2

    Process |
 innovation |
    1 as a |
     dummy |
   variable |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        119       39.02       39.02
          1 |        186       60.98      100.00
------------+-----------------------------------
      Total |        305      100.00

-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
-> a6a_entpscal2 = 3

    Process |
 innovation |
    1 as a |
     dummy |
   variable |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |         19       34.55       34.55
          1 |         36       65.45      100.00
------------+-----------------------------------
      Total |         55      100.00


. by a6a_entpscal2, sort: tabulate h4a_mktindm1

-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
-> a6a_entpscal2 = 1

  Marketing |
 innovation |
    1 as a |
     dummy |
   variable |      Freq.     Percent        Cum.
------------+-----------------------------------
```

```
          0 |         67       46.53       46.53
          1 |         77       53.47      100.00
------------+-----------------------------------
      Total |        144      100.00

-------------------------------------------------------------------------------
-------------------------------------------------------------------------
-> a6a_entpscal2 = 2

  Marketing |
 innovation |
    1 as a |
     dummy |
   variable |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        127       41.64       41.64
          1 |        178       58.36      100.00
------------+-----------------------------------
      Total |        305      100.00

-------------------------------------------------------------------------------
-------------------------------------------------------------------------
-> a6a_entpscal2 = 3

  Marketing |
 innovation |
    1 as a |
     dummy |
   variable |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |         22       40.00       40.00
          1 |         33       60.00      100.00
------------+-----------------------------------
      Total |         55      100.00


. by a6a_entpscal2, sort: tabulate h5_orgindum

-------------------------------------------------------------------------------
-------------------------------------------------------------------------
-> a6a_entpscal2 = 1

Organisatio |
        nal |
 innovation |
 as a dummy |
   variable |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |         77       53.47       53.47
          1 |         67       46.53      100.00
------------+-----------------------------------
      Total |        144      100.00

-------------------------------------------------------------------------------
-------------------------------------------------------------------------
-> a6a_entpscal2 = 2

Organisatio |
        nal |
 innovation |
 as a dummy |
   variable |      Freq.     Percent        Cum.
```

```
------------+-----------------------------------
          0 |        173       56.72       56.72
          1 |        132       43.28      100.00
------------+-----------------------------------
      Total |        305      100.00

-------------------------------------------------------------------------------
-------------------------------------------------------------------
-> a6a_entpscal2 = 3

Organisatio |
        nal |
 innovation |
 as a dummy |
   variable |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |         26       47.27       47.27
          1 |         29       52.73      100.00
------------+-----------------------------------
      Total |         55      100.00


. by a6a_entpscal2, sort: tabulate b2b_foreinowndm

-------------------------------------------------------------------------------
-------------------------------------------------------------------
-> a6a_entpscal2 = 1

         An |
 enterprise |
         is |
foreign-own |
   ed if it |
    reports |
     that a |
    foreign |
    company |
    owns at |
       leas |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        142       98.61       98.61
          1 |          2        1.39      100.00
------------+-----------------------------------
      Total |        144      100.00

-------------------------------------------------------------------------------
-------------------------------------------------------------------
-> a6a_entpscal2 = 2

         An |
 enterprise |
         is |
foreign-own |
   ed if it |
    reports |
     that a |
    foreign |
    company |
    owns at |
       leas |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        301       98.69       98.69
          1 |          4        1.31      100.00
```

```
------------+-----------------------------------
      Total |        305      100.00

-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
-> a6a_entpscal2 = 3

         An |
 enterprise |
         is |
foreign-own |
   ed if it |
    reports |
     that a |
    foreign |
    company |
    owns at |
       leas |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |         55      100.00      100.00
------------+-----------------------------------
      Total |         55      100.00


. by a6a_entpscal2, sort: tabulate ngb7_ownskildm

-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
-> a6a_entpscal2 = 1

        Top |
managerskil |
l(education |
level) as a |
      dummy |
  variable. |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        111       77.08       77.08
          1 |         33       22.92      100.00
------------+-----------------------------------
      Total |        144      100.00

-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
-> a6a_entpscal2 = 2

        Top |
managerskil |
l(education |
level) as a |
      dummy |
  variable. |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        224       73.44       73.44
          1 |         81       26.56      100.00
------------+-----------------------------------
      Total |        305      100.00

-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
-> a6a_entpscal2 = 3

        Top |
```

```
managerskil |
l(education |
level) as a |
      dummy |
  variable. |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |         28       50.91       50.91
          1 |         27       49.09      100.00
------------+-----------------------------------
      Total |         55      100.00


. by a6a_entpscal2, sort: tabulate R_and_Ddum

------------------------------------------------------------------------------
------------------------------------------------------------------------------
-> a6a_entpscal2 = 1

  If in the |
 last three |
  years, an |
 enterprise |
  did spend |
  on formal |
   research |
  and devel |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        120       83.33       83.33
          1 |         24       16.67      100.00
------------+-----------------------------------
      Total |        144      100.00

------------------------------------------------------------------------------
------------------------------------------------------------------------------
-> a6a_entpscal2 = 2

  If in the |
 last three |
  years, an |
 enterprise |
  did spend |
  on formal |
   research |
  and devel |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        253       82.95       82.95
          1 |         52       17.05      100.00
------------+-----------------------------------
      Total |        305      100.00

------------------------------------------------------------------------------
------------------------------------------------------------------------------
-> a6a_entpscal2 = 3

  If in the |
 last three |
  years, an |
 enterprise |
  did spend |
  on formal |
   research |
  and devel |      Freq.     Percent        Cum.
------------+-----------------------------------
```

```
          0 |         46       83.64       83.64
          1 |          9       16.36      100.00
------------+-----------------------------------
      Total |         55      100.00


. by a6a_entpscal2, sort: tabulate d8_Expotdm

------------------------------------------------------------------------------
------------------------------------------------------------------------
-> a6a_entpscal2 = 1

    Export |
  intensity |
 as a dummy |
   variable |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |         93       64.58       64.58
          1 |         51       35.42      100.00
------------+-----------------------------------
      Total |        144      100.00

------------------------------------------------------------------------------
------------------------------------------------------------------------
-> a6a_entpscal2 = 2

    Export |
  intensity |
 as a dummy |
   variable |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        240       78.69       78.69
          1 |         65       21.31      100.00
------------+-----------------------------------
      Total |        305      100.00

------------------------------------------------------------------------------
------------------------------------------------------------------------
-> a6a_entpscal2 = 3

    Export |
  intensity |
 as a dummy |
   variable |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |         44       80.00       80.00
          1 |         11       20.00      100.00
------------+-----------------------------------
      Total |         55      100.00


. by a6a_entpscal2, sort: tabulate l10_empskildm

------------------------------------------------------------------------------
------------------------------------------------------------------------
-> a6a_entpscal2 = 1

  Employee' |
         s |
skills/form |
al training |
 as a dymmy |
   variable |      Freq.     Percent        Cum.
```

```
------------+-----------------------------------
          0 |         99       68.75       68.75
          1 |         45       31.25      100.00
------------+-----------------------------------
      Total |        144      100.00

-------------------------------------------------------------------------------
-------------------------------------------------------------------
-> a6a_entpscal2 = 2

  Employee' |
         s |
skills/form |
al training |
 as a dymmy |
   variable |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        226       74.10       74.10
          1 |         79       25.90      100.00
------------+-----------------------------------
      Total |        305      100.00

-------------------------------------------------------------------------------
-------------------------------------------------------------------
-> a6a_entpscal2 = 3

  Employee' |
         s |
skills/form |
al training |
 as a dymmy |
   variable |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |         38       69.09       69.09
          1 |         17       30.91      100.00
------------+-----------------------------------
      Total |         55      100.00


. by a6a_entpscal2, sort: tabulate k8_finaccessdm

-------------------------------------------------------------------------------
-------------------------------------------------------------------
-> a6a_entpscal2 = 1

 Accesss to |
 finance as |
    a dummy |
   variable |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        128       88.89       88.89
          1 |         16       11.11      100.00
------------+-----------------------------------
      Total |        144      100.00

-------------------------------------------------------------------------------
-------------------------------------------------------------------
-> a6a_entpscal2 = 2

 Accesss to |
 finance as |
    a dummy |
   variable |      Freq.     Percent        Cum.
```

```
------------+-----------------------------------
          0 |        273       89.51       89.51
          1 |         32       10.49      100.00
------------+-----------------------------------
      Total |        305      100.00

-------------------------------------------------------------------------------
-------------------------------------------------------------------
-> a6a_entpscal2 = 3

 Accesss to |
 finance as |
    a dummy |
   variable |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |         50       90.91       90.91
          1 |          5        9.09      100.00
------------+-----------------------------------
      Total |         55      100.00


. by a6a_entpscal2, sort: tabulate ngd9_exptsubsdm

-------------------------------------------------------------------------------
-------------------------------------------------------------------
-> a6a_entpscal2 = 1

 Government |
policy/subs |
     idy as |
      dummy |
   variable |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        143       99.31       99.31
          1 |          1        0.69      100.00
------------+-----------------------------------
      Total |        144      100.00

-------------------------------------------------------------------------------
-------------------------------------------------------------------
-> a6a_entpscal2 = 2

 Government |
policy/subs |
     idy as |
      dummy |
   variable |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        303       99.34       99.34
          1 |          2        0.66      100.00
------------+-----------------------------------
      Total |        305      100.00

-------------------------------------------------------------------------------
-------------------------------------------------------------------
-> a6a_entpscal2 = 3

 Government |
policy/subs |
     idy as |
      dummy |
   variable |      Freq.     Percent        Cum.
------------+-----------------------------------
```

```
          0 |         54       98.18       98.18
          1 |          1        1.82      100.00
------------+-----------------------------------
      Total |         55      100.00


. by a6a_entpscal2, sort: tabulate a15a3_owngendum

------------------------------------------------------------------------------
------------------------------------------------------------------------
-> a6a_entpscal2 = 1

  Gender of |
  the owner |
      of an |
 enterprise |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        124       86.11       86.11
          1 |         20       13.89      100.00
------------+-----------------------------------
      Total |        144      100.00

------------------------------------------------------------------------------
------------------------------------------------------------------------
-> a6a_entpscal2 = 2

  Gender of |
  the owner |
      of an |
 enterprise |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        276       90.49       90.49
          1 |         29        9.51      100.00
------------+-----------------------------------
      Total |        305      100.00

------------------------------------------------------------------------------
------------------------------------------------------------------------
-> a6a_entpscal2 = 3

  Gender of |
  the owner |
      of an |
 enterprise |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |         46       83.64       83.64
          1 |          9       16.36      100.00
------------+-----------------------------------
      Total |         55      100.00


. by a6a_entpscal2, sort: tabulate ngf3_incroutpdd

------------------------------------------------------------------------------
------------------------------------------------------------------------
-> a6a_entpscal2 = 1

Enterprises |
          ' |
performance |
          . |      Freq.     Percent        Cum.
------------+-----------------------------------
          1 |        114       79.17       79.17
```

```
          2 |         30       20.83      100.00
------------+-----------------------------------
      Total |        144      100.00

-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
-> a6a_entpscal2 = 2

Enterprises |
          ' |
performance |
          . |      Freq.     Percent        Cum.
------------+-----------------------------------
         -9 |          3        0.98        0.98
          1 |        245       80.33       81.31
          2 |         57       18.69      100.00
------------+-----------------------------------
      Total |        305      100.00

-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
-> a6a_entpscal2 = 3

Enterprises |
          ' |
performance |
          . |      Freq.     Percent        Cum.
------------+-----------------------------------
         -9 |          1        1.82        1.82
          1 |         46       83.64       85.45
          2 |          8       14.55      100.00
------------+-----------------------------------
      Total |         55      100.00


.APPENDICE II
Pre-estimation Test Results for Innovation Models and Performance Models.
. *Inferential Analyses:
. *Product Innovation:
. *Heteroskedasticity test
.
. * Glejser Lagrange Multiplier Heteroscedasticity Test (for all models)
for innovation models lmhgl
. lmhgl h1_prodinndm entsize entsizsquared b5_entpage b5_entpagesq
b2b_foreinowndm ngb7_ownskildm b7_ownexper R_and_Ddum d8_Expotdm
l10_empsk
> ildm

      Source |       SS           df       MS      Number of obs   =
504
-------------+----------------------------------   F(10, 493)      =
3.03
       Model |  7.13127145        10  .713127145   Prob > F        =
0.0010
    Residual |  115.850871       493  .234991626   R-squared       =
0.0580
-------------+----------------------------------   Adj R-squared   =
0.0389
       Total |  122.982143       503  .244497302   Root MSE        =
.48476

-------------------------------------------------------------------------------
--------
```

```
   h1_prodinndm |      Coef.   Std. Err.      t    P>|t|     [95% Conf.
Interval]
---------------+----------------------------------------------------------
--------
        entsize |   .0088004   .0058327     1.51   0.132    -.0026596
.0202604
  entsizsquared |  -.0001072   .0001242    -0.86   0.388    -.0003513
.0001369
     b5_entpage |  -.0018881   .0063754    -0.30   0.767    -.0144143
.0106382
   b5_entpagesq |   .0000533   .0001276     0.42   0.676    -.0001974
.000304
b2b_foreinowndm |    .278476   .2029969     1.37   0.171    -.1203699
.6773218
 ngb7_ownskildm |  -.0346684   .0506767    -0.68   0.494    -.1342374
.0649006
    b7_ownexper |  -.0001013   .0029654    -0.03   0.973    -.0059277
.005725
     R_and_Ddum |   .1930122   .0612071     3.15   0.002     .0727533
.3132711
     d8_Expotdm |   .0704568   .0523488     1.35   0.179    -.0323976
.1733111
  l10_empskildm |   .1127012   .0506253     2.23   0.026     .0132332
.2121692
          _cons |      .4501   .0707851     6.36   0.000     .3110223
.5891778
------------------------------------------------------------------------------
--------
==============================================================================
=====
* OLS Glejser Lagrange Multiplier Heteroscedasticity Test
==============================================================================
=====
 Ho: No Heteroscedasticity - Ha: Heteroscedasticity

    Glejser LM Test           =   25.90768
    Degrees of Freedom        =       10.0
    P-Value > Chi2(10)        =    0.00387

.
. *There is heteroscedasticity problem, we then run robust regression for
cross-sectional dataset and gls for panel dataset:
.
. logistic h1_prodinndm entsize entsizsquared b5_entpage b5_entpagesq
b2b_foreinowndm ngb7_ownskildm b7_ownexper R_and_Ddum d8_Expotdm l10_em
> pskildm, vce(robust)

Logistic regression                               Number of obs     =
504
                                                  Wald chi2(10)     =
28.97
                                                  Prob > chi2       =
0.0013
Log pseudolikelihood = -327.74687                 Pseudo R2         =
0.0453

------------------------------------------------------------------------------
--------
                |               Robust
   h1_prodinndm | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
----------------+-------------------------------------------------------------
--------
```

```
        entsize |    1.03908   .0262946     1.51   0.130     .9888011
1.091916
  entsizsquared |   .9995272   .0005143    -0.92   0.358     .9985197
1.000536
     b5_entpage |   .9897532   .0271013    -0.38   0.707     .9380359
1.044322
   b5_entpagesq |   1.000281   .0005241     0.54   0.591     .9992548
1.001309
b2b_foreinowndm |   4.154738   4.898284     1.21   0.227     .4121054
41.88698
 ngb7_ownskildm |   .8642782   .1903302    -0.66   0.508     .5613104
1.330773
    b7_ownexper |   1.000151   .0126385     0.01   0.990     .9756838
1.025231
     R_and_Ddum |   2.491003   .7363593     3.09   0.002     1.395573
4.44627
     d8_Expotdm |   1.365765    .315598     1.35   0.177     .8683245
2.148175
  l10_empskildm |   1.628607   .3709425     2.14   0.032     1.042176
2.545023
          _cons |   .8044856   .2419963    -0.72   0.470     .4461382
1.450665
------------------------------------------------------------------------------
--------

. * Geary Non Normality LM Runs Test
. lmngr h1_prodinndm entsize entsizsquared b5_entpage b5_entpagesq
b2b_foreinowndm ngb7_ownskildm b7_ownexper R_and_Ddum d8_Expotdm
l10_empsk
> ildm

      Source |       SS           df       MS      Number of obs   =
504
-------------+----------------------------------   F(10, 493)      =
3.03
       Model |  7.13127145        10  .713127145   Prob > F        =
0.0010
    Residual |  115.850871       493  .234991626   R-squared       =
0.0580
-------------+----------------------------------   Adj R-squared   =
0.0389
       Total |  122.982143       503  .244497302   Root MSE        =
.48476

------------------------------------------------------------------------------
--------
   h1_prodinndm |      Coef.   Std. Err.      t    P>|t|     [95% Conf.
Interval]
----------------+-------------------------------------------------------------
--------
        entsize |   .0088004   .0058327     1.51   0.132    -.0026596
.0202604
  entsizsquared |  -.0001072   .0001242    -0.86   0.388    -.0003513
.0001369
     b5_entpage |  -.0018881   .0063754    -0.30   0.767    -.0144143
.0106382
   b5_entpagesq |   .0000533   .0001276     0.42   0.676    -.0001974
.000304
b2b_foreinowndm |    .278476   .2029969     1.37   0.171    -.1203699
.6773218
 ngb7_ownskildm |  -.0346684   .0506767    -0.68   0.494    -.1342374
.0649006
```

```
    b7_ownexper |  -.0001013   .0029654    -0.03   0.973    -.0059277
.005725
     R_and_Ddum |   .1930122   .0612071     3.15   0.002     .0727533
.3132711
     d8_Expotdm |   .0704568   .0523488     1.35   0.179    -.0323976
.1733111
  l10_empskildm |   .1127012   .0506253     2.23   0.026     .0132332
.2121692
          _cons |      .4501   .0707851     6.36   0.000     .3110223
.5891778
------------------------------------------------------------------------------
--------
=====================================
* Geary Non Normality LM Runs Test   *
=====================================
    Ho: Normality in Error Distribution
    Ha: Non Normality in Error Distribution

    LM Test      =  -0.2984
    DF Chi2      =        2
    Prob. > Chi2 =   0.8614

. *Residuals are normally distributed
.
. *Multicollinearity test
. collin h1_prodinndm entsize entsizsquared b5_entpage b5_entpagesq
b2b_foreinowndm ngb7_ownskildm b7_ownexper R_and_Ddum d8_Expotdm l10_emps
> kildm
(obs=504)

  Collinearity Diagnostics

                       SQRT                   R-
  Variable      VIF     VIF    Tolerance    Squared
----------------------------------------------------
h1_prodinndm      1.06    1.03    0.9420      0.0580
   entsize      5.79    2.41    0.1726      0.8274
entsizsquared      5.59    2.36    0.1790      0.8210
b5_entpage      8.49    2.91    0.1178      0.8822
b5_entpagesq      7.46    2.73    0.1340      0.8660
b2b_foreinowndm      1.04    1.02    0.9582      0.0418
ngb7_ownskildm      1.11    1.05    0.9002      0.0998
b7_ownexper      1.67    1.29    0.6004      0.3996
R_and_Ddum      1.15    1.07    0.8701      0.1299
d8_Expotdm      1.11    1.05    0.8994      0.1006
l10_empskildm      1.12    1.06    0.8939      0.1061
----------------------------------------------------
  Mean VIF      3.24

                        Cond
        Eigenval        Index
---------------------------------
    1     5.8374          1.0000
    2     1.2632          2.1497
    3     1.0320          2.3783
    4     0.9743          2.4477
    5     0.6884          2.9120
    6     0.6400          3.0201
    7     0.5611          3.2254
    8     0.5050          3.4000
    9     0.2819          4.5507
    10     0.1427          6.3953
    11     0.0503         10.7780
```

```
    12     0.0238         15.6704
--------------------------------
 Condition Number        15.6704
 Eigenvalues & Cond Index computed from scaled raw sscp (w/ intercept)
 Det(correlation matrix)    0.0107

.
. *Asbence of multicollinearity problems
.
. *Process Innovation 1:
.
. *Heteroskedasticity test
.
. * Glejser Lagrange Multiplier Heteroscedasticity Test (for all models)
lmhgl
. lmhgl h3_procindm1 entsize entsizsquared b5_entpage b5_entpagesq
b2b_foreinowndm ngb7_ownskildm b7_ownexper R_and_Ddum d8_Expotdm
l10_empsk
> ildm

      Source |       SS           df       MS      Number of obs   =
504
-------------+----------------------------------   F(10, 493)      =
2.32
       Model |  5.37713266        10  .537713266   Prob > F        =
0.0114
    Residual |  114.400645       493   .23204999   R-squared       =
0.0449
-------------+----------------------------------   Adj R-squared   =
0.0255
       Total |  119.777778       503  .238126795   Root MSE        =
.48172

------------------------------------------------------------------------------
--------
   h3_procindm1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf.
Interval]
----------------+-------------------------------------------------------------
--------
        entsize |   .0081438   .0057961     1.41   0.161    -.0032443
.0195318
  entsizsquared |  -.0001024   .0001234    -0.83   0.407    -.0003449
.0001402
     b5_entpage |  -.0019967   .0063353    -0.32   0.753    -.0144443
.0104509
   b5_entpagesq |   .0000106   .0001268     0.08   0.933    -.0002385
.0002597
b2b_foreinowndm |  -.0814663   .2017224    -0.40   0.686     -.477808
.3148753
 ngb7_ownskildm |   .0008489   .0503585     0.02   0.987    -.0980949
.0997928
    b7_ownexper |    .002794   .0029468     0.95   0.344    -.0029958
.0085838
     R_and_Ddum |    .170691   .0608228     2.81   0.005     .0511872
.2901948
     d8_Expotdm |   .0283392   .0520202     0.54   0.586    -.0738693
.1305477
  l10_empskildm |   .1046559   .0503075     2.08   0.038     .0058125
.2034994
          _cons |    .477095   .0703407     6.78   0.000     .3388904
.6152995
------------------------------------------------------------------------------
--------
```

```
================================================================================
=====
* OLS Glejser Lagrange Multiplier Heteroscedasticity Test
================================================================================
=====
 Ho: No Heteroscedasticity - Ha: Heteroscedasticity

    Glejser LM Test           =   26.09015
    Degrees of Freedom        =       10.0
    P-Value > Chi2(10)        =    0.00362

. *There is heteroscedasticity problem, we then run robust regression for
cross-sectional dataset and gls for panel dataset:
.
. logistic h3_procindm1 entsize entsizsquared b5_entpage b5_entpagesq
b2b_foreinowndm ngb7_ownskildm b7_ownexper R_and_Ddum d8_Expotdm l10_em
> pskildm, vce(robust)

Logistic regression                               Number of obs     =
504
                                                  Wald chi2(10)     =
22.06
                                                  Prob > chi2       =
0.0148
Log pseudolikelihood =  -324.7739                 Pseudo R2         =
0.0357

------------------------------------------------------------------------------
--------
                |               Robust
   h3_procindm1 | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
----------------+-------------------------------------------------------------
--------
        entsize |   1.036727   .0261963     1.43   0.153     .9866336
1.089363
  entsizsquared |   .9995411   .0005181    -0.89   0.376     .9985261
1.000557
     b5_entpage |   .9906856   .0295542    -0.31   0.754     .9344214
1.050338
   b5_entpagesq |   1.000068   .0006304     0.11   0.914     .9988334
1.001304
b2b_foreinowndm |   .7043202   .5566882    -0.44   0.657     .1496195
3.315523
 ngb7_ownskildm |   1.004971   .2225742     0.02   0.982     .6510814
1.551215
    b7_ownexper |   1.012878   .0131114     0.99   0.323     .9875029
1.038904
     R_and_Ddum |   2.309533   .6899349     2.80   0.005     1.286003
4.147693
     d8_Expotdm |   1.126716   .2602782     0.52   0.606     .7164429
1.771932
  l10_empskildm |   1.603429   .3661241     2.07   0.039     1.024915
2.508485
          _cons |   .8799305   .2703254    -0.42   0.677      .481891
1.606749
------------------------------------------------------------------------------
--------

.
.
. * Geary Non Normality LM Runs Test
```

```
. lmngr h3_procindm1 entsize entsizsquared b5_entpage b5_entpagesq
b2b_foreinowndm ngb7_ownskildm b7_ownexper R_and_Ddum d8_Expotdm
l10_empsk
> ildm

      Source |       SS           df       MS      Number of obs   =
504
-------------+----------------------------------   F(10, 493)      =
2.32
       Model |  5.37713266        10  .537713266   Prob > F        =
0.0114
    Residual |  114.400645       493   .23204999   R-squared       =
0.0449
-------------+----------------------------------   Adj R-squared   =
0.0255
       Total |  119.777778       503  .238126795   Root MSE        =
.48172

------------------------------------------------------------------------------
--------
   h3_procindm1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf.
Interval]
----------------+-------------------------------------------------------------
--------
        entsize |   .0081438   .0057961     1.41   0.161    -.0032443
.0195318
  entsizsquared |  -.0001024   .0001234    -0.83   0.407    -.0003449
.0001402
     b5_entpage |  -.0019967   .0063353    -0.32   0.753    -.0144443
.0104509
   b5_entpagesq |   .0000106   .0001268     0.08   0.933    -.0002385
.0002597
b2b_foreinowndm |  -.0814663   .2017224    -0.40   0.686     -.477808
.3148753
 ngb7_ownskildm |   .0008489   .0503585     0.02   0.987    -.0980949
.0997928
    b7_ownexper |    .002794   .0029468     0.95   0.344    -.0029958
.0085838
     R_and_Ddum |    .170691   .0608228     2.81   0.005     .0511872
.2901948
     d8_Expotdm |   .0283392   .0520202     0.54   0.586    -.0738693
.1305477
  l10_empskildm |   .1046559   .0503075     2.08   0.038     .0058125
.2034994
          _cons |    .477095   .0703407     6.78   0.000     .3388904
.6152995
------------------------------------------------------------------------------
--------
======================================
* Geary Non Normality LM Runs Test   *
======================================
    Ho: Normality in Error Distribution
    Ha: Non Normality in Error Distribution

    LM Test      =   0.4170
    DF Chi2      =        2
    Prob. > Chi2 =   0.8118

. *Residuals are normally distributed
.
. *Multicollinearity test
. collin h3_procindm1 entsize entsizsquared b5_entpage b5_entpagesq
b2b_foreinowndm ngb7_ownskildm b7_ownexper R_and_Ddum d8_Expotdm l10_emps
```

```
> kildm
(obs=504)

  Collinearity Diagnostics

                       SQRT                   R-
  Variable      VIF     VIF    Tolerance    Squared
----------------------------------------------------
h3_procindm1      1.05    1.02    0.9551      0.0449
   entsize      5.79    2.41    0.1727      0.8273
entsizsquared      5.59    2.36    0.1790      0.8210
b5_entpage      8.49    2.91    0.1178      0.8822
b5_entpagesq      7.46    2.73    0.1340      0.8660
b2b_foreinowndm      1.04    1.02    0.9616      0.0384
ngb7_ownskildm      1.11    1.05    0.9010      0.0990
b7_ownexper      1.67    1.29    0.5993      0.4007
R_and_Ddum      1.14    1.07    0.8737      0.1263
d8_Expotdm      1.11    1.05    0.9021      0.0979
l10_empskildm      1.12    1.06    0.8950      0.1050
----------------------------------------------------
  Mean VIF      3.23

                        Cond
        Eigenval        Index
---------------------------------
    1     5.8560          1.0000
    2     1.2596          2.1561
    3     1.0348          2.3788
    4     0.9699          2.4572
    5     0.6883          2.9167
    6     0.6468          3.0088
    7     0.5626          3.2263
    8     0.5072          3.3978
    9     0.2566          4.7767
    10     0.1440          6.3775
    11     0.0502         10.7963
    12     0.0238         15.6984
---------------------------------
 Condition Number        15.6984
 Eigenvalues & Cond Index computed from scaled raw sscp (w/ intercept)
 Det(correlation matrix)    0.0109

.
. *Asbence of multicollinearity problems
.
. *Marketing Innovation 1:
.
. *Heteroskedasticity test
.
. * Glejser Lagrange Multiplier Heteroscedasticity Test (for all models)
lmhgl
. lmhgl h4a_mktindm1 entsize entsizsquared b5_entpage b5_entpagesq
b2b_foreinowndm ngb7_ownskildm b7_ownexper R_and_Ddum d8_Expotdm
l10_empsk
> ildm

      Source |       SS           df       MS      Number of obs   =
504
-------------+----------------------------------   F(10, 493)      =
3.71
       Model |   8.6299239        10   .86299239   Prob > F        =
0.0001
```

```
    Residual |  114.798648       493  .232857297   R-squared       =
0.0699
-------------+----------------------------------   Adj R-squared   =
0.0511
       Total |  123.428571       503  .245384834   Root MSE        =
.48255

------------------------------------------------------------------------------
--------
   h4a_mktindm1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf.
Interval]
----------------+-------------------------------------------------------------
--------
        entsize |    .007336   .0058061     1.26   0.207    -.0040718
.0187438
  entsizsquared |  -.0000734   .0001237    -0.59   0.553    -.0003163
.0001696
     b5_entpage |  -.0018417   .0063464    -0.29   0.772     -.014311
.0106275
   b5_entpagesq |  -.0000947    .000127    -0.75   0.456    -.0003443
.0001548
b2b_foreinowndm |   .2576533    .202073     1.28   0.203    -.1393772
.6546837
 ngb7_ownskildm |   .0955689   .0504461     1.89   0.059    -.0035469
.1946847
    b7_ownexper |   .0024204   .0029519     0.82   0.413    -.0033795
.0082202
     R_and_Ddum |   .1493618   .0609285     2.45   0.015     .0296503
.2690732
     d8_Expotdm |   .1217574   .0521106     2.34   0.020     .0193712
.2241436
  l10_empskildm |   .1081133   .0503949     2.15   0.032     .0090981
.2071285
          _cons |   .4237092    .070463     6.01   0.000     .2852645
.5621539
------------------------------------------------------------------------------
--------
==============================================================================
=====
* OLS Glejser Lagrange Multiplier Heteroscedasticity Test
==============================================================================
=====
 Ho: No Heteroscedasticity - Ha: Heteroscedasticity

    Glejser LM Test           =   25.69401
    Degrees of Freedom        =       10.0
    P-Value > Chi2(10)        =    0.00417

.
. *There is heteroscedasticity problem, we then run robust regression for
cross-sectional dataset and gls for panel dataset:
.
. logistic h4a_mktindm1 entsize entsizsquared b5_entpage b5_entpagesq
b2b_foreinowndm ngb7_ownskildm b7_ownexper R_and_Ddum d8_Expotdm l10_em
> pskildm, vce(robust)

Logistic regression                               Number of obs     =
504
                                                  Wald chi2(10)     =
35.55
                                                  Prob > chi2       =
0.0001
```

```
Log pseudolikelihood = -325.46592                Pseudo R2         =
0.0544

------------------------------------------------------------------------------
             |               Robust
  h4a_mktindm1 | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
-------------+----------------------------------------------------------------
       entsize |   1.033006   .0258802     1.30   0.195     .9835067
1.084996
 entsizsquared |   .9996762   .0005091    -0.64   0.525     .9986788
1.000675
    b5_entpage |   .9929194   .0299646    -0.24   0.814     .9358929
1.053421
  b5_entpagesq |   .9995596   .0006812    -0.65   0.518     .9982254
1.000896
b2b_foreinowndm |   4.260824   4.564288     1.35   0.176     .5219967
34.77918
ngb7_ownskildm |   1.526175   .3359801     1.92   0.055      .991326
2.349591
   b7_ownexper |   1.010313   .0139146     0.74   0.456     .9834055
1.037956
    R_and_Ddum |   2.032099   .5909075     2.44   0.015     1.149282
3.593048
    d8_Expotdm |   1.735221   .4022064     2.38   0.017     1.101679
2.733094
 l10_empskildm |   1.601573   .3624681     2.08   0.037     1.027786
2.49569
         _cons |   .7054687   .2281067    -1.08   0.281     .3743257
1.329554
------------------------------------------------------------------------------


.
.
. * Geary Non Normality LM Runs Test
. lmngr h4a_mktindm1 entsize entsizsquared b5_entpage b5_entpagesq
b2b_foreinowndm ngb7_ownskildm b7_ownexper R_and_Ddum d8_Expotdm
l10_empsk
> ildm

      Source |       SS           df       MS      Number of obs   =
504
-------------+----------------------------------   F(10, 493)      =
3.71
       Model |   8.6299239        10   .86299239   Prob > F        =
0.0001
    Residual |  114.798648       493  .232857297   R-squared       =
0.0699
-------------+----------------------------------   Adj R-squared   =
0.0511
       Total |  123.428571       503  .245384834   Root MSE        =
.48255

------------------------------------------------------------------------------
             |      Coef.   Std. Err.      t    P>|t|     [95% Conf.
Interval]
-------------+----------------------------------------------------------------
```

```
       entsize |    .007336   .0058061     1.26   0.207    -.0040718
.0187438
  entsizsquared |  -.0000734   .0001237    -0.59   0.553    -.0003163
.0001696
     b5_entpage |  -.0018417   .0063464    -0.29   0.772     -.014311
.0106275
   b5_entpagesq |  -.0000947    .000127    -0.75   0.456    -.0003443
.0001548
b2b_foreinowndm |   .2576533    .202073     1.28   0.203    -.1393772
.6546837
 ngb7_ownskildm |   .0955689   .0504461     1.89   0.059    -.0035469
.1946847
    b7_ownexper |   .0024204   .0029519     0.82   0.413    -.0033795
.0082202
     R_and_Ddum |   .1493618   .0609285     2.45   0.015     .0296503
.2690732
     d8_Expotdm |   .1217574   .0521106     2.34   0.020     .0193712
.2241436
  l10_empskildm |   .1081133   .0503949     2.15   0.032     .0090981
.2071285
          _cons |   .4237092    .070463     6.01   0.000     .2852645
.5621539
------------------------------------------------------------------------------
--------
======================================
* Geary Non Normality LM Runs Test   *
======================================
    Ho: Normality in Error Distribution
    Ha: Non Normality in Error Distribution

    LM Test      =   1.2747
    DF Chi2      =        2
    Prob. > Chi2 =   0.5287

. *Residuals are normally distributed
.
. *Multicollinearity test
. collin h4a_mktindm1 entsize entsizsquared b5_entpage b5_entpagesq
b2b_foreinowndm ngb7_ownskildm b7_ownexper R_and_Ddum d8_Expotdm l10_emps
> kildm
(obs=504)

  Collinearity Diagnostics

                       SQRT                   R-
  Variable      VIF     VIF    Tolerance    Squared
----------------------------------------------------
h4a_mktindm1      1.08    1.04    0.9301      0.0699
   entsize      5.79    2.41    0.1728      0.8272
entsizsquared      5.58    2.36    0.1792      0.8208
b5_entpage      8.49    2.91    0.1178      0.8822
b5_entpagesq      7.47    2.73    0.1339      0.8661
b2b_foreinowndm      1.04    1.02    0.9587      0.0413
ngb7_ownskildm      1.12    1.06    0.8945      0.1055
b7_ownexper      1.67    1.29    0.5996      0.4004
R_and_Ddum      1.14    1.07    0.8770      0.1230
d8_Expotdm      1.12    1.06    0.8928      0.1072
l10_empskildm      1.12    1.06    0.8945      0.1055
----------------------------------------------------
  Mean VIF      3.24

                        Cond
        Eigenval        Index
```

```
---------------------------------
    1     5.8185          1.0000
    2     1.2597          2.1491
    3     1.0328          2.3736
    4     0.9963          2.4166
    5     0.6878          2.9084
    6     0.6637          2.9609
    7     0.5666          3.2046
    8     0.4881          3.4525
    9     0.2647          4.6882
    10     0.1477          6.2768
    11     0.0502         10.7620
    12     0.0238         15.6317
---------------------------------
 Condition Number        15.6317
 Eigenvalues & Cond Index computed from scaled raw sscp (w/ intercept)
 Det(correlation matrix)    0.0106

.
. *Asbence of multicollinearity problems
.
. *Organisational Innovation:
.
. *Heteroskedasticity test
.
. * Glejser Lagrange Multiplier Heteroscedasticity Test (for all models)
lmhgl
. lmhgl h5_orgindum entsize entsizsquared b5_entpage b5_entpagesq
b2b_foreinowndm ngb7_ownskildm b7_ownexper R_and_Ddum d8_Expotdm
l10_empskildm

      Source |       SS           df       MS      Number of obs   =
504
-------------+----------------------------------   F(10, 493)      =
7.03
       Model |  15.5884704        10  1.55884704   Prob > F        =
0.0000
    Residual |  109.268672       493  .221640309   R-squared       =
0.1249
-------------+----------------------------------   Adj R-squared   =
0.1071
       Total |  124.857143       503  .248224936   Root MSE        =
.47079

------------------------------------------------------------------------------
--------
    h5_orgindum |      Coef.   Std. Err.      t    P>|t|     [95% Conf.
Interval]
----------------+-------------------------------------------------------------
--------
        entsize |   .0103602   .0056646     1.83   0.068    -.0007695
.0214899
  entsizsquared |  -.0000893   .0001206    -0.74   0.460    -.0003263
.0001478
     b5_entpage |  -.0041338   .0061916    -0.67   0.505     -.016299
.0080314
   b5_entpagesq |   .0000195   .0001239     0.16   0.875     -.000224
.0002629
b2b_foreinowndm |   .0373096   .1971459     0.19   0.850    -.3500402
.4246593
 ngb7_ownskildm |   .0494584    .049216     1.00   0.315    -.0472407
.1461575
```

```
    b7_ownexper |   .0006702   .0028799     0.23   0.816    -.0049882
.0063287
     R_and_Ddum |   .2169439   .0594429     3.65   0.000     .1001513
.3337365
     d8_Expotdm |   .1777822     .05084     3.50   0.001     .0778925
.277672
  l10_empskildm |   .1897752   .0491661     3.86   0.000     .0931742
.2863761
          _cons |   .2672164   .0687449     3.89   0.000     .1321474
.4022855
------------------------------------------------------------------------------
--------
==============================================================================
=====
* OLS Glejser Lagrange Multiplier Heteroscedasticity Test
==============================================================================
=====
 Ho: No Heteroscedasticity - Ha: Heteroscedasticity

    Glejser LM Test           =   11.48549
    Degrees of Freedom        =       10.0
    P-Value > Chi2(10)        =    0.32096

.
. *There is no heteroscedasticity problem

.  logistic h5_orgindum entsize entsizsquared b5_entpage b5_entpagesq
b2b_foreinowndm ngb7_ownskildm b7_ownexper R_and_Ddum d8_Expotdm
l10_empskildm

Logistic regression                               Number of obs     =
504
                                                  LR chi2(10)       =
65.85
                                                  Prob > chi2       =
0.0000
Log likelihood = -314.13408                       Pseudo R2         =
0.0949

------------------------------------------------------------------------------
--------
    h5_orgindum | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
----------------+-------------------------------------------------------------
--------
        entsize |   1.047833   .0284514     1.72   0.085     .9935267
1.105107
  entsizsquared |   .9995999   .0006092    -0.66   0.511     .9984066
1.000795
     b5_entpage |   .9808665   .0278893    -0.68   0.497     .9276997
1.03708
   b5_entpagesq |   1.000106   .0005689     0.19   0.851     .9989922
1.001222
b2b_foreinowndm |   1.188544   1.084846     0.19   0.850     .1986457
7.111337
 ngb7_ownskildm |    1.25765   .2805296     1.03   0.304     .8122543
1.947276
    b7_ownexper |   1.002426   .0132523     0.18   0.855     .9767857
1.02874
     R_and_Ddum |     2.6646   .7404857     3.53   0.000     1.545558
4.593871
     d8_Expotdm |   2.218955   .5127983     3.45   0.001     1.410707
3.490281
```

```
  l10_empskildm |   2.289893   .5080923     3.73   0.000     1.482336
3.537398
          _cons |   .3642188   .1156387    -3.18   0.001     .1954825
.6786049
------------------------------------------------------------------------------
--------

. * Geary Non Normality LM Runs Test
. lmngr h5_orgindum entsize entsizsquared b5_entpage b5_entpagesq
b2b_foreinowndm ngb7_ownskildm b7_ownexper R_and_Ddum d8_Expotdm
l10_empski
> ldm

      Source |       SS           df       MS      Number of obs   =
504
-------------+----------------------------------   F(10, 493)      =
7.03
       Model |  15.5884704        10  1.55884704   Prob > F        =
0.0000
    Residual |  109.268672       493  .221640309   R-squared       =
0.1249
-------------+----------------------------------   Adj R-squared   =
0.1071
       Total |  124.857143       503  .248224936   Root MSE        =
.47079

------------------------------------------------------------------------------
--------
    h5_orgindum |      Coef.   Std. Err.      t    P>|t|     [95% Conf.
Interval]
----------------+-------------------------------------------------------------
--------
        entsize |   .0103602   .0056646     1.83   0.068    -.0007695
.0214899
  entsizsquared |  -.0000893   .0001206    -0.74   0.460    -.0003263
.0001478
     b5_entpage |  -.0041338   .0061916    -0.67   0.505     -.016299
.0080314
   b5_entpagesq |   .0000195   .0001239     0.16   0.875     -.000224
.0002629
b2b_foreinowndm |   .0373096   .1971459     0.19   0.850    -.3500402
.4246593
 ngb7_ownskildm |   .0494584    .049216     1.00   0.315    -.0472407
.1461575
    b7_ownexper |   .0006702   .0028799     0.23   0.816    -.0049882
.0063287
     R_and_Ddum |   .2169439   .0594429     3.65   0.000     .1001513
.3337365
     d8_Expotdm |   .1777822    .05084     3.50   0.001     .0778925
.277672
  l10_empskildm |   .1897752   .0491661     3.86   0.000     .0931742
.2863761
          _cons |   .2672164   .0687449     3.89   0.000     .1321474
.4022855
------------------------------------------------------------------------------
--------
=======================================
* Geary Non Normality LM Runs Test   *
=======================================
    Ho: Normality in Error Distribution
    Ha: Non Normality in Error Distribution

    LM Test      =   1.5037
```

```
    DF Chi2      =        2
    Prob. > Chi2 =   0.4715

. *Residuals are normally distributed
.
. *Multicollinearity test
. collin h5_orgindum entsize entsizsquared b5_entpage b5_entpagesq
b2b_foreinowndm ngb7_ownskildm b7_ownexper R_and_Ddum d8_Expotdm
l10_empsk
> ildm
(obs=504)

  Collinearity Diagnostics

                       SQRT                   R-
  Variable      VIF     VIF    Tolerance    Squared
----------------------------------------------------
h5_orgindum      1.14    1.07    0.8751      0.1249
   entsize      5.81    2.41    0.1722      0.8278
entsizsquared      5.58    2.36    0.1791      0.8209
b5_entpage      8.50    2.91    0.1177      0.8823
b5_entpagesq      7.46    2.73    0.1340      0.8660
b2b_foreinowndm      1.04    1.02    0.9618      0.0382
ngb7_ownskildm      1.11    1.05    0.8992      0.1008
b7_ownexper      1.67    1.29    0.6004      0.3996
R_and_Ddum      1.16    1.08    0.8643      0.1357
d8_Expotdm      1.14    1.07    0.8808      0.1192
l10_empskildm      1.14    1.07    0.8764      0.1236
----------------------------------------------------
  Mean VIF      3.25

                         Cond
        Eigenval         Index
---------------------------------
    1     5.7629          1.0000
    2     1.2656          2.1339
    3     1.0394          2.3547
    4     1.0138          2.3842
    5     0.6878          2.8945
    6     0.6397          3.0014
    7     0.5701          3.1794
    8     0.4630          3.5279
    9     0.3331          4.1597
    10     0.1506          6.1858
    11     0.0502         10.7136
    12     0.0238         15.5553
---------------------------------
 Condition Number        15.5553
 Eigenvalues & Cond Index computed from scaled raw sscp (w/ intercept)
 Det(correlation matrix)    0.0100

.
. *Asbence of multicollinearity problems
.APPENDICE III
.Robust Logistic Regression Results for Innovation Models of
Disaggregated sampls
. *Innovation Models for the disaggregated sample:
. by a6a_entpscal2, sort: logistic h1_prodinndm entsize entsizsquared
b5_entpage b5_entpagesq b2b_foreinowndm ngb7_ownskildm b7_ownexper R_an
> d_Ddum d8_Expotdm l10_empskildm, vce(robust)

-------------------------------------------------------------------------------
-------------------------------------------------------------------
```

```
-> a6a_entpscal2 = 1
note: b2b_foreinowndm != 0 predicts success perfectly
      b2b_foreinowndm dropped and 2 obs not used


Logistic regression                               Number of obs     =
142
                                                  Wald chi2(9)      =
25.52
                                                  Prob > chi2       =
0.0025
Log pseudolikelihood = -84.601551                 Pseudo R2         =
0.1400

------------------------------------------------------------------------------
-------
                 |               Robust
   h1_prodinndm | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
-----------------+------------------------------------------------------------
-------
        entsize |   3.010172   1.584624     2.09   0.036     1.072752
8.446627
  entsizsquared |     .78258   .0922204    -2.08   0.037     .6211863
.9859061
     b5_entpage |   1.167413    .079929     2.26   0.024     1.020811
1.335068
   b5_entpagesq |   .9960982   .0017062    -2.28   0.022     .9927596
.999448
b2b_foreinowndm |          1  (omitted)
 ngb7_ownskildm |   .7483916   .3548856    -0.61   0.541     .2954548
1.895687
    b7_ownexper |   .9724381    .026251    -1.04   0.301     .9223246
1.025275
     R_and_Ddum |    2.37834   1.429798     1.44   0.150     .7320705
7.726713
     d8_Expotdm |   1.944061   .8186247     1.58   0.114     .8516817
4.437541
  l10_empskildm |    3.82467   1.627736     3.15   0.002     1.660857
8.807562
          _cons |   .1203954   .1017925    -2.50   0.012     .0229579
.6313759
------------------------------------------------------------------------------
-------

------------------------------------------------------------------------------
-------------------------------------------------------------------
-> a6a_entpscal2 = 2

Logistic regression                               Number of obs     =
305
                                                  Wald chi2(10)     =
17.27
                                                  Prob > chi2       =
0.0686
Log pseudolikelihood = -195.43424                 Pseudo R2         =
0.0479

------------------------------------------------------------------------------
-------
                 |               Robust
   h1_prodinndm | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
```

```
----------------+----------------------------------------------------------------
--------
        entsize |   1.325249   .2386303     1.56   0.118     .9311647
1.886117
  entsizsquared |   .9884452   .0081174    -1.42   0.157     .9726627
1.004484
     b5_entpage |    .946305    .036635    -1.43   0.154     .8771582
1.020903
   b5_entpagesq |   1.001706    .000892     1.91   0.056     .9999593
1.003456
b2b_foreinowndm |   1.672944   2.091013     0.41   0.681     .1443991
19.38198
 ngb7_ownskildm |   .8243551   .2355878    -0.68   0.499     .4708192
1.443359
    b7_ownexper |   1.005141   .0176935     0.29   0.771     .9710541
1.040425
     R_and_Ddum |    2.58313   1.036616     2.36   0.018     1.176406
5.671989
     d8_Expotdm |   1.233085   .3956326     0.65   0.514      .657487
2.312593
  l10_empskildm |   1.205078   .3696315     0.61   0.543     .6605828
2.19838
          _cons |   .3895198   .3509848    -1.05   0.295     .0666096
2.277834
------------------------------------------------------------------------------
--------

------------------------------------------------------------------------------
-------------------------------------------------------------------
-> a6a_entpscal2 = 3
note: b2b_foreinowndm omitted because of collinearity

Logistic regression                               Number of obs     =
55
                                                  Wald chi2(9)      =
6.20
                                                  Prob > chi2       =
0.7194
Log pseudolikelihood = -33.820976                 Pseudo R2         =
0.0863

------------------------------------------------------------------------------
--------
                |               Robust
   h1_prodinndm | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
----------------+----------------------------------------------------------------
--------
        entsize |   .9925819   .1551717    -0.05   0.962     .7306288
1.348453
  entsizsquared |   1.000326   .0019622     0.17   0.868     .9964881
1.00418
     b5_entpage |   .9204378   .0854148    -0.89   0.372     .7673697
1.104039
   b5_entpagesq |   1.000489   .0015307     0.32   0.749     .9974938
1.003494
b2b_foreinowndm |          1  (omitted)
 ngb7_ownskildm |    2.49444   2.032994     1.12   0.262     .5049348
12.32284
    b7_ownexper |   1.071688   .0482987     1.54   0.124     .9810846
1.170658
     R_and_Ddum |   1.664241   2.062386     0.41   0.681     .1466821
18.88231
```

```
     d8_Expotdm |   1.064871   1.065409     0.06   0.950     .1498531
7.567082
  l10_empskildm |   1.007375   .6810712     0.01   0.991     .2677361
3.790319
          _cons |   1.071068   2.852884     0.03   0.979     .0057885
198.1833
------------------------------------------------------------------------------
--------

. by a6a_entpscal2, sort: logistic h4b_procindm2 entsize entsizsquared
b5_entpage b5_entpagesq b2b_foreinowndm ngb7_ownskildm b7_ownexper R_a
> nd_Ddum d8_Expotdm l10_empskildm, vce(robust)

------------------------------------------------------------------------------
------------------------------------------------------------------------
-> a6a_entpscal2 = 1

Logistic regression                               Number of obs     =
144
                                                  Wald chi2(10)     =
16.16
                                                  Prob > chi2       =
0.0951
Log pseudolikelihood =  -85.07902                 Pseudo R2         =
0.1020

------------------------------------------------------------------------------
--------
                 |               Robust
  h4b_procindm2 | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
-----------------+------------------------------------------------------------
--------
        entsize |   .7992368   .4191966    -0.43   0.669     .2859062
2.234227
  entsizsquared |   1.088235   .1266347     0.73   0.467     .8663056
1.367019
     b5_entpage |   .9974597   .0591932    -0.04   0.966     .8879361
1.120493
   b5_entpagesq |   1.000175   .0012747     0.14   0.891       .99768
1.002677
b2b_foreinowndm |   1.122605   1.790917     0.07   0.942     .0492364
25.59575
 ngb7_ownskildm |   2.067847   .8868903     1.69   0.090     .8921581
4.792862
    b7_ownexper |   1.006223   .0262371     0.24   0.812     .9560909
1.058983
     R_and_Ddum |   4.717212   2.479128     2.95   0.003      1.68398
13.21398
     d8_Expotdm |   1.150274   .4614113     0.35   0.727     .5240315
2.524906
  l10_empskildm |   1.534145   .6653798     0.99   0.324     .6556748
3.589585
          _cons |   .2387749   .1938886    -1.76   0.078     .0486184
1.172672
------------------------------------------------------------------------------
--------

------------------------------------------------------------------------------
------------------------------------------------------------------------
-> a6a_entpscal2 = 2
```

```
Logistic regression                               Number of obs     =
305
                                                  Wald chi2(10)     =
49.27
                                                  Prob > chi2       =
0.0000
Log pseudolikelihood = -168.30038                 Pseudo R2         =
0.1629

------------------------------------------------------------------------------
             |               Robust
  h4b_procindm2 | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
-------------+----------------------------------------------------------------
        entsize |   1.226758   .2471373     1.01   0.310     .8265697
1.820699
  entsizsquared |   .9964274   .0090958    -0.39   0.695     .9787585
1.014415
     b5_entpage |   1.099589   .0443148     2.36   0.018     1.016075
1.189966
   b5_entpagesq |   .9985925   .0007335    -1.92   0.055     .9971559
1.000031
b2b_foreinowndm |   4.380006    6.06276     1.07   0.286     .2905696
66.02361
 ngb7_ownskildm |   1.634903   .4815732     1.67   0.095     .9178342
2.912192
    b7_ownexper |   .9670554   .0190576    -1.70   0.089     .9304154
1.005138
     R_and_Ddum |   4.198523   1.539896     3.91   0.000     2.045976
8.615738
     d8_Expotdm |    1.03678   .3466932     0.11   0.914     .5383319
1.996749
  l10_empskildm |   2.465569   .7397096     3.01   0.003     1.369441
4.43906
          _cons |   .0395152   .0408702    -3.12   0.002     .0052045
.3000225
------------------------------------------------------------------------------

------------------------------------------------------------------------------
-------------------------------------------------------------------------
-> a6a_entpscal2 = 3
note: b2b_foreinowndm omitted because of collinearity

Logistic regression                               Number of obs     =
55
                                                  Wald chi2(9)      =
11.27
                                                  Prob > chi2       =
0.2577
Log pseudolikelihood = -32.679059                 Pseudo R2         =
0.1426

------------------------------------------------------------------------------
             |               Robust
  h4b_procindm2 | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
-------------+----------------------------------------------------------------
--------
```

```
        entsize |   1.329822   .1939131     1.95   0.051     .9992455
1.769761
  entsizsquared |     .99695   .0017533    -1.74   0.082     .9935195
1.000392
     b5_entpage |   1.080657   .0980714     0.85   0.393      .904565
1.291028
   b5_entpagesq |   .9977121   .0014651    -1.56   0.119     .9948447
1.000588
b2b_foreinowndm |          1  (omitted)
 ngb7_ownskildm |   .6222437   .4195313    -0.70   0.482     .1659818
2.332709
    b7_ownexper |   1.003405   .0418505     0.08   0.935      .924643
1.088877
     R_and_Ddum |   4.454171   4.504599     1.48   0.140      .613661
32.32997
     d8_Expotdm |   1.631835    1.53042     0.52   0.602     .2596422
10.25598
  l10_empskildm |   1.330204    1.11507     0.34   0.734     .2572656
6.877888
          _cons |   .0028609   .0069561    -2.41   0.016     .0000244
.3358276
------------------------------------------------------------------------------
--------

. by a6a_entpscal2, sort: logistic h6_mktindm2 entsize entsizsquared
b5_entpage b5_entpagesq b2b_foreinowndm ngb7_ownskildm b7_ownexper R_and
> _Ddum d8_Expotdm l10_empskildm, vce(robust)

------------------------------------------------------------------------------
------------------------------------------------------------------------
-> a6a_entpscal2 = 1

Logistic regression                               Number of obs     =
144
                                                  Wald chi2(10)     =
20.88
                                                  Prob > chi2       =
0.0219
Log pseudolikelihood = -80.955385                 Pseudo R2         =
0.1455

------------------------------------------------------------------------------
--------
             |               Robust
    h6_mktindm2 | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
-------------+----------------------------------------------------------------
--------
        entsize |   2.002792   .9881703     1.41   0.159      .761476
5.267634
  entsizsquared |   .8995175   .1034128    -0.92   0.357     .7180447
1.126854
     b5_entpage |   1.181519   .0819065     2.41   0.016     1.031413
1.35347
   b5_entpagesq |   .9958322   .0016234    -2.56   0.010     .9926555
.9990191
b2b_foreinowndm |   .7810203     1.0384    -0.19   0.853     .0576705
10.57721
 ngb7_ownskildm |   1.609642    .789531     0.97   0.332     .6154803
4.209635
    b7_ownexper |   .9858003    .024944    -0.57   0.572     .9381035
1.035922
```

```
     R_and_Ddum |   2.069412   1.337892     1.12   0.261     .5828249
7.347774
     d8_Expotdm |    3.42082   1.523581     2.76   0.006     1.428953
8.189216
  l10_empskildm |    3.56828   1.871673     2.43   0.015     1.276373
9.975631
          _cons |   .1059297   .0875856    -2.72   0.007     .0209518
.5355676
------------------------------------------------------------------------------
--------

------------------------------------------------------------------------------
-------------------------------------------------------------
-> a6a_entpscal2 = 2
note: b2b_foreinowndm != 0 predicts success perfectly
      b2b_foreinowndm dropped and 4 obs not used


Logistic regression                               Number of obs     =
301
                                                  Wald chi2(9)      =
19.87
                                                  Prob > chi2       =
0.0187
Log pseudolikelihood = -183.22057                 Pseudo R2         =
0.0702

------------------------------------------------------------------------------
--------
                |               Robust
    h6_mktindm2 | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
----------------+-------------------------------------------------------------
--------
        entsize |   1.216834   .2346958     1.02   0.309     .8337897
1.775849
  entsizsquared |   .9931175   .0087754    -0.78   0.434     .9760662
1.010467
     b5_entpage |   .9497733   .0392469    -1.25   0.212     .8758833
1.029897
   b5_entpagesq |   1.001466    .000871     1.68   0.092     .9997602
1.003174
b2b_foreinowndm |          1  (omitted)
 ngb7_ownskildm |   1.227913   .3723919     0.68   0.498     .6776758
2.224915
    b7_ownexper |   .9814072   .0176335    -1.04   0.296     .9474476
1.016584
     R_and_Ddum |   5.046843   2.485983     3.29   0.001     1.921912
13.25275
     d8_Expotdm |    1.32624   .4451983     0.84   0.400     .6868898
2.560692
  l10_empskildm |   1.118807   .3597563     0.35   0.727      .595728
2.101174
          _cons |   .7324151   .7035849    -0.32   0.746     .1114453
4.81341
------------------------------------------------------------------------------
--------

------------------------------------------------------------------------------
-------------------------------------------------------------
-> a6a_entpscal2 = 3
note: b2b_foreinowndm omitted because of collinearity
```

```
Logistic regression                               Number of obs     =
55
                                                  Wald chi2(9)      =
12.24
                                                  Prob > chi2       =
0.2000
Log pseudolikelihood =  -29.85505                 Pseudo R2         =
0.1837

------------------------------------------------------------------------------
             |               Robust
    h6_mktindm2 | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
-------------+----------------------------------------------------------------
        entsize |   1.112173    .211574     0.56   0.576     .7660274
1.614732
  entsizsquared |   .9989105   .0023761    -0.46   0.647     .9942643
1.003578
     b5_entpage |   1.025654    .101228     0.26   0.797     .8452608
1.244546
   b5_entpagesq |   .9971953   .0016482    -1.70   0.089     .9939701
1.000431
b2b_foreinowndm |          1  (omitted)
 ngb7_ownskildm |   .3159349   .2490294    -1.46   0.144     .0673992
1.480949
    b7_ownexper |   1.066115   .0530688     1.29   0.198     .9670147
1.175371
     R_and_Ddum |   11.85639   15.73488     1.86   0.062     .8796375
159.8089
     d8_Expotdm |   .5723647   .5122351    -0.62   0.533      .099059
3.307132
  l10_empskildm |    1.62477   1.513618     0.52   0.602     .2617109
10.087
          _cons |    .227947   .6599341    -0.51   0.610     .0007825
66.39959
------------------------------------------------------------------------------

. by a6a_entpscal2, sort: logistic h5_orgindum entsize entsizsquared
b5_entpage b5_entpagesq b2b_foreinowndm ngb7_ownskildm b7_ownexper R_and
> _Ddum d8_Expotdm l10_empskildm

------------------------------------------------------------------------------
-------------------------------------------------------------------------------
-> a6a_entpscal2 = 1

Logistic regression                               Number of obs     =
144
                                                  LR chi2(10)       =
37.69
                                                  Prob > chi2       =
0.0000
Log likelihood = -80.618628                       Pseudo R2         =
0.1895

------------------------------------------------------------------------------
    h5_orgindum | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
----------------+-------------------------------------------------------------
```

```
        entsize |   2.084937   1.137111     1.35   0.178     .7159016
6.072011
  entsizsquared |   .8830877   .1085708    -1.01   0.312     .6939901
1.12371
     b5_entpage |   1.043077   .0667359     0.66   0.510     .9201454
1.182431
   b5_entpagesq |   .9993217    .001496    -0.45   0.650      .996394
1.002258
b2b_foreinowndm |   1.631088   2.622459     0.30   0.761     .0698101
38.10982
 ngb7_ownskildm |   1.320802   .6364501     0.58   0.564      .513656
3.396277
    b7_ownexper |   1.001014   .0259808     0.04   0.969     .9513661
1.053253
     R_and_Ddum |   7.790187   5.266725     3.04   0.002     2.070497
29.31036
     d8_Expotdm |   2.583746    1.11533     2.20   0.028      1.10869
6.021287
  l10_empskildm |   3.165325   1.428764     2.55   0.011     1.306782
7.667145
          _cons |   .0864072     .07475    -2.83   0.005     .0158556
.470886
------------------------------------------------------------------------------
--------

------------------------------------------------------------------------------
-------------------------------------------------------------
-> a6a_entpscal2 = 2

Logistic regression                               Number of obs     =
305
                                                  LR chi2(10)       =
45.43
                                                  Prob > chi2       =
0.0000
Log likelihood = -185.92993                       Pseudo R2         =
0.1089

------------------------------------------------------------------------------
--------
    h5_orgindum | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
----------------+-------------------------------------------------------------
--------
        entsize |   1.361577   .2561722     1.64   0.101     .9416595
1.968749
  entsizsquared |   .9901653   .0084633    -1.16   0.248     .9737157
1.006893
     b5_entpage |   .9454133   .0354568    -1.50   0.134     .8784118
1.017525
   b5_entpagesq |   1.000975   .0007668     1.27   0.203     .9994729
1.002479
b2b_foreinowndm |   .7486999   .8227664    -0.26   0.792     .0868759
6.452322
 ngb7_ownskildm |   1.521691    .445783     1.43   0.152     .8569687
2.702016
    b7_ownexper |   1.002478   .0178647     0.14   0.890     .9680679
1.03811
     R_and_Ddum |   2.290568   .8081088     2.35   0.019     1.147204
4.573469
     d8_Expotdm |   2.527438   .7931904     2.95   0.003     1.366301
4.675356
```

```
  l10_empskildm |   2.082784     .61532     2.48   0.013     1.167274
3.716345
          _cons |   .1027712    .097185    -2.41   0.016     .0161041
.6558512
------------------------------------------------------------------------------
--------

------------------------------------------------------------------------------
-------------------------------------------------------------------
-> a6a_entpscal2 = 3
note: b2b_foreinowndm omitted because of collinearity

Logistic regression                               Number of obs     =
55
                                                  LR chi2(9)        =
10.47
                                                  Prob > chi2       =
0.3140
Log likelihood = -32.807719                       Pseudo R2         =
0.1376

------------------------------------------------------------------------------
--------
    h5_orgindum | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
----------------+-------------------------------------------------------------
--------
        entsize |   1.170997   .1901101     0.97   0.331     .8518521
1.609709
  entsizsquared |   .9983854   .0021395    -0.75   0.451     .9942009
1.002588
     b5_entpage |   .9277031   .1018176    -0.68   0.494     .7481482
1.150351
   b5_entpagesq |   .9997247   .0021737    -0.13   0.899     .9954734
1.003994
b2b_foreinowndm |          1  (omitted)
 ngb7_ownskildm |   .5976814   .4085457    -0.75   0.451     .1565417
2.281967
    b7_ownexper |   1.013934    .047173     0.30   0.766     .9255671
1.110738
     R_and_Ddum |   1.976673   2.110903     0.64   0.523     .2437422
16.0302
     d8_Expotdm |   1.356191   1.255873     0.33   0.742     .2208428
8.328344
  l10_empskildm |   1.443662   1.021192     0.52   0.604     .3608759
5.775283
          _cons |   .1880173   .5193404    -0.61   0.545     .0008376
42.20682
------------------------------------------------------------------------------
--------

.
.
.
.
*******************************************************************************
**************************************************
APPENDICE IV.
Pre-estimation Test Results for Performance Models.
. *Performance Model for Quantitative Measure for the whole sample:
. *Innovation Model:
. *Descriptive Analysis:
.
```

```
.
.
. *Inferential Analyses:
.
. *Product Innovation:
. *Heteroskedasticity test
.
. * Glejser Lagrange Multiplier Heteroscedasticity Test (for all models)
lmhgl
.
. lmhgl ngf3_incroutpdddm h1_prodinndm k8_finaccessdm ngd9_exptsubsdm
entsize entsizsquared b7_ownexper a15a3_owngendum

      Source |       SS           df       MS      Number of obs   =
504
-------------+----------------------------------   F(7, 496)       =
6.19
       Model |  6.38953857         7  .912791225   Prob > F        =
0.0000
    Residual |  73.1640329       496  .147508131   R-squared       =
0.0803
-------------+----------------------------------   Adj R-squared   =
0.0673
       Total |  79.5535714       503  .158158194   Root MSE        =
.38407

------------------------------------------------------------------------------
--------
ngf3_incroutp~m |      Coef.   Std. Err.      t    P>|t|     [95% Conf.
Interval]
----------------+-------------------------------------------------------------
--------
   h1_prodinndm |   .2145582   .0350223     6.13   0.000     .1457478
.2833685
 k8_finaccessdm |  -.0602334   .0564373    -1.07   0.286    -.1711191
.0506522
ngd9_exptsubsdm |  -.1270261   .1949394    -0.65   0.515    -.5100348
.2559827
        entsize |   .0043592   .0044934     0.97   0.332    -.0044691
.0131876
  entsizsquared |  -.0000398   .0000972    -0.41   0.682    -.0002307
.0001511
    b7_ownexper |   .0017975     .00185     0.97   0.332    -.0018374
.0054323
a15a3_owngendum |   .0668067   .0539669     1.24   0.216    -.0392252
.1728385
          _cons |   .6219525     .04486    13.86   0.000     .5338133
.7100916
------------------------------------------------------------------------------
--------
================================================================================
=====
* OLS Glejser Lagrange Multiplier Heteroscedasticity Test
================================================================================
=====
 Ho: No Heteroscedasticity - Ha: Heteroscedasticity

    Glejser LM Test           =  151.20505
    Degrees of Freedom        =        7.0
    P-Value > Chi2(7)         =    0.00000

.
. *There is heteroscedasticity problem, robust regression should applied:
```

```
. logistic ngf3_incroutpdddm h1_prodinndm k8_finaccessdm ngd9_exptsubsdm
entsize entsizsquared b7_ownexper a15a3_owngendum, vce(robust)

Logistic regression                               Number of obs     =
504
                                                  Wald chi2(7)      =
35.50
                                                  Prob > chi2       =
0.0000
Log pseudolikelihood = -229.12173                 Pseudo R2         =
0.0824

------------------------------------------------------------------------------
                   |               Robust
ngf3_incroutpdddm | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
-------------------+----------------------------------------------------------
     h1_prodinndm |   4.066284   1.010237     5.65   0.000     2.498753
6.617167
   k8_finaccessdm |   .6386838   .2336303    -1.23   0.220     .3118292
1.308143
  ngd9_exptsubsdm |   .4524329   .7874575    -0.46   0.649     .0149294
13.71092
          entsize |   1.028913   .0315666     0.93   0.353     .9688667
1.09268
    entsizsquared |   .9998388   .0006231    -0.26   0.796     .9986183
1.001061
      b7_ownexper |   1.013882   .0139236     1.00   0.315     .9869563
1.041542
  a15a3_owngendum |    1.58216   .6459802     1.12   0.261     .7107441
3.521985
            _cons |   1.416753   .4432534     1.11   0.266     .7673304
2.615808
------------------------------------------------------------------------------

.
. * Geary Non Normality LM Runs Test
. lmngr ngf3_incroutpdddm h1_prodinndm k8_finaccessdm ngd9_exptsubsdm
entsize entsizsquared b7_ownexper a15a3_owngendum

      Source |       SS           df       MS      Number of obs   =
504
-------------+----------------------------------   F(7, 496)       =
6.19
       Model |  6.38953857         7  .912791225   Prob > F        =
0.0000
    Residual |  73.1640329       496  .147508131   R-squared       =
0.0803
-------------+----------------------------------   Adj R-squared   =
0.0673
       Total |  79.5535714       503  .158158194   Root MSE        =
.38407

------------------------------------------------------------------------------
ngf3_incroutp~m |      Coef.   Std. Err.      t    P>|t|     [95% Conf.
Interval]
----------------+-------------------------------------------------------------
```

```
   h1_prodinndm |   .2145582   .0350223     6.13   0.000     .1457478
.2833685
 k8_finaccessdm |  -.0602334   .0564373    -1.07   0.286    -.1711191
.0506522
ngd9_exptsubsdm |  -.1270261   .1949394    -0.65   0.515    -.5100348
.2559827
       entsize |   .0043592   .0044934     0.97   0.332    -.0044691
.0131876
  entsizsquared |  -.0000398   .0000972    -0.41   0.682    -.0002307
.0001511
    b7_ownexper |   .0017975     .00185     0.97   0.332    -.0018374
.0054323
a15a3_owngendum |   .0668067   .0539669     1.24   0.216    -.0392252
.1728385
          _cons |   .6219525     .04486    13.86   0.000     .5338133
.7100916
------------------------------------------------------------------------------
--------
======================================
* Geary Non Normality LM Runs Test   *
======================================
    Ho: Normality in Error Distribution
    Ha: Non Normality in Error Distribution

    LM Test      =  -0.7688
    DF Chi2      =        2
    Prob. > Chi2 =   0.6808


.
. *Residuals are normally distributed
.
. *Multicollinearity test
. collin ngf3_incroutpdddm h1_prodinndm k8_finaccessdm ngd9_exptsubsdm
entsize entsizsquared b7_ownexper a15a3_owngendum
(obs=504)

  Collinearity Diagnostics

                       SQRT                   R-
  Variable      VIF     VIF    Tolerance    Squared
----------------------------------------------------
ngf3_incroutpdddm      1.09    1.04    0.9197      0.0803
h1_prodinndm      1.10    1.05    0.9091      0.0909
k8_finaccessdm      1.03    1.01    0.9742      0.0258
ngd9_exptsubsdm      1.02    1.01    0.9773      0.0227
   entsize      5.46    2.34    0.1830      0.8170
entsizsquared      5.44    2.33    0.1839      0.8161
b7_ownexper      1.03    1.02    0.9665      0.0335
a15a3_owngendum      1.02    1.01    0.9838      0.0162
----------------------------------------------------
  Mean VIF      2.15

                        Cond
        Eigenval        Index
---------------------------------
    1     4.4556          1.0000
    2     1.1257          1.9895
    3     0.9836          2.1283
    4     0.8718          2.2607
    5     0.8198          2.3313
    6     0.3706          3.4676
    7     0.2207          4.4934
    8     0.1032          6.5696
```

```
    9     0.0490          9.5313
--------------------------------
 Condition Number         9.5313
 Eigenvalues & Cond Index computed from scaled raw sscp (w/ intercept)
 Det(correlation matrix)    0.1594

.
. *Asbence of multicollinearity problems
.
.
. *Process Innovation 1:
.
. *Heteroskedasticity test
.
. * Glejser Lagrange Multiplier Heteroscedasticity Test (for all models)
lmhgl
. lmhgl ngf3_incroutpdddm h3_procindm1 k8_finaccessdm ngd9_exptsubsdm
entsize entsizsquared b7_ownexper a15a3_owngendum

      Source |       SS           df       MS      Number of obs   =
504
-------------+----------------------------------   F(7, 496)       =
4.73
       Model |  4.97638598         7  .710912283   Prob > F        =
0.0000
    Residual |  74.5771855       496  .150357229   R-squared       =
0.0626
-------------+----------------------------------   Adj R-squared   =
0.0493
       Total |  79.5535714       503  .158158194   Root MSE        =
.38776

------------------------------------------------------------------------------
--------
ngf3_incroutp~m |      Coef.   Std. Err.      t    P>|t|     [95% Conf.
Interval]
----------------+-------------------------------------------------------------
--------
   h3_procindm1 |   .1874932   .0358043     5.24   0.000     .1171464
.25784
 k8_finaccessdm |  -.0473567   .0568304    -0.83   0.405    -.1590148
.0643014
ngd9_exptsubsdm |  -.1145115    .196783    -0.58   0.561    -.5011426
.2721196
        entsize |   .0044423   .0045374     0.98   0.328    -.0044726
.0133572
  entsizsquared |  -.0000397   .0000981    -0.40   0.686    -.0002325
.0001531
    b7_ownexper |   .0015239     .00187     0.81   0.416    -.0021503
.0051981
a15a3_owngendum |   .0677489   .0545034     1.24   0.214     -.039337
.1748348
          _cons |   .6324655   .0456114    13.87   0.000     .5428501
.7220809
------------------------------------------------------------------------------
--------
================================================================================
=====
* OLS Glejser Lagrange Multiplier Heteroscedasticity Test
================================================================================
=====
 Ho: No Heteroscedasticity - Ha: Heteroscedasticity
```

```
    Glejser LM Test           =  115.11474
    Degrees of Freedom        =        7.0
    P-Value > Chi2(7)         =    0.00000

. *There is heteroscedasticity problem, we then run robust regression for
cross-sectional dataset and gls for panel dataset:
.
. logistic ngf3_incroutpdddm h3_procindm1 k8_finaccessdm ngd9_exptsubsdm
entsize entsizsquared b7_ownexper a15a3_owngendum, vce(robust)

Logistic regression                               Number of obs     =
504
                                                  Wald chi2(7)      =
29.57
                                                  Prob > chi2       =
0.0001
Log pseudolikelihood = -234.07702                 Pseudo R2         =
0.0625

------------------------------------------------------------------------------
----------
                     |               Robust
ngf3_incroutpdddm | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
-------------------+----------------------------------------------------------
----------
     h3_procindm1 |   3.226143   .7637668     4.95   0.000     2.028465
5.130972
   k8_finaccessdm |   .7221511   .2705607    -0.87   0.385     .3465114
1.505008
  ngd9_exptsubsdm |   .5106278    .836786    -0.41   0.682     .0205687
12.67658
          entsize |   1.026777   .0315752     0.86   0.390     .9667189
1.090566
    entsizsquared |   .9998758   .0006099    -0.20   0.839     .9986812
1.001072
      b7_ownexper |   1.010481   .0132303     0.80   0.426     .9848802
1.036748
  a15a3_owngendum |   1.555545   .6256556     1.10   0.272     .7071649
3.421718
            _cons |   1.552966   .4662724     1.47   0.143     .8621675
2.797255
------------------------------------------------------------------------------
----------

.
.
. * Geary Non Normality LM Runs Test
. lmngr ngf3_incroutpdddm h3_procindm1 k8_finaccessdm ngd9_exptsubsdm
entsize entsizsquared b7_ownexper a15a3_owngendum

      Source |       SS           df       MS      Number of obs   =
504
-------------+----------------------------------   F(7, 496)       =
4.73
       Model |  4.97638598         7  .710912283   Prob > F        =
0.0000
    Residual |  74.5771855       496  .150357229   R-squared       =
0.0626
-------------+----------------------------------   Adj R-squared   =
0.0493
       Total |  79.5535714       503  .158158194   Root MSE        =
.38776
```

```
------------------------------------------------------------------------------
ngf3_incroutp~m |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
----------------+-------------------------------------------------------------
   h3_procindm1 |   .1874932   .0358043     5.24   0.000     .1171464    .25784
 k8_finaccessdm |  -.0473567   .0568304    -0.83   0.405    -.1590148   .0643014
ngd9_exptsubsdm |  -.1145115    .196783    -0.58   0.561    -.5011426   .2721196
        entsize |   .0044423   .0045374     0.98   0.328    -.0044726   .0133572
  entsizsquared |  -.0000397   .0000981    -0.40   0.686    -.0002325   .0001531
    b7_ownexper |   .0015239     .00187     0.81   0.416    -.0021503   .0051981
a15a3_owngendum |   .0677489   .0545034     1.24   0.214     -.039337   .1748348
          _cons |   .6324655   .0456114    13.87   0.000     .5428501   .7220809
------------------------------------------------------------------------------

=====================================
* Geary Non Normality LM Runs Test   *
=====================================
    Ho: Normality in Error Distribution
    Ha: Non Normality in Error Distribution

    LM Test      =  -0.7222
    DF Chi2      =        2
    Prob. > Chi2 =   0.6969

. *Residuals are normally distributed
.
. *Multicollinearity test
. collin ngf3_incroutpdddm h3_procindm1 k8_finaccessdm ngd9_exptsubsdm
entsize entsizsquared b7_ownexper a15a3_owngendum
(obs=504)

  Collinearity Diagnostics

                        SQRT                   R-
  Variable      VIF     VIF    Tolerance    Squared
----------------------------------------------------
ngf3_incroutpdddm      1.07    1.03    0.9374      0.0626
h3_procindm1      1.08    1.04    0.9279      0.0721
k8_finaccessdm      1.02    1.01    0.9802      0.0198
ngd9_exptsubsdm      1.02    1.01    0.9778      0.0222
   entsize      5.47    2.34    0.1830      0.8170
entsizsquared      5.44    2.33    0.1838      0.8162
b7_ownexper      1.04    1.02    0.9648      0.0352
a15a3_owngendum      1.02    1.01    0.9831      0.0169
----------------------------------------------------
  Mean VIF      2.14

                         Cond
        Eigenval         Index
---------------------------------
    1     4.4793          1.0000
    2     1.1233          1.9969
```

```
    3     0.9843          2.1333
    4     0.8716          2.2670
    5     0.8247          2.3305
    6     0.3407          3.6259
    7     0.2241          4.4707
    8     0.1029          6.5972
    9     0.0490          9.5600
----------------------------------
 Condition Number         9.5600
 Eigenvalues & Cond Index computed from scaled raw sscp (w/ intercept)
 Det(correlation matrix)    0.1627


.
. *Asbence of multicollinearity problems
.
. *Marketing Innovation 1:
.
. *Heteroskedasticity test
.
. * Glejser Lagrange Multiplier Heteroscedasticity Test (for all models)
lmhgl
. lmhgl ngf3_incroutpdddm h4a_mktindm1 k8_finaccessdm ngd9_exptsubsdm
entsize entsizsquared b7_ownexper a15a3_owngendum

      Source |       SS           df       MS      Number of obs   =
504
-------------+----------------------------------   F(7, 496)       =
7.09
       Model |  7.23357851         7  1.03336836   Prob > F        =
0.0000
    Residual |  72.3199929       496  .145806437   R-squared       =
0.0909
-------------+----------------------------------   Adj R-squared   =
0.0781
       Total |  79.5535714       503  .158158194   Root MSE        =
.38185

------------------------------------------------------------------------------
ngf3_incroutp~m |      Coef.   Std. Err.      t    P>|t|     [95% Conf.
Interval]
----------------+-------------------------------------------------------------
   h4a_mktindm1 |   .2300725   .0347802     6.62   0.000     .1617378
.2984073
 k8_finaccessdm |  -.0331364   .0557398    -0.59   0.552    -.1426516
.0763788
ngd9_exptsubsdm |  -.1469567   .1938904    -0.76   0.449    -.5279045
.233991
        entsize |    .004839   .0044641     1.08   0.279     -.003932
.0136099
  entsizsquared |  -.0000531   .0000966    -0.55   0.583    -.0002429
.0001367
    b7_ownexper |   .0022779   .0018392     1.24   0.216    -.0013357
.0058915
a15a3_owngendum |   .1024102   .0540871     1.89   0.059    -.0038578
.2086782
          _cons |   .5990527   .0455349    13.16   0.000     .5095877
.6885178
------------------------------------------------------------------------------
==============================================================================
=====
```

```
* OLS Glejser Lagrange Multiplier Heteroscedasticity Test
================================================================================
=====
 Ho: No Heteroscedasticity - Ha: Heteroscedasticity

    Glejser LM Test           =  169.16649
    Degrees of Freedom        =        7.0
    P-Value > Chi2(7)         =    0.00000

.
. *There is heteroscedasticity problem, we then run robust regression for
cross-sectional dataset and gls for panel dataset:
.
. logistic ngf3_incroutpdddm h4a_mktindm1 k8_finaccessdm ngd9_exptsubsdm
entsize entsizsquared b7_ownexper a15a3_owngendum, vce(robust)

Logistic regression                               Number of obs     =
504
                                                  Wald chi2(7)      =
42.80
                                                  Prob > chi2       =
0.0000
Log pseudolikelihood = -226.65057                 Pseudo R2         =
0.0923

------------------------------------------------------------------------------
----------
                     |               Robust
ngf3_incroutpdddm | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
---------------------+--------------------------------------------------------
----------
     h4a_mktindm1 |   4.479037    1.13121     5.94   0.000     2.730286
7.347864
   k8_finaccessdm |   .7958329   .2997157    -0.61   0.544     .3804118
1.664906
  ngd9_exptsubsdm |    .393341   .6362506    -0.58   0.564      .016516
9.367731
          entsize |   1.031126   .0315833     1.00   0.317     .9710458
1.094924
    entsizsquared |   .9997524   .0005943    -0.42   0.677     .9985882
1.000918
      b7_ownexper |   1.014738   .0128197     1.16   0.247     .9899208
1.040178
  a15a3_owngendum |   1.907935   .8093981     1.52   0.128     .8307316
4.381941
            _cons |   1.294835   .3822616     0.88   0.381     .7259759
2.309438
------------------------------------------------------------------------------
----------

.
.
. * Geary Non Normality LM Runs Test
. lmngr ngf3_incroutpdddm h4a_mktindm1 k8_finaccessdm ngd9_exptsubsdm
entsize entsizsquared b7_ownexper a15a3_owngendum

      Source |       SS           df       MS      Number of obs   =
504
-------------+----------------------------------   F(7, 496)       =
7.09
       Model |  7.23357851         7  1.03336836   Prob > F        =
0.0000
```

```
    Residual |  72.3199929       496  .145806437   R-squared       =
0.0909
-------------+----------------------------------   Adj R-squared   =
0.0781
       Total |  79.5535714       503  .158158194   Root MSE        =
.38185

------------------------------------------------------------------------------
ngf3_incroutp~m |      Coef.   Std. Err.      t    P>|t|     [95% Conf.
Interval]
----------------+-------------------------------------------------------------
   h4a_mktindm1 |   .2300725   .0347802     6.62   0.000     .1617378
.2984073
 k8_finaccessdm |  -.0331364   .0557398    -0.59   0.552    -.1426516
.0763788
ngd9_exptsubsdm |  -.1469567   .1938904    -0.76   0.449    -.5279045
.233991
        entsize |    .004839   .0044641     1.08   0.279     -.003932
.0136099
  entsizsquared |  -.0000531   .0000966    -0.55   0.583    -.0002429
.0001367
    b7_ownexper |   .0022779   .0018392     1.24   0.216    -.0013357
.0058915
a15a3_owngendum |   .1024102   .0540871     1.89   0.059    -.0038578
.2086782
          _cons |   .5990527   .0455349    13.16   0.000     .5095877
.6885178
------------------------------------------------------------------------------
=======================================
* Geary Non Normality LM Runs Test   *
=======================================
    Ho: Normality in Error Distribution
    Ha: Non Normality in Error Distribution

    LM Test      =  -0.6518
    DF Chi2      =        2
    Prob. > Chi2 =   0.7219

. *Residuals are normally distributed
.
. *Multicollinearity test
. collin ngf3_incroutpdddm h4a_mktindm1 k8_finaccessdm ngd9_exptsubsdm
entsize entsizsquared b7_ownexper a15a3_owngendum
(obs=504)

  Collinearity Diagnostics

                       SQRT                   R-
  Variable      VIF     VIF    Tolerance    Squared
----------------------------------------------------
ngf3_incroutpdddm      1.10    1.05    0.9091      0.0909
h4a_mktindm1      1.11    1.06    0.8974      0.1026
k8_finaccessdm      1.01    1.01    0.9888      0.0112
ngd9_exptsubsdm      1.02    1.01    0.9763      0.0237
   entsize      5.46    2.34    0.1832      0.8168
entsizsquared      5.44    2.33    0.1839      0.8161
b7_ownexper      1.04    1.02    0.9655      0.0345
a15a3_owngendum      1.04    1.02    0.9641      0.0359
----------------------------------------------------
  Mean VIF      2.15
```

```
                        Cond
        Eigenval        Index
---------------------------------
    1     4.4331        1.0000
    2     1.1139        1.9950
    3     0.9829        2.1237
    4     0.8861        2.2368
    5     0.8381        2.2999
    6     0.3854        3.3916
    7     0.2084        4.6125
    8     0.1032        6.5532
    9     0.0489        9.5206
---------------------------------
 Condition Number         9.5206
 Eigenvalues & Cond Index computed from scaled raw sscp (w/ intercept)
 Det(correlation matrix)    0.1573

.
. *Asbence of multicollinearity problems
.
. *Organisational Innovation:
.
. *Heteroskedasticity test
.
. * Glejser Lagrange Multiplier Heteroscedasticity Test (for all models)
lmhgl
. lmhgl ngf3_incroutpdddm h5_orgindum k8_finaccessdm ngd9_exptsubsdm
entsize entsizsquared b7_ownexper a15a3_owngendum

      Source |       SS           df       MS      Number of obs   =
504
-------------+----------------------------------   F(7, 496)       =
4.89
       Model |   5.1377285         7  .733961215   Prob > F        =
0.0000
    Residual |  74.4158429       496  .150031941   R-squared       =
0.0646
-------------+----------------------------------   Adj R-squared   =
0.0514
       Total |  79.5535714       503  .158158194   Root MSE        =
.38734

------------------------------------------------------------------------------
--------
ngf3_incroutp~m |      Coef.   Std. Err.      t    P>|t|     [95% Conf.
Interval]
----------------+-------------------------------------------------------------
--------
    h5_orgindum |   .1896908   .0354969     5.34   0.000      .119948
.2594335
 k8_finaccessdm |  -.0668017   .0572237    -1.17   0.244    -.1792325
.045629
ngd9_exptsubsdm |  -.1514702   .1967807    -0.77   0.442    -.5380967
.2351563
        entsize |     .00455   .0045313     1.00   0.316     -.004353
.0134529
  entsizsquared |  -.0000522    .000098    -0.53   0.595    -.0002447
.0001403
    b7_ownexper |   .0020753   .0018653     1.11   0.266    -.0015896
.0057403
a15a3_owngendum |   .0843637   .0546595     1.54   0.123     -.023029
.1917563
```

```
          _cons |   .6555401    .043875    14.94   0.000     .5693362
.7417439
------------------------------------------------------------------------------
--------
================================================================================
=====
* OLS Glejser Lagrange Multiplier Heteroscedasticity Test
================================================================================
=====
 Ho: No Heteroscedasticity - Ha: Heteroscedasticity

    Glejser LM Test           =  143.14648
    Degrees of Freedom        =        7.0
    P-Value > Chi2(7)         =    0.00000

.
. *There is no heteroscedasticity problem
.
. * Geary Non Normality LM Runs Test
. lmngr ngf3_incroutpdddm h5_orgindum k8_finaccessdm ngd9_exptsubsdm
entsize entsizsquared b7_ownexper a15a3_owngendum

      Source |       SS           df       MS      Number of obs   =
504
-------------+----------------------------------   F(7, 496)       =
4.89
       Model |   5.1377285         7  .733961215   Prob > F        =
0.0000
    Residual |  74.4158429       496  .150031941   R-squared       =
0.0646
-------------+----------------------------------   Adj R-squared   =
0.0514
       Total |  79.5535714       503  .158158194   Root MSE        =
.38734

------------------------------------------------------------------------------
--------
ngf3_incroutp~m |      Coef.   Std. Err.      t    P>|t|     [95% Conf.
Interval]
----------------+-------------------------------------------------------------
--------
    h5_orgindum |   .1896908   .0354969     5.34   0.000      .119948
.2594335
 k8_finaccessdm |  -.0668017   .0572237    -1.17   0.244    -.1792325
.045629
ngd9_exptsubsdm |  -.1514702   .1967807    -0.77   0.442    -.5380967
.2351563
        entsize |     .00455   .0045313     1.00   0.316     -.004353
.0134529
  entsizsquared |  -.0000522    .000098    -0.53   0.595    -.0002447
.0001403
    b7_ownexper |   .0020753   .0018653     1.11   0.266    -.0015896
.0057403
a15a3_owngendum |   .0843637   .0546595     1.54   0.123     -.023029
.1917563
          _cons |   .6555401    .043875    14.94   0.000     .5693362
.7417439
------------------------------------------------------------------------------
--------
======================================
* Geary Non Normality LM Runs Test   *
======================================
    Ho: Normality in Error Distribution
```

```
    Ha: Non Normality in Error Distribution

    LM Test      =  -0.7222
    DF Chi2      =         2
    Prob. > Chi2 =    0.6969

. *Residuals are normally distributed
.
. *Multicollinearity test
. collin ngf3_incroutpdddm h5_orgindum k8_finaccessdm ngd9_exptsubsdm
entsize entsizsquared b7_ownexper a15a3_owngendum
(obs=504)

  Collinearity Diagnostics

                       SQRT                   R-
  Variable      VIF     VIF    Tolerance    Squared
----------------------------------------------------
ngf3_incroutpdddm      1.07    1.03    0.9354      0.0646
h5_orgindum      1.11    1.05    0.9017      0.0983
k8_finaccessdm      1.04    1.02    0.9634      0.0366
ngd9_exptsubsdm      1.03    1.01    0.9752      0.0248
   entsize      5.46    2.34    0.1830      0.8170
entsizsquared      5.44    2.33    0.1839      0.8161
b7_ownexper      1.03    1.02    0.9664      0.0336
a15a3_owngendum      1.03    1.01    0.9737      0.0263
----------------------------------------------------
  Mean VIF      2.15

                        Cond
        Eigenval        Index
---------------------------------
    1     4.3585          1.0000
    2     1.1161          1.9761
    3     0.9780          2.1110
    4     0.8945          2.2074
    5     0.8101          2.3196
    6     0.4535          3.1002
    7     0.2370          4.2885
    8     0.1032          6.4987
    9     0.0491          9.4246
---------------------------------
 Condition Number         9.4246
 Eigenvalues & Cond Index computed from scaled raw sscp (w/ intercept)
 Det(correlation matrix)    0.1581

.
. *Asbence of multicollinearity problems
.
.
.
. *logistic ngf3_incroutpdddm h1_prodinndm k8_finaccessdm ngd9_exptsubsdm
entsize entsizsquared b7_ownexper a15a3_owngendum, vce(robust)
. *logistic ngf3_incroutpdddm h3_procindm1 k8_finaccessdm ngd9_exptsubsdm
entsize entsizsquared b7_ownexper a15a3_owngendum, vce(robust)
. *logistic ngf3_incroutpdddm h6_mktindm2 k8_finaccessdm ngd9_exptsubsdm
entsize entsizsquared b7_ownexper a15a3_owngendum, vce(robust)
. *logistic ngf3_incroutpdddm h5_orgindum k8_finaccessdm ngd9_exptsubsdm
entsize entsizsquared b7_ownexper a15a3_owngendum, vce(robust)
.
.
. *h1_prodinndm h3_procindm1 h4b_procindm2 h4a_mktindm1 h6_mktindm2
h5_orgindum k8_finaccessdm ngd9_exptsubsdm entsize b7_ownexper a15a3_owng
```

```
> endum
. *f1_entoutput ngf3_incroutpdddm
.
. APPENDICE V.
Robust Logistic Regression Results for Performance Models of
Disaggregated sample.
. *Performance Model for Qualitative Measure for the disaggregated
sample:

. *Innovation Model:
.
. *Product Innovation:
.
. by a6a_entpscal2, sort: logistic ngf3_incroutpdddm h1_prodinndm
k8_finaccessdm ngd9_exptsubsdm entsize entsizsquared b7_ownexper
a15a3_owng
> endum, vce(robust)

-------------------------------------------------------------------------------
-------------------------------------------------------------------
-> a6a_entpscal2 = 1
note: ngd9_exptsubsdm != 0 predicts success perfectly
      ngd9_exptsubsdm dropped and 1 obs not used


Logistic regression                                     Number of obs     =
143
                                                        Wald chi2(6)      =
26.90
                                                        Prob > chi2       =
0.0002
Log pseudolikelihood = -57.939949                       Pseudo R2         =
0.2112

------------------------------------------------------------------------------
----------
                     |               Robust
ngf3_incroutpdddm | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
---------------------+--------------------------------------------------------
----------
     h1_prodinndm |    9.23675   5.495367     3.74   0.000     2.878063
29.64409
   k8_finaccessdm |   .7547662   .6115269    -0.35   0.728     .1542239
3.693798
  ngd9_exptsubsdm |          1  (omitted)
          entsize |   1.367625    .763823     0.56   0.575     .4576868
4.086635
    entsizsquared |    .975495   .1337608    -0.18   0.856     .7456027
1.27627
      b7_ownexper |   1.063926   .0276529     2.38   0.017     1.011084
1.119529
  a15a3_owngendum |   2.623559   2.186182     1.16   0.247     .5123825
13.43345
            _cons |   .3935533   .2137345    -1.72   0.086     .1357455
1.14099
------------------------------------------------------------------------------
----------

-------------------------------------------------------------------------------
-------------------------------------------------------------------
-> a6a_entpscal2 = 2
note: ngd9_exptsubsdm != 0 predicts success perfectly
```

```
      ngd9_exptsubsdm dropped and 2 obs not used


Logistic regression                               Number of obs     =
303
                                                  Wald chi2(6)      =
20.88
                                                  Prob > chi2       =
0.0019
Log pseudolikelihood = -140.22366                 Pseudo R2         =
0.0701

------------------------------------------------------------------------------
-----------
                  |               Robust
ngf3_incroutpdddm | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
------------------+-----------------------------------------------------------
-----------
     h1_prodinndm |   3.030546   .9358298     3.59   0.000     1.654514
5.550998
   k8_finaccessdm |   .6224102   .2814882    -1.05   0.294     .2565171
1.510209
  ngd9_exptsubsdm |          1  (omitted)
          entsize |    1.48285   .3260192     1.79   0.073     .9637231
2.281615
    entsizsquared |   .9853073   .0097857    -1.49   0.136     .9663132
1.004675
      b7_ownexper |   1.004469   .0161456     0.28   0.781     .9733179
1.036618
  a15a3_owngendum |   1.645215   .8666409     0.95   0.345     .5859218
4.619611
            _cons |   .2784769   .2907565    -1.22   0.221     .0359794
2.155385
------------------------------------------------------------------------------
-----------

------------------------------------------------------------------------------
-------------------------------------------------------------------------
-> a6a_entpscal2 = 3
note: ngd9_exptsubsdm != 0 predicts failure perfectly
      ngd9_exptsubsdm dropped and 1 obs not used


Logistic regression                               Number of obs     =
54
                                                  Wald chi2(6)      =
12.90
                                                  Prob > chi2       =
0.0446
Log pseudolikelihood = -16.019074                 Pseudo R2         =
0.2928

------------------------------------------------------------------------------
-----------
                  |               Robust
ngf3_incroutpdddm | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
------------------+-----------------------------------------------------------
-----------
     h1_prodinndm |   9.820024   9.649311     2.32   0.020     1.431227
67.37778
```

```
   k8_finaccessdm |   .1139668   .1376427    -1.80   0.072     .0106843
1.215659
  ngd9_exptsubsdm |          1  (omitted)
          entsize |   .4274589   .2325623    -1.56   0.118     .1471606
1.241644
    entsizsquared |   1.014338   .0089989     1.60   0.109     .9968526
1.032129
      b7_ownexper |   .9383755   .0345573    -1.73   0.084      .873031
1.008611
  a15a3_owngendum |    1.63577   1.497385     0.54   0.591     .2719767
9.838132
            _cons |   877549.8    7001724     1.72   0.086     .1418317
5.43e+12
------------------------------------------------------------------------------
----------
Note: 0 failures and 1 success completely determined.

.

. *Process Innovation 1:
.
.
. by a6a_entpscal2, sort: logistic ngf3_incroutpdddm h3_procindm1
k8_finaccessdm ngd9_exptsubsdm entsize entsizsquared b7_ownexper
a15a3_owng
> endum, vce(robust)

------------------------------------------------------------------------------
-------------------------------------------------------------------
-> a6a_entpscal2 = 1
note: ngd9_exptsubsdm != 0 predicts success perfectly
      ngd9_exptsubsdm dropped and 1 obs not used


Logistic regression                               Number of obs     =
143
                                                  Wald chi2(6)      =
15.48
                                                  Prob > chi2       =
0.0168
Log pseudolikelihood = -66.051978                 Pseudo R2         =
0.1008

------------------------------------------------------------------------------
----------
                  |               Robust
ngf3_incroutpdddm | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
------------------+-----------------------------------------------------------
----------
     h3_procindm1 |   2.504593   1.235917     1.86   0.063     .9521455
6.588267
   k8_finaccessdm |   1.384264   1.050833     0.43   0.668      .312643
6.128995
  ngd9_exptsubsdm |          1  (omitted)
          entsize |   1.096809   .5943963     0.17   0.865     .3791726
3.172668
    entsizsquared |   .9996692   .1238528    -0.00   0.998     .7841474
1.274427
      b7_ownexper |   1.054858   .0293885     1.92   0.055     .9988025
1.11406
  a15a3_owngendum |   2.421781   1.983474     1.08   0.280      .486394
12.05817
```

```
            _cons |   .8537065   .4535027    -0.30   0.766     .3013953
2.418136
------------------------------------------------------------------------------
----------

------------------------------------------------------------------------------
-------------------------------------------------------------------
-> a6a_entpscal2 = 2
note: ngd9_exptsubsdm != 0 predicts success perfectly
      ngd9_exptsubsdm dropped and 2 obs not used


Logistic regression                               Number of obs     =
303
                                                  Wald chi2(6)      =
22.05
                                                  Prob > chi2       =
0.0012
Log pseudolikelihood = -139.29606                 Pseudo R2         =
0.0762

------------------------------------------------------------------------------
----------
                     |               Robust
ngf3_incroutpdddm | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
---------------------+--------------------------------------------------------
----------
     h3_procindm1 |   3.256431   .9975714     3.85   0.000     1.786429
5.936056
   k8_finaccessdm |   .6527285   .3108413    -0.90   0.370     .2566698
1.659932
  ngd9_exptsubsdm |          1  (omitted)
          entsize |   1.522304   .3271207     1.96   0.051     .9990579
2.319594
    entsizsquared |    .984127   .0095521    -1.65   0.099     .9655822
1.003028
      b7_ownexper |   1.004871   .0162982     0.30   0.765     .9734291
1.037328
  a15a3_owngendum |   1.707055    .886022     1.03   0.303      .617225
4.721188
            _cons |   .2330617   .2398757    -1.42   0.157     .0310015
1.7521
------------------------------------------------------------------------------
----------

------------------------------------------------------------------------------
-------------------------------------------------------------------
-> a6a_entpscal2 = 3
note: ngd9_exptsubsdm != 0 predicts failure perfectly
      ngd9_exptsubsdm dropped and 1 obs not used


Logistic regression                               Number of obs     =
54
                                                  Wald chi2(6)      =
12.06
                                                  Prob > chi2       =
0.0607
Log pseudolikelihood =  -16.18157                 Pseudo R2         =
0.2856
```

```
------------------------------------------------------------------------------
                 |               Robust
ngf3_incroutpdddm | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
-----------------+------------------------------------------------------------
     h3_procindm1 |   9.617211    8.83389     2.46   0.014     1.589198
58.19965
   k8_finaccessdm |   .0654091   .0934154    -1.91   0.056     .0039809
1.074728
  ngd9_exptsubsdm |          1  (omitted)
          entsize |   .3263541   .1792132    -2.04   0.041     .1112404
.9574487
    entsizsquared |   1.018764   .0092608     2.05   0.041     1.000774
1.037077
      b7_ownexper |   .9646114   .0414685    -0.84   0.402     .8866647
1.04941
  a15a3_owngendum |   2.066162   2.241308     0.67   0.504     .2464945
17.31894
            _cons |   2.40e+07   1.92e+08     2.12   0.034     3.655706
1.57e+14
------------------------------------------------------------------------------
Note: 0 failures and 1 success completely determined.

.
.
. *Marketing Innovation 1:
.
.
. by a6a_entpscal2, sort: logistic ngf3_incroutpdddm h6_mktindm2
k8_finaccessdm ngd9_exptsubsdm entsize entsizsquared b7_ownexper
a15a3_ownge
> ndum, vce(robust)

------------------------------------------------------------------------------
-------------------------------------------------------------------------------
-> a6a_entpscal2 = 1
note: ngd9_exptsubsdm != 0 predicts success perfectly
      ngd9_exptsubsdm dropped and 1 obs not used


Logistic regression                               Number of obs     =
143
                                                  Wald chi2(6)      =
17.96
                                                  Prob > chi2       =
0.0063
Log pseudolikelihood =  -63.76052                 Pseudo R2         =
0.1320

------------------------------------------------------------------------------
                 |               Robust
ngf3_incroutpdddm | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
-----------------+------------------------------------------------------------
      h6_mktindm2 |   3.604278   1.672359     2.76   0.006     1.451666
8.9489
   k8_finaccessdm |   1.346193   1.024353     0.39   0.696     .3029747
5.981477
```

```
  ngd9_exptsubsdm |          1  (omitted)
          entsize |   1.563084   .8633439     0.81   0.419     .5294624
4.614552
    entsizsquared |   .9286529   .1182454    -0.58   0.561     .7235522
1.191892
      b7_ownexper |   1.059339   .0301002     2.03   0.042     1.001957
1.120008
  a15a3_owngendum |   2.260914   1.891423     0.98   0.329     .4387231
11.65138
            _cons |   .5019411   .2995581    -1.15   0.248     .1558319
1.616774
------------------------------------------------------------------------------
----------

------------------------------------------------------------------------------
----------------------------------------------------------------------
-> a6a_entpscal2 = 2
note: ngd9_exptsubsdm != 0 predicts success perfectly
      ngd9_exptsubsdm dropped and 2 obs not used


Logistic regression                               Number of obs     =
303
                                                  Wald chi2(6)      =
29.94
                                                  Prob > chi2       =
0.0000
Log pseudolikelihood = -134.05906                 Pseudo R2         =
0.1109

------------------------------------------------------------------------------
----------
                    |               Robust
ngf3_incroutpdddm | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
--------------------+---------------------------------------------------------
----------
      h6_mktindm2 |   4.724301   1.505922     4.87   0.000     2.529344
8.824035
   k8_finaccessdm |   .6420768   .3048736    -0.93   0.351     .2531721
1.628389
  ngd9_exptsubsdm |          1  (omitted)
          entsize |   1.483211   .3174529     1.84   0.065     .9750333
2.256245
    entsizsquared |   .9850139   .0096034    -1.55   0.121     .9663702
1.004017
      b7_ownexper |   1.016097    .017337     0.94   0.349     .9826793
1.050652
  a15a3_owngendum |     1.8142   1.026693     1.05   0.293     .5983745
5.500439
            _cons |   .1896913   .1994064    -1.58   0.114     .0241686
1.488825
------------------------------------------------------------------------------
----------

------------------------------------------------------------------------------
----------------------------------------------------------------------
-> a6a_entpscal2 = 3
note: ngd9_exptsubsdm != 0 predicts failure perfectly
      ngd9_exptsubsdm dropped and 1 obs not used
```

```
Logistic regression                               Number of obs     =
54
                                                  Wald chi2(6)      =
11.57
                                                  Prob > chi2       =
0.0722
Log pseudolikelihood = -17.291983                 Pseudo R2         =
0.2366

------------------------------------------------------------------------------
             |               Robust
ngf3_incroutpdddm | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
-------------+----------------------------------------------------------------
      h6_mktindm2 |   4.988184   4.329455     1.85   0.064     .9102252
27.33607
   k8_finaccessdm |   .0801524   .0975342    -2.07   0.038     .0073811
.8703817
  ngd9_exptsubsdm |          1  (omitted)
          entsize |   .4473128   .2059548    -1.75   0.081     .1814242
1.102878
    entsizsquared |   1.013796   .0074687     1.86   0.063     .9992627
1.028541
      b7_ownexper |   .9590845   .0369348    -1.08   0.278     .8893582
1.034277
  a15a3_owngendum |   1.887583   1.733854     0.69   0.489     .3119093
11.4231
            _cons |   361512.1    2596755     1.78   0.075     .2779137
4.70e+11
------------------------------------------------------------------------------
Note: 0 failures and 1 success completely determined.

.
.
.  *Organisational Innovation:
.
.
. by a6a_entpscal2, sort: logistic ngf3_incroutpdddm h5_orgindum
k8_finaccessdm ngd9_exptsubsdm entsize entsizsquared b7_ownexper
a15a3_owngе
> ndum, vce(robust)

------------------------------------------------------------------------------
-------------------------------------------------------------------------------
-> a6a_entpscal2 = 1
note: ngd9_exptsubsdm != 0 predicts success perfectly
      ngd9_exptsubsdm dropped and 1 obs not used


Logistic regression                               Number of obs     =
143
                                                  Wald chi2(6)      =
15.12
                                                  Prob > chi2       =
0.0193
Log pseudolikelihood = -65.723787                 Pseudo R2         =
0.1053

------------------------------------------------------------------------------
```

```
                  |               Robust
ngf3_incroutpdddm | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
------------------+------------------------------------------------------------
----------
      h5_orgindum |   2.691287   1.291608     2.06   0.039     1.050629
6.893987
   k8_finaccessdm |   1.135863    .921509     0.16   0.875     .2316107
5.570488
  ngd9_exptsubsdm |          1  (omitted)
          entsize |   1.362749   .7108552     0.59   0.553     .4902313
3.788183
    entsizsquared |   .9621606   .1186364    -0.31   0.754     .7556013
1.225187
      b7_ownexper |    1.05786   .0310778     1.91   0.056      .998669
1.120559
  a15a3_owngendum |   3.100942   2.455338     1.43   0.153     .6569148
14.63788
            _cons |   .7131351   .3752778    -0.64   0.521     .2542368
2.000347
------------------------------------------------------------------------------
----------

------------------------------------------------------------------------------
-------------------------------------------------------------------
-> a6a_entpscal2 = 2
note: ngd9_exptsubsdm != 0 predicts success perfectly
      ngd9_exptsubsdm dropped and 2 obs not used


Logistic regression                               Number of obs     =
303
                                                  Wald chi2(6)      =
22.15
                                                  Prob > chi2       =
0.0011
Log pseudolikelihood = -137.86623                 Pseudo R2         =
0.0857

------------------------------------------------------------------------------
----------
                  |               Robust
ngf3_incroutpdddm | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
------------------+------------------------------------------------------------
----------
      h5_orgindum |   4.202874   1.565802     3.85   0.000     2.025009
8.722998
   k8_finaccessdm |   .5681245   .2789916    -1.15   0.250     .2169901
1.487466
  ngd9_exptsubsdm |          1  (omitted)
          entsize |   1.486729    .332194     1.77   0.076     .9594888
2.303689
    entsizsquared |   .9842772   .0099645    -1.57   0.117     .9649395
1.004002
      b7_ownexper |   1.008506   .0160945     0.53   0.596     .9774493
1.040549
  a15a3_owngendum |   1.536553    .853619     0.77   0.439     .5172131
4.564838
            _cons |   .3224998   .3429326    -1.06   0.287     .0401234
2.592155
------------------------------------------------------------------------------
----------
```

```
------------------------------------------------------------------------------
-------------------------------------------------------------------------
-> a6a_entpscal2 = 3
note: ngd9_exptsubsdm != 0 predicts failure perfectly
      ngd9_exptsubsdm dropped and 1 obs not used


Logistic regression                               Number of obs     =
54
                                                  Wald chi2(6)      =
11.45
                                                  Prob > chi2       =
0.0755
Log pseudolikelihood = -17.124697                 Pseudo R2         =
0.2440

------------------------------------------------------------------------------
----------
                     |               Robust
ngf3_incroutpdddm | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf.
Interval]
---------------------+--------------------------------------------------------
----------
      h5_orgindum |   6.265179    5.91565     1.94   0.052     .9845091
39.87009
   k8_finaccessdm |   .0886005   .1065734    -2.01   0.044     .0083862
.936068
  ngd9_exptsubsdm |          1  (omitted)
          entsize |   .4192088   .2465754    -1.48   0.139     .1323611
1.327702
    entsizsquared |   1.014893   .0098913     1.52   0.129     .9956906
1.034466
      b7_ownexper |   .9694251   .0336989    -0.89   0.372     .9055762
1.037776
  a15a3_owngendum |    3.06851   2.727544     1.26   0.207     .5374147
17.52046
            _cons |   773550.7    6791834     1.54   0.123     .0259941
2.30e+13
------------------------------------------------------------------------------
----------
Note: 0 failures and 1 success completely determined.

.
.
end of do-file
```