



**KAUNAS UNIVERSITY OF TECHNOLOGY  
SCHOOL OF ECONOMICS AND BUSINESS**

**Collins Odiakachi Osanebi**

**INNOVATIONS IN SMALL AND MEDIUM AUTOMOBILE  
COMPANIES**

Final Master Thesis

**Supervisor**

Prof. dr. Vilmantė Kumpikaitė-Valiūnienė

**Kaunas, 2017**

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**Technology Management (621N20032)**

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Prof. dr. Vilmantė Kumpikaitė-Valiūnienė

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**Reviewer**

Doc. Mantas Vilkas

2017-05-10

**Project made by (signature)**

Collins Odiakachi Osanebi

2017-05-10

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KAUNAS UNIVERSITY OF TECHNOLOGY  
School of Economics and Business

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Collins Odiakachi Osanebi

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Technology Management 621N20032

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Innovations in Small and Medium Automobile Companies

**DECLARATION OF ACADEMIC INTEGRITY**

10 May 2017

Kaunas

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## SUMMARY

Automobile companies are constantly increasing over the years, considering ergonomic factors consumers demand for safer, reliable, and more comfortable vehicles with less weight, and, less fuel consumption in other to control pollution from fossil fuel. There has been great shift in 21st century as new technologies emerges, key players have been able to achieve remarkable results with most current technologies developments, which disrupt traditional automobile companies by adopting new technologies effectively.

**The purpose of the thesis:** To highlight innovations' impact on small and medium automobile companies.

Empirical study by quantitative analysis in two automobile companies (Innoson motors in Nigeria and UAB Autotoja in Lithuania) was developed to reach the purpose.

**The outcome of the thesis:** Theoretical model for evaluation of innovations in small and medium automobile companies, including innovations types, benefits and barriers, which companies face during innovation implementation, was constructed. Based on scientific literature analysis theoretical model for evaluation of innovations in small and medium automobile companies was constructed. Conducted study revealed, innovations have the lowest benefit on employee's satisfaction (mean 4.15) based on respondents' answers. As the main barriers of innovations implementation lack of intellectual property rights (mean 46.4 - Environmental factor), access to finance (mean 42.9 - External factor), technical know-how (mean 42.9 - Internal factor) and inexperienced personals (mean 35.7 – Skills) were highlighted analyzed companies.

The main limitation of this study should be highlighted a small sample of respondents participated in this research. Due to differences in language, just 8 persons from UAB "Autotoja" could take part in interview. In addition, a study with Nigerian company was provided via Skype. This issue decreased number of responses too.

The thesis consists of seventy (70) pages, excluding annexes. Seventeen (17) tables, fifteen (15) figures, were used to illustration for better understanding in this thesis.

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## INTRODUCTION

Automobile companies are constantly increasing over the years, considering ergonomic factors consumers demand for safer, reliable, and more comfortable vehicles with less weight, and, less fuel consumption in order to control pollution from fossil fuel. There has been great shift in 21st century as new technologies emerge, key players have been able to achieve remarkable results with most current technologies developments, which disrupt traditional automobile companies by adopting new technologies effectively. Top managers and leaders of several automobile companies embrace digital technology as part of their core processes in manufacturing of vehicles. Large scale production in automobile industries is more popular, small and medium enterprises (SMEs) are not adequately considered, which does not encourage SMEs to engage and benefit from most recent technological advances. There is margin for electric cars and biofuel today, higher fuel consumption in 1970s and 1980s the price of fuel varies while the price of gas is lower, the industry offer different design, brands and technologies, vehicles with good fuel economy in north America is likely to be smaller and cheaper and demanded mostly for consumers with less income.

The concern for fuel consumption has been increased, CO<sub>2</sub> emissions associated with automobiles. European union (EU) countries, automobile manufacturing association had agreement with manufacturers in the mid-1990s, to reduce emission per kilometre of new cars by 20% between 1998 and 2008 but manufacturers failed to reach that goal of 140 g/km, 2009 data suggest new cars achieved a reduction to 145.6 g/km (ADEME, 2010). Japan has similar program called “Top Runners” in 1998 (IEA, 2000). The United States standards regarding carbon dioxide (CO<sub>2</sub>) emissions reduction (EPA, 2010a,) as industrialized country are more focused on the performance of light duty vehicles, since oil prices increase in 2002 sending road fuel prices in USA is up unto 100% by 2008 and 40% in Europe and Japan. Higher price increase in fuel leads to political debate, similar issues in Nigeria and Algeria, two of the three other African members of OPEC (Karpukhin, 2014) experience similar challenges of fuel price increase. For example, this issue lead to concerns of climate change reaction by US, EU, and Japanese’s authorities (Fontaras and Samaras, 2010; METI, 2010).

Global vehicle production expected to increase from 88.7 million in 2015 to more than 110 million units by 2025, (Spinks, 2016). One of the major challenges the automobiles industry is facing today is how to reduce the weight of the vehicle that roll out of the production line, also focus on fuel efficiency and reduce Carbon dioxide emission. Innovative technologies will help meet demand future automobile requirement for small and medium enterprises. Climate change has affected manufacturing of automobiles and companies try to reduce the emissions of CO<sub>2</sub> through innovative technology, in recent years most companies have developed reducing Carbon dioxide in their manufacturing process through innovation, which are characterised by modification of product components and continuous innovation in future is necessary to achieve clean technology.

In recent years, small and medium enterprises (SMEs) influenced economic growth of many nations positively. SMEs provide job opportunities across the country also act as supply chain for large organization with the aid of innovation technologies to improve quality of manufacturing processes in the automobile industries and, produce and render services at affordable prices. SMEs try to explore technological infrastructure to enhance production for customers and to final consumers, it is important to become competitive to meet with globalisation challenges in other to produce quality product within a given period, to meet market requirements for goods and achieve required profit. Problem arises in SMEs sector because of Inadequate technical knowhow, lack of information, innovative idea and implementation of ideas in the right direction and right source, most companies also lack capital for infrastructure, having the right knowledge and profession skills would enhance the growth of SMEs. In a market condition, research can help improve product quality which is crucial for company progress in term of production in automobile companies in other to achieve high customer's satisfaction.

In this project, the impact of innovations to small and medium companies is evaluated and various ways SMEs can harness innovation and benefit from innovative technologies in production processes. It is difficult for SMEs to achieve their desired goal without adequate knowledge of innovation.

**The fundamental problem of the thesis:** What are the areas local automobile companies can improve production processes in other to meet up with globalisation challenges? Innovative technologies will help small and medium enterprises enhance production processes, increase competitiveness to business and public sector organization, create employment and boost economic growth. The idea of this thesis is based on research to gain top manager opinion towards innovation in SMEs which is a road map for companies and value added to production process in other to achieve desired goal.

**The purpose of the thesis:** To highlight innovations' impact on small and medium automobile companies.

**Objectives of this thesis:**

- To disclose types of innovations in automobile SME;
- To expose barriers and benefits of innovations' implementation in organizations;
- To propose model for innovations impact's evaluation on small and medium automobile companies.
- To evaluate innovations impact on small and medium automobile companies in two selected companies.

**Research method:** Quantitative research methods were used to gain insight on how local companies engage in innovative technology. In addition, structural analysis of scientific literature, and graphical modelling result of research analysed using Microsoft excel and SPSS software.

# **1. PROBLEM ANALYSIS ON INNOVATIONS IMPLEMENTATION IN AUTOMOBILE COMPANIES**

Small and medium-sized enterprises face globalization challenges in development and professionalism. As technology advances, people create new high-tech devices and cutting edge software which is introduced to companies basically, every year. Innovation would help small and medium enterprises increase competitiveness to business and public sector organization. And, add value to products. Several strategies are being implanted to boost production and economic growth in developing countries. Disruptive technological help minimise waste of time and effort in the value chain and increases accessibility, production, and marketability of local companies.

The impact of disruptive process in automobile will enhance vehicle performance improve its quality and safety. But also, social concern in our society is very important and significant to note during production. In other to tackle some of these problems in our society we need to make practical and effective use of innovative technology in local companies in manufacturing which helps market openness. Innovative technologies in automobile manufacturing include, sensor technology, autonomous cars, autopilot systems, advanced dashboards (customizable digital panels), video mirrors, turbo downsizing (smaller engines) more performance, parental controls, driver override safety systems, advanced lighting (LED headlights), vehicle to vehicle communication and vehicle and infrastructure communication and SMEs has not been able to engage effectively in modern technologies.

Innovative technologies in car manufacturing would ensure quality and safety of vehicle. Companies strive to reduce pollution and manufacture safer and more reliable product that is more efficient, and cost effective this means that the final product must have all functions and specifications for smart product. Vehicle would also be integrated with modern technological functions, is important for manufacturers to meet the standards and laws governing car manufacturing process and observe necessary protocol and government policies. In most countries, e.g. developing countries SMEs automobile manufacturing companies lack adequate facilities because of insufficient funding, inadequate capital become a measure issue in development of local companies, they strive to gain reputation but lack government support and research medium are limited. Lack of innovation has made it difficult for companies to engage in disruptive process in other to boost manufacturing and enhance production of vehicles.

Through the years, car manufacturers have been able to use innovative technologies to make (vehicles) more convenient for environment purposes. Technological advancements in the fields automotive, design processes, etc., have radically changed the outlook of automobile industries, improving productivity and highly competitive industries which is even more evident in the continuous development of vehicle with smart functions. Although, local companies have not been able to tap into



this opportunity in manufacturing process, they have limitation in technological devices, there is not enough access to finance and lack capacity to compete globally.

There is high demand for innovations all over the world, and inability of SMEs to tap into adequate funding limit their abilities. SMEs make up 90 to 95 % of all firms worldwide, almost 50 percent of world gross domestic product also provide about 70% of employment of the economy 25 % of small companies and 40 percent of medium-sized companies in least-developed countries have bank accounts, in Latin America, and East and Central Asia are better prepared to compete globally than in Asia and sub-Saharan Africa (Gonzalez, 2015). Demand for more innovative cars is faster which will encourage innovative technologies to fill and improve the standard of manufacturing processes. The aim of this thesis is to reveal the importance of innovation in small and medium enterprises, with specific interest in automobile industries how they can benefit from disruptive technologies.

This research will examine the problems and facing small and medium companies and elaborate way they can benefit from innovative technologies in terms of productivity and competitiveness, as they are behind and smaller than the large automotive companies by a wide margin which implies high rate of poverty because of low production capabilities, also low wages and terrible working conditions which affect purchasing power of an economy. The gap in productivity between SMEs and large firms is higher in developing countries and this research tend to spot areas of improvement for SMEs. Also, in most developing countries companies lack awareness and research laboratories in other to improve their expertise. A lot of managers are confiding to their own ideas, thereby not eager to learn new innovative idea, no sense of versatility. It is important managers look across alternative to find solution to problems or learn from their environment, some of this factor restrict innovation.

Industrial globalization rise and increase in population increases pollution and hazardous substances from manufacturing processes, waste from metal such as hydrocarbons, metal ions, pesticide etc., which are harmful to human health over the past years government and several institution try to enact laws to control waste of production and the rate of pollution from toxic substances and chemicals which have negative influence to human and poses threat to environmental health .In recent years brought a significant change in automotive industries, but the problem is that the rate of accident brought a lot of concerns and also the rate of traffic congestion in big cities is high. What the future holds in automotive industries, major players engage in innovative advancement of electronics technologies which is the major process in manufacturing in other to solve complex problems customers nowadays care more about the infotainment technologies embedded in the dashboard of a vehicle, SMEs companies should follow the road map of larger enterprises in other to innovate. There is also increase in demand to develop vehicles with lighter weight, with more smart functions which is believed to be cost effective by consumers.

## **1.1. Situation analysis for SMEs automobile companies**

The market of automobile industry is increasing around the world and SMEs enterprises seek recognition to compete with larger automotive companies in order to benefit from high sales. Innovation is extremely important in developing countries due to the rise in the market demand worldwide, manufacturers are faced with several challenges which include meeting with social environment needs and how to stay in line of manufacturing on a long run. Technologies has significant impact in developing economy and lack of technological infrastructure limits the growth of any nation. Innovation have a great influence in every economy and helps every country to boost its gross domestic product (GDP), but the ability of small and medium companies to innovate is very low. In developing countries like Nigeria, China, India, and other part of the world (Eastern Europe) etc. automobile companies most especially SMEs are facing several challenges in manufacturing processes in order to make use of clean technology. SMEs performance is based on fuel prices, environmental and social issue, customers, and market behaviour, etc. In most case, there is no market for products that consume much energy, like cars with high engine capacity which consume fuel more fuel, the demand for such product might be low in most developing countries. Also, if cars emit more carbons there will be penalties because of government regulations to control pollution and emission of waste from fossil fuel.

Major players in the industries invest huge amount of money in research and development, some example of leading automotive industries like Toyota, Honda, GM, Ford, BMW, Daimler-Chrysler, Suzuki, Tata, Hyundai, etc. In 2008, North American Environmental Report, Toyota, vehicle makers, in USA spend an average of almost \$1 million an hour on research and development to develop the cars and technologies of the future (Brecard, 2011). Environmental pollution is the biggest challenges in automobile industries and how to control it (pollution) is a major issue the industries face. Therefore, major firms face cost and complication trying to reduce the social and environmental pressure, and yearly, firm's research aims to develop and improve their product which would be less harmful to human and natural environment. Nowadays, firms are moving and thinking beyond the conventional ways and adopting green initiatives in other words trying to offset greenhouse gases emitted by human being activities from industrial production processes, such as eco-production, green supply chain management, green innovation etc. to develop and implement such strategy, (Ar Ilker, 2012). Because of high fuel prices and increasing pollution from waste product e.g., carbon monoxide from burning of fossil fuel the automobile sector is a very significant concern both for customers and government (KPMG, 2010). In USA, pollution from carbon emissions accounts for 18% and they are planning to reduce to about %15 in 2035 (Congressional Budget Office, 2013). If companies pay taxes for pollution because of not producing according to government requirement and specifications in manufacturing processes, it also affect customers because the price for such commodity would be increased and customers will avoid such products.

## **1.2. Automobile companies' performance in different countries**

This study was designed for proper insight into some country SMEs automotive companies for developing country such as China. The Chinese automobile industry important component for national economy and for research and development, as the country is one of the fastest growing economy in the world today and automobile sector also depend on and supports the logistic and transport industry for growth and development. After the attainment of world trade organisation (WTO) the Chinese automobile industry experiences a significant growth. China automotive companies forecast 2006 to 2010, (Chinamet,2008) showed that vehicle production and sales in China had increased by 27% and 25% respectively in 2005, which contributed to fast economic growth and create avenue for national development. Although, it consumes large amount of energy and resources and affect the environment negatively with pollution from burning of fossil fuel. The rate of pollution is of great concern and reduction of environmental pollution is important to safe human from health problems. In terms of research, resources also help to develop in a general direction for science and technological development by means of strategic planning. Therefore, technological infrastructure applied to understanding the importance and a general direction within the automobile industry which have great potential benefits.

Also, there are some technology foresight on automobile of the most famous transport programme in UK which focus on development of new technologies for use in mass market vehicle which include making limited fuel resources, ensuring cars are safer and can avoid collisions, also development of environmentally friendly cars, and so on. (Taylor, 1998), this played an important role in transport policy (Kimberley 1997). The Chinese industrial evolution helped investors and global players to identify the most important opportunity rapidly changing market (Chinamet, 2008). This work on automobile contributed to industrial development, although only a few research on impact of technology in our environment which is not adequate and more researched should carried out to meet the ever-demanding need for total transformation in the industry.

Furthermore, works on new energy and innovation is lacking in local automobile industries and there is gap in research which SMEs should be able to engage in disruptive technology in other to fill this gap and make good use of resource available to explore potential which is the evolution and extension or modification. It is important to consider main ideas in other for local companies to engage in innovation, from most literature benchmark that is suitable for the development of SMEs to adopt is lacking and shows that there is no clear pattern for SMEs to follow in other to compete with big players in the industries. The major problem for SMEs are:

1. There are no tools available to support benchmarking (such as a structure and self-assessment tool, for SMEs etc.);
2. there are no enough resources for SMEs to collect the necessary data for evaluation; and
3. there is no generally accepted instrument for evaluation of manufacturing practices;

4. There are no adequate databases of manufacturing practices for companies (Sarkis,2001; Haksever, 1996; Voss et al., 1994).

This point clearly states the gap in current research and lack of development and evaluation pattern for SMEs. This means there is need for further research and evaluation of framework for SMEs to be able to engage in modern technologies. This study a new pattern is important which is hopefully will be of interest and suitable for considerable, more research should be carried out to become more effective and competitive in other for local companies to attain recognitions.

Considering the US manufacturing sector, it is better positioned to which is road map for most developing firms. Also, there is apparently rise in the economy GDP. Currently, the US is leading developed country in terms of automotive manufacturing in digital age because of its significant value and economic power, high productivity level although, have one of lowest wages in developed world, in comparison with China which is developing country but with fast rising wages. In other to manufacture a product, the cost of manufacturing is very important and serve as guideline for manufacturer to obtain conclusion. Future manufacturing will comprise of digital technology, electronics, social and mobile technologies also analytics. Top manufacturing companies must target best approach to gather useful information and policy makers must create enabling environment for digital manufacturing. It is important for companies to consider the following:

1. Get access to the right skills and boost productivity and innovation to create an enabling environment for the switch to the digital age.
2. Invest in supply chain analytics to optimize their global sourcing strategy.
3. Drive productivity and return on equity to attract capital investments for social and mobile technologies, as well as analytics.

Also, policy makers should be able to:

1. Address the gap in professionalism in local automotive manufacturing.
2. Also, help remove some policies that discourage SMEs like cooperate tax, regulatory and compliance cost.

In the USA, one of the developed economy in the world today, is well regarded as one of the leading automotive manufacturing for digital age, with its population and constant drive for productivity, competitive unit labour cost and higher in rank for innovation track record. It employs 19.5 million direct manufacturing jobs in 1979, manufacturing's current share represents a 40% loss. (Harleen, U.S. Bureau of Labour Statistics Research).

Automobile production in Nigeria are faced with so many challenges. These challenges which include lack of adequate innovation to boost production and can only be overcome when government implement and support production, to meet the demand of people, economic improvement, and technological development of the country.

## 2. THEORETICAL SOLUTIONS OF INNOVATION IN SMES AUTOMOBILE COMPANIES

### 2.1. Innovation and their importance for companies

Due to limitation of incremental changes in the car industries, many authors believe that changes in SMEs will only occur through radical transformation strategies which will improve its efficiency with changes in consumption or socio cultural patterns (Wells, Nieuwenhuis 1999), this has led to intensive research to find the solution in the stages of design in other to be innovative. Firstly, it would be product or process redesign which focus on technological improvement in automobile industry, in this case replacement of internal combustion engine of a vehicle with hybrid powertrain. The process design might involve the use of life circle assessment to determine the end of life of product and risk in other to use the appropriate design for recycle or disassembly initiative. Another stage of improvement of functions of automobile, which involve taking the unrevealed product function as a point of investigation of new and innovative ways to deliver functionality. Finally, this stage of system innovation requires changes in system related to the product. This might involve in underlying economic or market changes, as well as infrastructure and the behaviour of related organisations and stakeholder groups. this stage organisation within this sector collaborate with other organisations within its sector and throughout product supply chains, but also consider the role of consumers, retailers, and other stakeholders outside their local area of activity (van den Bosch SJM, 2005).

Ehrenfeld (2001) expands this basic model by adding another class of innovations, in which the product system remains largely unchanged, but where innovative institutional or infrastructural arrangements produce beneficial changes. In the automobile industry, examples of such changes might include car sharing or leasing schemes. He also put forward for consideration of four stages of innovation which should be defined in terms of other three factors of improvement which include:

- Change in device concept
- Change in the infrastructure
- Change in the user's practices or learning

**Table 1. Characteristics that define innovative categories**

Category	Change in device concept	Change in infrastructure	Change in user learning
Product and process redesign	None to minor	None	None
Functional innovation	Significant	None to minor	Minor
Institutional innovation	None to minor	Significant	Significant
System innovation	Significant	Significant	Significant

From this table 1, it is road map for any analysis base on this work to evaluate from this factors in the four categories. although it fails to capture radical transformation from PSS point of view since it did not entail much about the ownership structure and mode of communications, because of this disapproval each of these four stages of innovation is important to add this other two change factor and the first three for a better evaluation.

Change in ownership structure which deal with the relationship between manufacturers and consumers in local sales transactions, this is a situation where product is assembled in local retails store for purchase by consumers. In this context, the consumer take responsibility of product after purchase and there are no warranties from manufacturers whereas, the intermediate function is a process where there is no direct contact between producers and buyers. A product still form the basis of relationship between producer and consumer.

Trott (2005), a classification according to general type of innovation, in respect to product, process, and service. He also points to the following types of innovation:

- Management innovation represents systems such as TQM (total quality management), BPR (business process reengineering);
- organizational innovation is a new venture division, a new internal communication system, introduction of a new accounting procedure;
- production innovation consists of Quality Circles, just-in-time (JIT) manufacturing system, new production planning software such as MRPII; and
- Commercial innovation is represented by new financing arrangements; new sales approached as Direct Marketing (p. 17).

Proposed innovation model by Oke et al. (2007), and Francis and Bessant (2005). Oke et al. (2007) identify three main types of innovation, process, product and service, which distinguish between product innovation and service innovation. Their framework makes links between these main types of innovation and other types of innovation. For example, they suggest that product innovation results in incremental or radical innovations. Innovation results in improvement in the “delivery of the core product and making it more attractive for customers” and, process innovation deals with production, service, or administrative improvements.

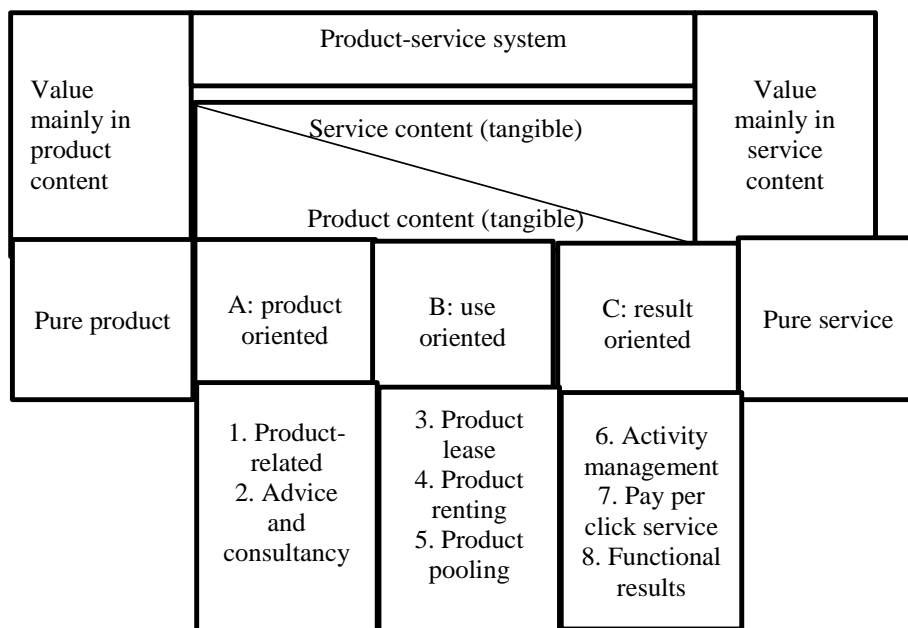
Francis and Bessant (2005) view innovation from the perspective of the change that comes with innovation. On this basis, Bessant and Tidd (2007) propose the following four categories of innovation:

- Process innovation, changes in the way in which things (products and services) are created and delivered.
- Position innovation, changes in the context in which products and services are introduced.
- Product innovation, changes in the things (products and services) which an organization offers.

- Paradigm innovation, changes in the underlying mental models which frame what the organization does.

There are limitations from early research strategies which rely on incremental technological innovation as a solution to economic and environmental problems in SMEs automobile industries which include improvement of vehicle performance, reducing the emission of carbon monoxide etc. With such limitation, it is believed that the only way to achieve this is by focusing on border and system level changes which is the feature of the concept of product service systems (PSSs) as a potential means of achieving such changes (Williams, 2006).

(Mont, 2002), described product service system (PSS) as a system of products, services, supporting networks and infrastructure that is designed to be: competitive, satisfy customer needs and have a lower environmental impact than local business models. And this is a relationship between a producer and consumer of product and service, instead of concentrating of local form of selling, PSS focusses on delivery function to customers which is the combination of product and service to satisfy customer needs.



**Figure 1. Product service system (Tukker, 2004)**

Figure 1, review the structured overview of PSS initiatives at the empirical level in the automobile industry. Earlier studies (Tukker, 2004) have revealed that most PSSs can be classified as belonging to one of three main categories:

- 1) Product-oriented services: where the business model is still largely associated with the sale of products to consumers
- 2) Use-oriented services: where products remain central, but are owned by service providers and are made available to users in different forms (e.g. leasing or sharing) and,

- 3) Result-oriented services, where customers and service providers agree on a desired outcome (e.g. mobility) without specifying the product involved.

This idea is evaluated against the key assessment which contribute to sustainability challenges in automobile companies if it does not correspond with the key element of SPP, it means it will not be able to deliver its benefit, therefore, they seek for a better and more reliable way which is radical changes.

### 2.1.1. Definitions of innovation

Innovations refers to technological devices, techniques or achievements that employ the most current and high-level IT developments; in other words, technology at the frontiers of knowledge. Leading and innovative IT industry organizations are often referred to as "disruptive technologies." Innovation is also known as leading-edge technology, disruptive technology, or state-of-the-art technology. According to Technopedia (2014) innovative technology refers to current and fully developed technology features, unlike bleeding-edge technology, which is so new that it poses unreliability risks to users. While commonly used to refer to computer and electronic technology, the term can apply to technology of any type, including automotive, medical, engineering and other field of applications.

Innovation is often seen from different perspectives either radical transformation which is entire change or incremental dealing with the process of the product, whichever way we view it, it remains the backbone for product creation and service performance of any firm. It involves the change in the tactics or strategy of an organisation functions in developing product and service to the market which the customers are willing to accept at a price. Innovation in automobile industry is the outcome of the organisation performance. An organisation characterized by constant markets change, their competitive advantage may emerge and then fall, which is characterised by changes in the internal and externals environment (D'Aveni, 1994). Therefore, competitive advantage maybe be compelled reflecting an organisation short-term market performance over time.

All the above definitions show clearly how businesses view Innovations. The first and the most selected definition fits more to the concept of innovation but only if those changes add significant value and are truly unique and new and important and relevant to the consumer or the customer. Despite their different perceptions, the fact remains that they all see innovations as something new designed or created to enhance business outcomes whether in areas of production or business dealing within and outside the organisational structure.

The main concept of innovation framework is described in the diagram below:

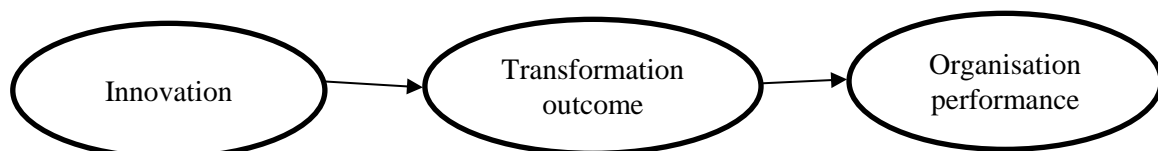


Figure 2. Innovation research framework pattern



This framework by Eisenhardt and Martin's (2000) and Zott's (2003) a conception, especially in relation to organization performance characterized by constant change ability for technological transitions.

### **2.1.2. Types of Innovation**

Different innovation processes result in different outputs. Quite a lot is clear and definite in result for product changes and others may result in changes of services or the way companies perform its tasks. If organisation want to last long they need to invest in different type of innovation, since it influences the performance of organisation and enable organisation to achieve different outcomes and impacts (Siguawet al., 2006).

Classification according to general type of innovations:

1. Manufacturing-process innovation, referring to the changes to company operations and production; this is also usually initiated by technological advancements.
2. Product or service innovation, concerned with the organization's new product or service offerings.
3. People innovation, relating to changes to the people (staff) within an organization, including changes in staffing levels, personnel, job roles, cultures, and behaviours.
4. Organizational structure innovation, concerned with the organization's "authority relations, communication systems, or formal reward systems" (Knight, 1967, p. 482).

Early studies of innovation types had a binary focus (pair wise) such as product/process, administrative/technical and radical and incremental as discussed in the following:

- Administrative innovation, and
- Technical innovation

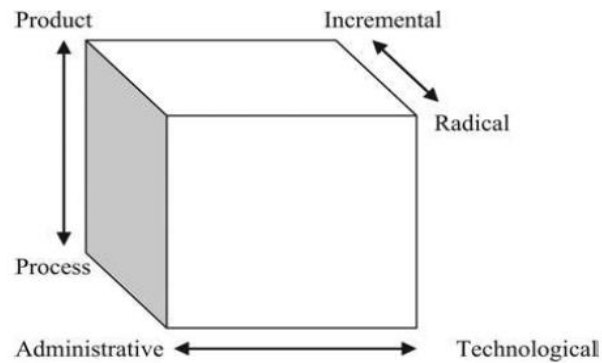
Technical innovation is a binary model of types of innovation, with technical innovation relating to new products, processes or services, related to the central activities of the organization (design and delivery of products, services, marketing, and office operations); while administrative innovation involves changes to the social structure of the organization (Evan, 1966) such as "policies of recruitment, allocation of resources, and the structuring of tasks, authority and reward" (Daft, 1978, p 198). Technical innovation refers to any type of innovation structured from a technical viewpoint and which lies at the heart of operations; such innovations influence the flow of product or process operations (Damanpour, 1991). The third binary of classification include:

- Radical innovation, and
- Incremental innovation

This classification is based on the level of change and newness of the innovation. Radical innovation is a "fundamental change" (Dewar and Dutton, 1986, p. 1422) while incremental innovation is an add-on to a previous innovation without changing its essential concept (Dewar and Dutton, 1986). Incremental

innovation could, for example, take the form of changing the materials used to make a product, improving the product through an updated design, or adding additional features or options.

Regarding innovation types radical and incremental innovations represent the level of change the innovation brings such as process, administrative, product or technical.



**Figure 3. Multidimensional model (Copper, 1998)**

In figure 3, Cooper (1998) proposed a multidimensional integrative model of innovation, which drew together the types of innovation embedded in three of the earlier binary classifications, administrative, technical, process, product, radical, and incremental innovation.

### 2.1.3. Classification of Innovation

Classifications relating to types of innovation, based on the products definitions, frameworks types which includes earlier foundation models, and more recent integrated models with a diagrammatic representation of the framework which is platform prosed for the basics of the types of innovation today. The importance of innovation cannot be over emphasized and its importance increases every day in companies and commercial arena which become more vital. An organisation needs to innovate in response to customer demands in other to offer the opportunities offered by technological innovation. In 1950, Schumpeter argued that companies should innovate to renew the value of their asset quality or ability possessed. Zahra and Covin (1994).

Bessant et al. (2005) when discussing the role of innovation in renewal and growth emphasize: *Innovation represents the core renewal process in any organization. Unless it changes what, it offers the world and the way in which it creates and delivers those offerings it risks its survival and growth prospects (p. 1366).*

Innovation-type mapping tool, building on Francis and Bessant's (2005) types of innovation model. And the reason for selecting the model is because of the following:

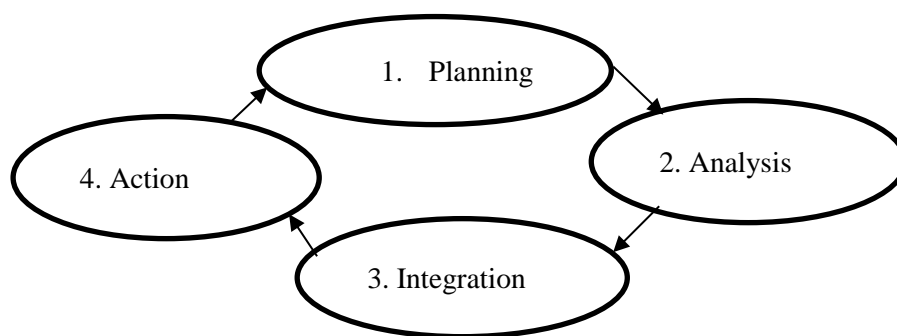
- ❖ it is a relatively recent model, whose development has been informed by earlier models, and structure;
- ❖ classifications and frameworks can be mapped onto this model;

- ❖ it is the only model to introduce the important concepts of position and paradigm innovation; and
- ❖ There is lack of research on innovation based on this model.

The development of SMEs automotive industries in many developed countries, and developing countries have great impact in growth of economy. It engages in long and continuing for long period in a right direction with the aid of innovation, proper management, supply chain and human resource etc. in other to boost production because economic growth of a nation depend on its manufacturing capabilities. In other to implement innovation in SMEs some needs should be satisfies such as technology management, product development, manufacturing processes, customer satisfaction, etc. which means that result must be satisfied in other to achieve a common goal. In other to implement innovations the functions of management team are to evaluate and communicate company vision and mission by comparison with a required standard in terms of manufacturing and make changes where it is important which the working pattern for all organisations. It is also important to involve employees of evaluation to show results for better knowledge and understanding. Also, the company top managers should encourage employees to give opinion, and comments in other to learn, SMEs top manager act as role model for change initiative as employee tend to copy and learn from their good conduct so is it is important for business owners to exhibit a positive attitude

The major roles for development and implementation of SMEs:

1. assists top management in making evaluation and policy decisions;
2. to review all the activities with respect to the evaluation processes;
3. decides on the evaluation techniques to be adopted; and
4. Identify and select main business performance measures to be evaluated from a spectrum of performance measures depending upon the objectives, priority set by the company.



**Figure 4. General evaluation methodology**

From figure 4, the first stage of evaluating process is planning. It helps to develop and design to give results for investigation which should be conducted carefully in other to achieve desired goal. In other to examine the data collected, someone who is responsible to evaluate data collected should have adequate knowledge, experience and technical know-how in evaluation concepts and practical skills to give accurate result experience is needed. A trained personal is needed to for measurement of result,

calibration and interpretation of data and appropriate work that should be carried out and, should have understanding on how to interpret result. In the process of evaluation, questions should be addressed at the early stage as evaluation process. Planning require detailed research to avoid lot of problems in data analysis and evaluation and integration of result should be done by personal with right knowledge and skills to avoid mistakes, when proper result is achieved then the company can proceed with evaluation of analysed data and compare result before making right decision.

The vital questions in other to integrate before taking actions are what would be the best approach of a firm to tackle challenges how prepared they are for new innovations, the current performance of a firm, there advantages and limitations. Alternatively, the steps include analysing and evaluation of data to determine company's performance currently and future, and were the company is lacking and understand the right approach to the goal of the firm comparing to other partners by discovering their strengths and opportunity and threat which is important for company growth. The aim for integration is to evaluate the processes and spot the most important factor and improvement of the firm, this aspect would be for top managers to accept the result of evaluation and team findings based on what the company need to explore and reach the target and their objective would be clearly communicated from this step and be able to plan in other to achieve their goal and note if the result should be recalibrated before implementation of the required actions.

The classification of technological innovations in automobile companies has been based on the products produced by these technologies. Report has shown from the world investment report of 2002 (UNCTAD) which classified them based on its performance as low-tech, medium tech and finally high tech. this classification is also based on the required skills, level of research and development (R&D) and equipment involved in the production of goods mostly in the manufacturing industry. The concept of this thesis which is basically on SMEs automobile companies the classification is on manufacturing and service industries which will be examined later headings on innovation in manufacturing and service industries.

The development of any country today depends highly on their high technological development and a percent of exports from the high-tech industries. This proven in the developed countries like the USA for example, the high-tech industry is one of the most important sectors for economic growth.

The Nigeria Medium tech industry is far behind the international standard and competitively in the global market but has managed to cope with the global pressure better than expected. Adequate infrastructure is needed to support auto industry growth. There is poor infrastructure in transportation, including a massive interstate highway system. the issue of road congestion in major cities, commercial vehicle growth require upgrade to increase capacity, government need to play important role in creating sustainable automobile companies. Government incentives can help encourage research and development (R&D) by assemblers and component suppliers.

## 2.2. Innovations in SME and large companies

There are differences between SMEs companies and large manufacturing firm in terms of number of employees, structure, policy making etc. In the USA, noted by Baumack (1988), large business in the fortune at least started with SMEs business entrepreneurs with no adequate capital for investment or expansion. For example, Ford motors, Toyota motors etc. The major difference between the small and large firms is characterised by: system and procedure, structure, culture and behaviour, human resource, and market and customers.

**Table 2. SMEs characteristics, strengths and weaknesses versus large organisations**

<b>SMES CHARACTERISTICS</b>	<b>STRENGTHS</b>	<b>WEAKNESSES</b>
<b>Systems and procedures</b>		
Activities and operations not governed by formal rules and procedures	Simple system encourage innovation, allows flexibility and speed of response to customer needs and demands	Lack of proper system difficulty in ensuring efficiency of work, and high variability in work outcome
Simple planning and control system	Act as training ground for new entrepreneurs and workers	Lack of proper and effective time and cash flow management
<b>Structure</b>		
Management highly visible and close to the point of delivery	decision-making process, faster implementation Short decision-making chain	Low specialisation may result in lack of expertise in change initiatives Need outside assistance
Division of activities specialisation Flexible structure and information flows	Very few interest groups opportunity to new business ventures and entrepreneurs	Owner controls everything and lacks delegation Lack of capital and credit facilities
<b>Culture and behaviour</b>		
Operations and behaviour of employees influence by owners and managers	Corporate mind-set in making a certain situation and initiatives for new changes	Lack of managerial and technical expertise place above competence and performance
Organic, not strong departmental and functional	High staff loyalty and hard work to company	Danger when loyalties and emotional ties

**Table 2. SMEs characteristics, strengths and weaknesses versus large organisations (cont.)**

<b>Human resources</b>		
High personal authority and commitment of the owner Individual creativity encourages and high innovativeness	High authority, commitment, and responsibility can creates cohesion and enhance common	Lack of financial support, e.g. no training budget improvement efforts improvement needs
Modest human capital, financial resources and know-how	Innovative environment will support improvement culture	investment in human resources Shortage of skilled workers
<b>Market and customers</b>		
Normally dependent on small customer based	Immediate feedback from customers	Limitation to marketing and knowledge
close contact, easily accessible and many known customers personally	Able to respond quicker Understand better customer needs.	International marketing expensive

Small and medium enterprises (SMEs) is easier to communicate from top managers to staffs and employees because of the structure and style. Whereas, in large organisation communication is more complex and involve several protocols, it is easier to make decision and implement it because there is not a lot of people to reach in small firm. Also comprises of higher contribution as a source of ideas in terms of work culture, manager and staff has the privilege to contribute to ideas which will benefit the firm. It also has simple system and procedure, which allows flexibility, immediate feedback and better understanding to customer needs which is not the same with larger firms (Kraipornsak, 2002). Final decision is carried out by the owner of the firms though employees are also given authority and they are responsible in their own department. Job environment allow personal relationship among workers since it is not a large firm, everyone will be able to get noticed easily which promote good relationship and communication among workers.

SMEs also have other limitation which include inadequate financial resource, lack of technical know-how and professionalism, it is also difficult to get loan from financial institution, which result to lack of facilities for staff training and empowerment programs, they also do not have enough skilled workers in terms of human resources, as a result of shortage in skills they are not able to compete with large companies because large companies are able to offer skilled workers , better working conditions and wages (Reed et al., 2001; Chee, 1987). Shortage of raw material is another problem facing SMEs as they cannot obtain loan to purchase raw material needed for manufacturing, inadequate inventory management and control of stock of raw material (Hashim and Wafa, 2002). Majority of entrepreneur does not have formal education and limited to new innovative and technical knowledge.

In SMEs, the owner takes financial risks in the hope of profit, control everything, one person management, therefore does not have enough time to pay attention to all department which and will not be able to manage all department. Since the owner control everything he might be inexperienced because he cannot be versatile in all field and department and be expert and possess all technical skills.

Some of SMEs rely on outdated technology, they require a large amount of work force to get required output and they also depend on local management practices. Some SMEs do not trust new technology because they are used to old way of practices and not ready to try new innovation, some entrepreneur is not risk takers and do not want to invest in what they don't have the knowledge or idea about its functions. It is important to understand the difference between SMEs and large firms before helping them to implement new innovative technology and most of SMEs lack information and inadequate expertise, appropriate technology and efficient production system is crucial in explaining the comparative advantage and competitiveness of the SMEs and large firms (Hashim and Wafa,2002).

It is important for an organisation to have a structure Aalbrecht et al. (1991), it serves and guideline for implementation, which helps a firm in the following ways:

- It helps illustrate an overview and communicate a new vision to the firm
- It supports implementation and to improve the chance of success of a firm because it will provide not only overview but also more detailed information describing the content of each structure element and its relationship to other elements
- It gives valuable insights into the organisation's strengths and weaknesses, and its overall strategic position in the market-place; and
- It enhances the management system to address and consider importance areas and list of key issues which otherwise might not be addressed

These reasons are important in the structure of a firm implementation, since a firm structure is one of the tool for strategic management which would enhance success and yield profit for a firm when properly managed.

There is a structure for developing SMEs which is characterized by the following as proposed by (Yusof and Aspinwall, 2000)

- Implementable should be at reasonable cost and time
- Decision should general enough to suit different contexts
- Structure should represent a road map and a planning tools for implementation
- It should clear links between the elements and steps outlined
- It should be simple in structure
- Systematic and easily understood
- Answers "how to?" and not "what is?"

This are important steps to consider when developing a structure or a framework for SMEs implementation. It is important for SMEs to understand their strengths and weaknesses before considering a work pattern or structure to implement in other to improve their product quality, efficiency, process, services, etc. From the above table 2, we can see the different sectoral ranking pattern of innovation which combine manufacturing and service industry within the structure, it interacts between technological and service sectors in other to international competitiveness, and efficient set up in sustaining infrastructure service and strong mass production. In the scheme the changes in the mass production sector also supported by growth of the industrial sector, each national economy should make effort to transform its industrial structure to a progressive form to make it more efficient to meet market requirement and opportunities provided by new technology. Although it requires a long run period to achieve this and resources that maybe hard to find but it can also be complimented by short term with specific policies that will take immediate effect that will bring changes to national system.

Opportunities that characterize technological activities in various industries and implementation of those activities is sometimes base on research and development which will support all industrial and service sectors. The vertical linkages show different innovation pattern with high performance and opportunity which are closely related to advance knowledge provider, science base and network infrastructure services which will help policies design to enhance innovation and strengthen new technologies. Alternatively, it is possible to sustain competitiveness of sector that experience lower opportunities and less changes in terms of infrastructural services. The challenges for industries of this type is to strengthen their weakness with more technological advances, policies help in making decision for acquisition of advance machinery equipment and software and external knowledge from supplier in other to decide areas of concentration for development also help to increase communication between producer and suppliers. Knowledge creation is very important, and innovation is the basis, also policy making is involve taking them into due account and three appear particularly relevant:

- The great importance of customization and interactivity emphasizes the role of user–producer interactions and of policies that may strengthen the connection
- The relevance of human resources and capabilities for the performance of service firms should draw the attention of policy-makers to the role played by training activities and organizational changes that may prove to be a more crucial factor of competitive advantage in services than the amount of resources spent on research and development
- The lower reliance on formal means for example patents in services requires a rethinking of the policy rationale that is commonly adopted for the protection of innovative results.

In research for innovation several factors are considered by domestic manufacturing firms over the years, which include rising energy cost, high price of fuel, environmental and social factors etc. Technology has significant value in the industries which support firms nationwide and it is very



important in automotive companies many firms spend fortune yearly for research development in other to implore the standard of innovative development. The question which arises is the right approach to carryout research in other to achieve desired result for SMEs also following the right road map to evaluate result is of uttermost important. There has been great achievement over the years by SMEs in other to engage in disruptive technology but lack technical know-how in other to improve various researches should be carried out by expert and educate managers and employee around professionalism in general following the right approach.

The future of automotive industries is characterised by information age SMEs must get the basic approach in other to innovate, there would be standard for manufacturing and companies need to identify their niche to be able to tackle globalization challenges which will enable firms improve product quality, productivity, service, process efficiency etc. SMEs will be able to improve performance and competitiveness to innovate and create high economic value.

The object of the research is to analyse innovation performance in SMEs sector in some major countries, the most important situation is to identify technological requirement considering vision for future which include environmental friendly society, and disruptive technology is the evolution for traditional companies to engage with innovative activities. Some researchers have been able to contribute to this automotive field and the roles of top managers in SMEs companies, it is noticeable that the industry has undergone:

- 1) Radical transformation, in recent years' product have entirely new outlook
- 2) We also have other types of innovation which will be discusses in theoretical aspect

This has helped SMEs companies in technological and innovative competence are factor of survival in competitive environment.

Science and technological is considered by government as the most important driver of national innovation (Andersen et al. 2004), but subject to serious constraints. And, it is advisable that every nation must be determined to target on technological investments, with the objectives to find discover new technologies and the most effective with potential to promote technological development plan. In the government of China, for example is considered as one of the fastest growing economy in world and as developing country since 1990s, the plan for technology advancement in SMEs automotive sector has a great interest for both the government and academia, which provide basic information for policymaking processes for technological issues (Bañuls and Salmeron 2008; Salo and Cuhls 2003). This is the process involve in making a long term future plan for innovation, with the objective to identify the area the economy lack in terms of technology and this process will yield economic benefit. The process was developed (long-term of science and technology) in the USA, later improved in Japan, then adopted in Europe and currently is being used all over the world which will act as road map for SMEs development.

We have seen noticeable innovative transformation around the world. Nevertheless, the traditional automobile companies have not been able to engage fully in disruptive technology and economic development and not able to maximise total profit from this sector. The level of innovation of SMEs completely depend on new idea that can be implemented in other to innovate new product line which is the paramount of every company. In radical innovation, it depends entirely on total transformation which is associated with fundamental change, change might be a major restructuring, such as a new process or product line. Whereas, incremental involve improving the service not huge change like radical. Companies that tend to innovate think of incremental innovation as cost cutting or feature improvements in existing products or services (Leifer, 2000).

### 2.2.1. Particularities of managing small and medium enterprises

Managing a small or medium automobile companies would certainly not be an easy task in a competitive market environment. It is not clear yet in literature how innovative technologies are viewed in SMEs companies. Managers tends to adopt disruptive innovative competitiveness and gaining market share. The research interest therefore is aimed to finding out what the situation is with the research on the adoption of innovative technologies in small and medium enterprises and how management policies drive this policies within firms. Also, to provide recommendations to management of the firms on how to properly use innovative technologies to increase market share.

**Table 3. Definitions for SMES in selected economies**

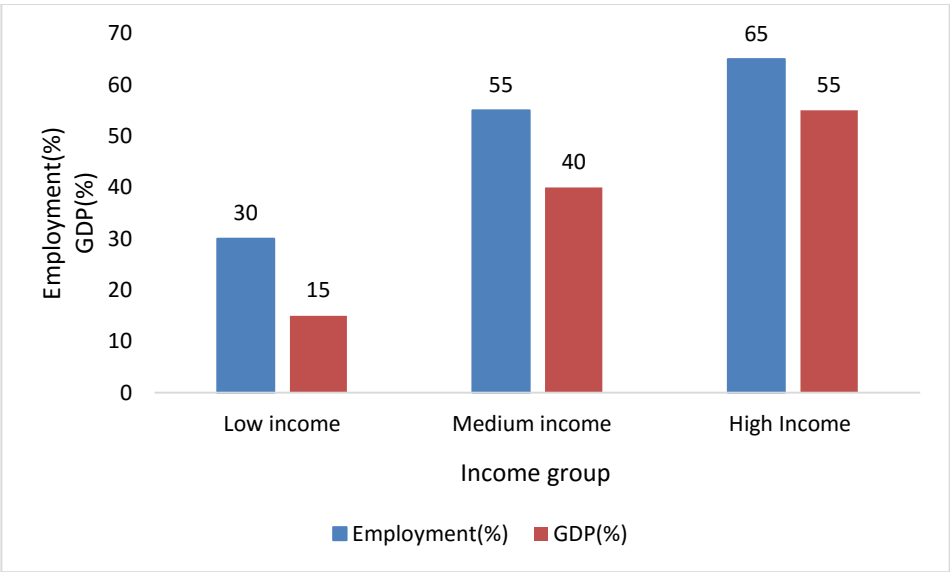
COUNTRY	SECTOR	NUMBER OF EMPLOYEES	OTHER MEASURES
<b>Developing economies</b>			
China	Varies with industry	Usually <100	
Korea	Manufacturing	<300	
Malaysia	Manufacturing	<150	RM25 million
Philippines	Manufacturing	<200	P40 million asset
Singapore	Manufacturing		S\$12 million
Taiwan	Manufacturing		NT\$40 million
Tanzania	Manufacturing	<50 employees	
Nigeria	Manufacturing	<50 employees	Millions
Malawi	Manufacturing	<50 employees	
South Africa	Varies with industry	<100	
<b>OECD</b>			
Denmark	Manufacturing	<500 employees	
USA	Manufacturing	<500	millions
Australia	Manufacturing	<100	Australia
Canada	Manufacturing	<500	
Japan	Manufacturing	<300	¥100 million assets
Germany	Manufacturing	<500	
France	Manufacturing	<500	
Sweden	Manufacturing	<200 employees	

There is no clear definition for SMEs, because of change or difference between companies and countries. It is therefore, defined considering number of factors which include: size, location, age, structure of the company, number of employees, assets, sales volume, ownership through innovation and technology (Rahman, 2001; Sevilla and Soonthornthada, 2000; Husband and Mandal, 1999).

Table 3 shows the definitions of SMEs companies in selected economies. Although there is no clear definition of SMEs companies, researchers most times use quantitative (number of employees) and qualitative (data collection methods) to define SMEs in comparison of size in several countries.

The framework used is the same procedure from previous work and definition of SMEs in respect to small manufacturing companies which employ less than 250 employees (McAdam and Kelly, 2002; Jeffcoate et al., 2002; Hinton et al., 2000). Their research followed the same pattern of definition of SME is other to provide a better comparison between recent and past studies on SMEs framework. The monetary value is not considered as it differs by countries.

Small and medium-sized enterprises (SMEs) also ranges in different areas of business, also comprises of different field from manufacturing to agricultural devices as well as shops and farm produce in local market, the internet cafe, coffee shops, small engineering firm, software dealer and marketers, automotive parts manufacturer etc.

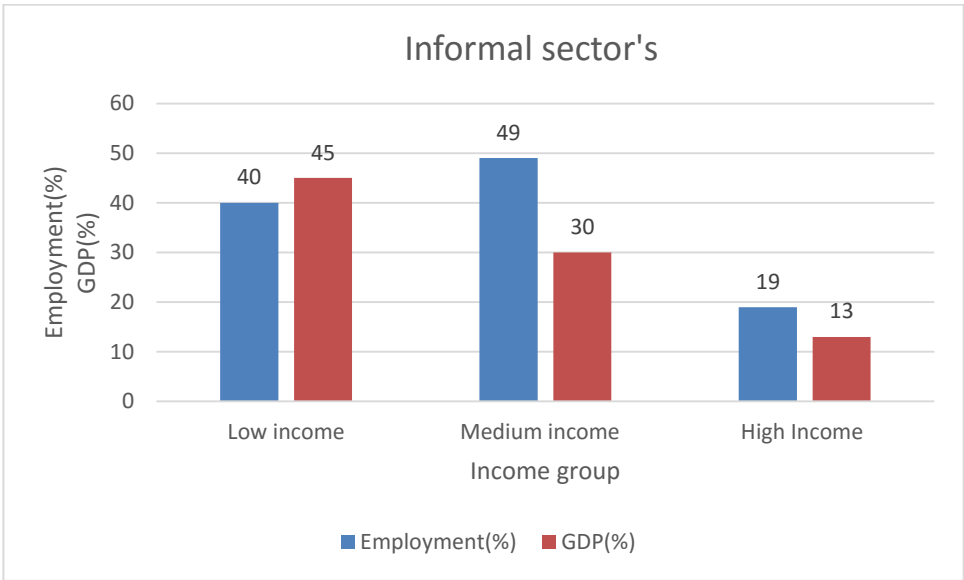


**Figure 5. SME Sector's Contribution to Employment and GDP**

Empirical studies show that SMEs contribute to over 55% of GDP and over 65% of total employment in high-income countries, which is related to economic development. In developing economies, the contribution of SMEs is much lower than developed economy because of lack of fund and majority of the citizens do not engage in business activities to boost economic growth. From figure 5, we can see that over 60 percent of GDP and over 70 percent of total employment in low income

countries, Policies reform is important for both formal and inform sectors, which will enable the less privilege also to participate in value added business activities.

While 95 percent of the total employment and 70 percent of middle- income countries are contributed by SMEs sectors. Figure 5 and 6 also show the importance of both SMEs and informal sector which is related to economic development. in developing countries, the SMEs contribute to GDP and employment is less than informal sector, where the poor are trying to make a living and living standard is poor, important policies to reform developing countries is very essential which will separate the informal and formal sector, which will enable the poor benefit and engage in market activities create profitable output and value added business to organisation. This reform will enhance the living condition and create more employment for citizens to benefit, the importance of this job creation through development of SMEs should not be overlooked if any economy want to achieve from this sector.



**Figure 6. Informal Sector's Contribution to Employment and GDP**

Informal sector, which is neither taxed, or activities being monitored by government. SMEs contribute 20 percent to employment and gross domestic product (GDP) in the middle-income countries than the informal enterprises. Which remove some factors and encourages informal form of business and which when venture into formal sector will provide profit in economic terms. This shows that medium size companies add value to informal sector, also encourages employment over 65 percent and GDP 55 percent in high income countries, and these nations brings the idea to many informal sectors and to formal, both formal and informal is of great significance and value added.

Table 3, Also gives insight on export shares for SMEs in some developing countries like Africa, Asia, and OECD economies. Export from manufacturing sector brings revenue to developing countries, in East Asia for example Taipei about 56 percent and 40 percent in China, and in India 31.5% which is less in east Africa like Malawi and Tanzania. While in table 3 which has, higher export than small enterprises about 50 employees in developing countries. In summary from this figure policies for

promoting SMEs export should be implemented in order to boost GDP and employment in developing countries. Innovation in SMEs is important as it will aid economic growth.

The study reveals the impact of innovation in small and medium enterprises which will enable SMEs to have a competitive edge and benefit from market shares. SMEs innovating seems to have a significant impact on the overall international business environment. Therefore, when companies engage in disruptive technology it has enormous benefit and potential to aid the growth of SMEs. The informal sector consists of privately owned businesses in developing countries, most of which are later transformed into large-scale businesses. Privately owned businesses have existed for a long time. Countries depend on technological infrastructure for development as well as trading between countries which include import and export, and other forms of industries. In developed countries, innovation is the key and important to economic growth and development. This high-tech industry creates employment for the majority of the citizen and boosts production which in turn contributes to a developed nation's GDP. SMEs encourage development and help to reduce poverty; some challenges should be addressed and they should expand via:

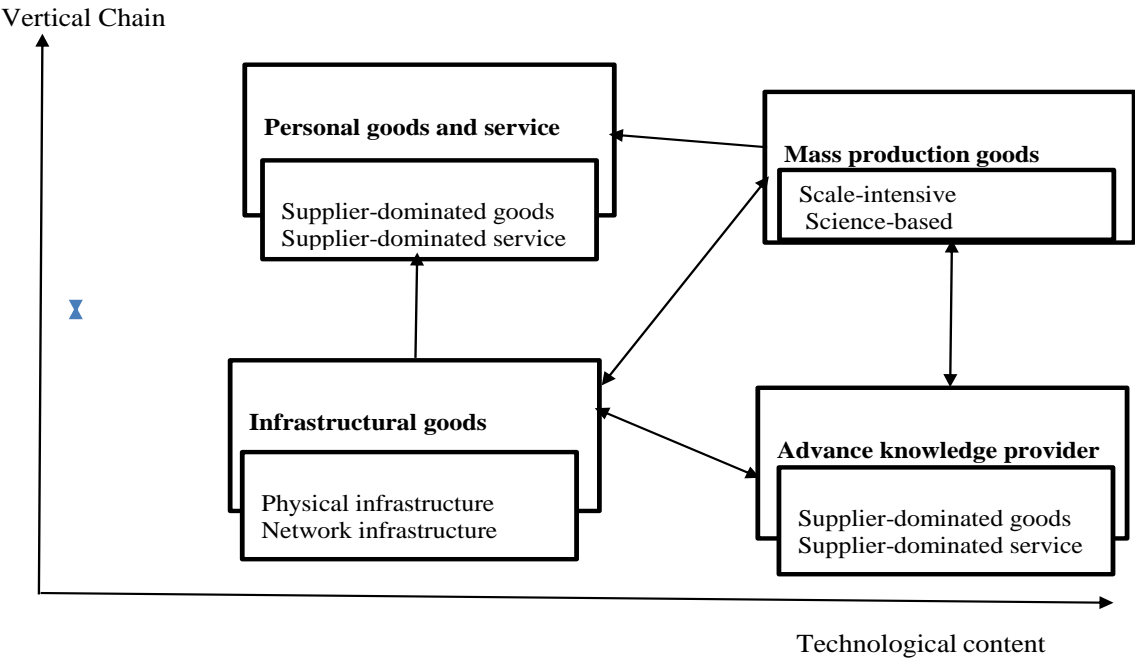
- Integration of informal firms to formal sectors
- Also by creation of new and innovative firms
- Firms must become more competitive and productive
- SMEs should be able to tackle some challenges facing them like lack of innovation and professionalism for awareness creation and become competitive and measure with other larger companies in terms of production and integrate into value chain through export and investment.

### **2.2.2. Innovation in manufacturing and service industries**

The classification of innovation in automotive industry and service sector below makes up the element in economics and innovation studies. The economic literature is often derived from product-related type of classification while the industrial sector relates to the kind of product a company produces and commercialises. The product type of grouping relates to the function each firm assumes in the economic system as provider of goods and services to other companies, that is the stage of vertical chain while the economic system as producers of a design plan (the R&D sector), intermediate or final goods (e.g. Romer, 1990; Grossman and Helpman, 1991). This model presents a useful stylized representation of the economy, but it does not enable detailed investigation of the industry-specific nature of innovation and the variety of sectoral patterns of technological change characteristic of the knowledge-based economy. The classification aims to provide a more precise characterization of sectoral patterns of innovation than what is commonly offered by having an internal cause or origin. On the other hand, the innovation studies literature has frequently adopted sectoral classifications that point out more explicitly the characteristics of the process of technological change, rather than the types of items produced by firms

in various sectors. Technological systems of classification focus on the innovative modes and strategies that are adopted by firms in different parts of the economic system, i.e. the characteristics of their technological regimes and trajectories. The focus on technological pattern and path leads to an emphasis on the vertical linkages and knowledge exchanges that firms in different sectors of the economy have with their suppliers and/or with the users of new technologies. A familiar example of this type of classification scheme is the taxonomy of Pavitt (1984), where the focus is on the innovative mode adopted by different sectoral groups and the related inter-sectoral knowledge flows.

This model also builds up a type of classification scheme, but it differs from previous sectoral classification in the innovation studies literature in one important aspect. While typologies of manufacturing and service innovation have so far been carried out separately and independently of each other, the taxonomic model proposed here combines manufacturing and services within the same framework, and points out the fundamental role played by vertical linkages and inter-sectoral knowledge exchanges between them.



**Figure 7. Classification of innovation in manufacturing and service industries**

**Source: F. Castellacci / Research Policy 37 (2008) 978–994**

Figure 7 presents technology-related characteristic simultaneously, which is made up of industrial and service sector. The position of the vertical chain illustrates industries in the economic system which provide goods and services, and industries in the intermediate that provide goods and service position in higher (lower)level along the Y-axis in the diagram. The technology content of the industry, in other words the overall level of technological capabilities or innovative companies in a sectoral system. The dimension is defined by the level at which firms can create new innovations within the company or

considering other source to create new technology i.e. external for acquisition of machinery, equipment and knowledge from suppliers or another source.

Whereas the X-axis are industries that acquire advance knowledge from other sectors rather than creating them internally, these illustrate two different dimension shown in Y and X axis. The classification is built up by applying these dimensions in two step, firstly it is divided according to the main function it is assume in the economic system (Y-axis). The grouping brought about four main functions as seen in the figure 7. Furthermore, each of the four blocks is divided into sub-groups based on technological concept that made up on X-axis. From this two layers X and Y axis, the classification not only point out functions of each sector but also provide recipient of goods and services from another field (Pavitt, 1984; Miozzo and Soete, 2001). The main features of industrial blocks are represented in table 4.

It is important to note the needs, the two-dimension pointed from graphical representation in figure 7, it provides a style and simplified representation of concept of innovation in multidimensional ways. Firstly, the vertical chain represented on the Y-axis refers to the product chain, and the related set of inputs–output sectoral exchanges. The chain would, however, look different if structured in terms of, e.g., knowledge or financial flows. Furthermore, the degree of vertical integration in the industrial system changes over time, so that different sectors, and firms within sectors, may indeed shift their relative position on the vertical chain in the long run (Von Tunzelmann and Acha, 2005).

Furthermore, the technological content dimension represented on the x-axis in the figure also represents a linear form of the concept of innovative model (arrangement and path or order etc.), which is complex and difficult to summarize by means of a single uni-dimensional construct, as discussed in table 4. this taxonomic model provides a rather style and simplified representation of the economic system, and it is important to acknowledge and emphasize the sense of multidimensionality that underlies these two conceptual dimensions. Firms in these manufacturing and service sector, typically small enterprises, are mostly recipients of advanced knowledge. To the extent that they can implement new technologies created elsewhere in the economy, they may use them to increase the efficiency of the production process as well as to improve the quality of the final goods and services they commercialize. This type of strategy may help to lengthen the industry-life cycle of these mature industrial sectors and recreate new technological opportunities (Robertson and Patel, 2007). In a nutshell, the above figure, represent innovation in manufacturing and service industries is a view of some of the main vertical linkages between manufacturing and business services within a national system of innovation. One relevant aspect of this classification model is the explanation it provides of the mechanisms that drive growth and structural change in industry.

The table also represent previous taxonomic exercises for the study of sectoral patterns of innovation in manufacturing and service industries, respectively.

**Table 4. The main characteristics of the various sectoral groups in the new classification**

Source: F. Castellacci / Research Policy 37 (2008) 978–994

<b>Sectoral category</b>	<b>Sub-groups within each category</b>	<b>Typical core sectors</b>	<b>Functions and relationships to technological paradigm</b>	<b>Technological rule</b>	<b>Technological path</b>
Mass production goods	Science-based Manufacturing	Electronics	The carrier industries of the ICT paradigm	Opportunity levels: high External source: universities etc. patents; design; size: large	Type of innovation: new products; organizational innovation
	Scale-intensive manufacturing	Motor vehicles	The carrier industries of the fordist paradigm	Opportunity levels: medium External sources: suppliers design; process size: large	Type of innovation: mixed products and process strategy: R&D; acquisition of machinery
Advanced knowledge providers	Knowledge-intensive business services  Specialized suppliers manufacturing	Software; R&D; engineering; consultancy  Machinery; instruments	The supporting knowledge base of the ICT paradigm  The supporting knowledge base of the Fordist paradigm	Opportunity levels: very high External sources: users  Appropriability: know-how; size: SMEs Opportunity levels: high External sources: users patents; design know-how size: SMEs	Type of innovation: new services; organizational innovation R&D; training; Cooperation Type of innovation: new products Innovation R&D; acquisition of machinery; software



**Table 4. The main characteristics of the various sectoral groups in the new classification**

Source: F. Castellacci / *Research Policy* 37 (2008) 978–994 (cont.)

Supporting infrastructure services	Network infrastructure Services	Telecommunications; Finance	The supporting infrastructure of the ICT paradigm	Opportunity levels: medium sources: suppliers and users standards; design firm size: large	Type of innovation: mixed process, service and organizational strategy: R&D;
	Physical infrastructure services	Transport; wholesale trade	The supporting infrastructure of the Fordist paradigm	Opportunity levels: low sources: suppliers standards; design size: large	Process Innovation expenditures and strategy: acquisition of machinery and software
Personal goods and services	Supplier-dominated good	Textiles and wearing	enhance the quality of final products and	levels: medium sources: suppliers trademarks size: SMEs	process Innovation strategy: acquisition of machinery
	Supplier-dominated services	Hotels and restaurants		levels: low sources: suppliers non-technical means firm size: SMEs	Process Innovation strategy: acquisition of machinery; training

Referring to table 4, which present a summary of the main features in figure 7 industrial block, it shows the relationship to dominant technological pattern and their characteristics and technological rules and path from the advance knowledge provider which have higher capacity and consisting of many different technological parts to create better knowledge. The sub group which is within manufacturing deals with suppliers of machinery equipment and precision instrument. In area of service provider and specialised knowledge that give technical solution like research and development (R&D) software, engineering, and consulting business etc. They provide similar functions, innovation activities which they continue to improve by upgrading the system in other to achieve a desired result, this firms are

usually small and tend to develop around technological activities for users and potential clients of their new products. The Fordist model, is an example for car producers in the automobile industry relationship that exist between user and producer of these products.

Mass production sector (MPGs) is very important in this work since it deals with production of automobiles which is the main objective of the thesis, this field comprises of the major manufacturing areas, they might be in intermediate state of the vertical chain, since they provide both intermediate goods used in other production process and final goods. In relation to technology abilities they are characterised by two sub groups (Pavitt, 1984)

- a. Scale-intensive industries (e.g. motor vehicles and other transport equipment)

This field has their own research and development facilities, and their innovative activities also develop in close cooperation with specialized suppliers of precision machinery and instruments.

- b. Science-based sectors (such as electronics) which are characterized by a greater ability to create new technological knowledge internally, and their innovation processes stay close to the scientific advances continuously achieved by universities and other public research institutes. There might be differences in sectoral groups which share common characteristics.

This firm is large and profitable, though it depends on the scale of production, they are, in a nutshell, the carrier industries of a new technological paradigm (Freeman and Louc, 2001). Producing technological advancement on large scale, quality of production process of final goods and services, would help increase demand of such product which will enhance productivity role in the economic system.

In support of service and infrastructure which may be closely related to previous patterns from the vertical chain, they produce intermediate products and services instead of items for personal consumption which is different from advanced knowledge providers in terms of technological advances regarding this they are limited in development of new ideas internally which is a shortcoming. This time of innovation tends to be based on acquiring machinery and other types of advanced technology.

Two sub-groups of sectors can be distinguished here, each characterized by a different level of technological sophistication (Miozzo and Soete, 2001)

- a. Providers of distributive and physical infrastructure services (e.g. transport and wholesale trade);
- b. Providers of network infrastructure services (such as finance and telecommunications).

Companies in the second category make use of ICTs developed by advanced sectors in order to increase productivity and efficiency, and quality of goods and services. These firms generally have common factors in the economic system, which represent and support economic infrastructure upon which business and innovative activities are carried out by companies. The more the advancement in infrastructure the more efficient the domestic companies would be and easier the process for firms to use technologies.

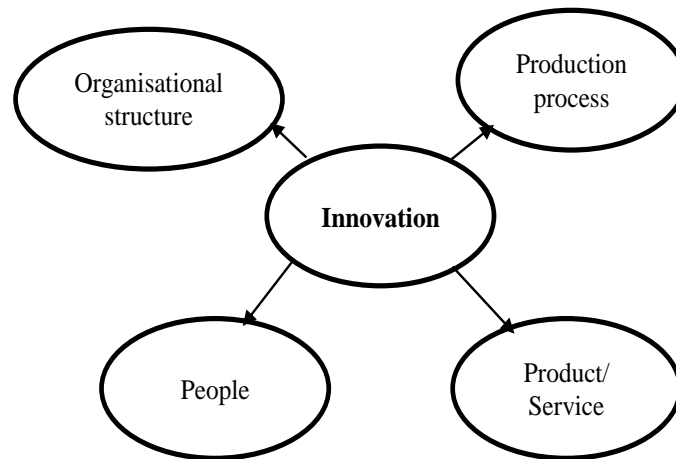
The other block comprises of person and service goods, which is located at the final state of the vertical chain, this aspect is characterised with lower technological content and limited to ability to develop new

product and processes within the form. They acquire machinery, equipment, and other external knowledge produced by their suppliers, they lack capability and resources to organise and maintain their research and development.

### **Innovation-type mapping tool**

Innovation-type mapping tool represent diagrams in different ways, which tends to bring together earlier models, a classification according to general type and framework on innovation.

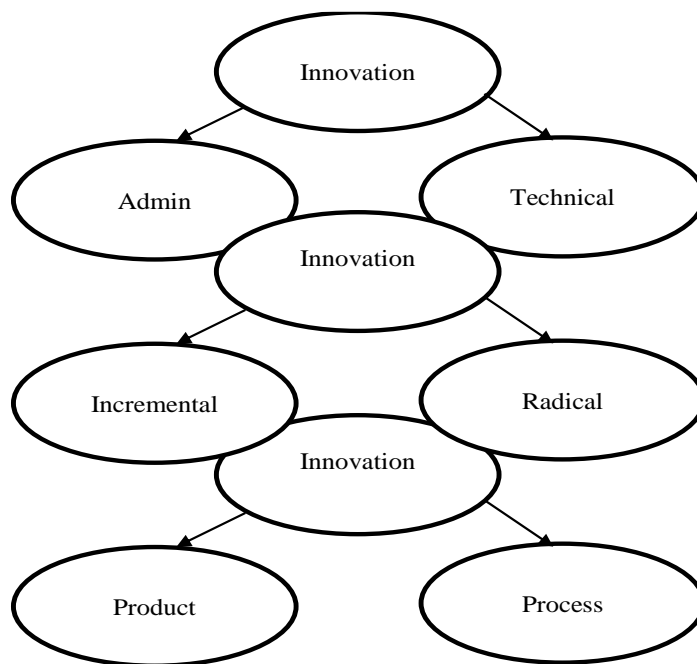
Classification of innovation from past to present:



**Figure 8. Innovation mapping (Knight, 1967)**

Early stage of innovation mapping which comprises of four major type of innovation, which include: production process, product and service, people and organisational structure Knight’s (1967) classification based on product and process innovation is a binary form which is categorized types of innovation. This is one of the early types of which is identifies in literature, product innovation is concerned with development of new products and services for customers while process deals with production process to improves product and services. It aims to improve product and services for customers while process improve firm performance.

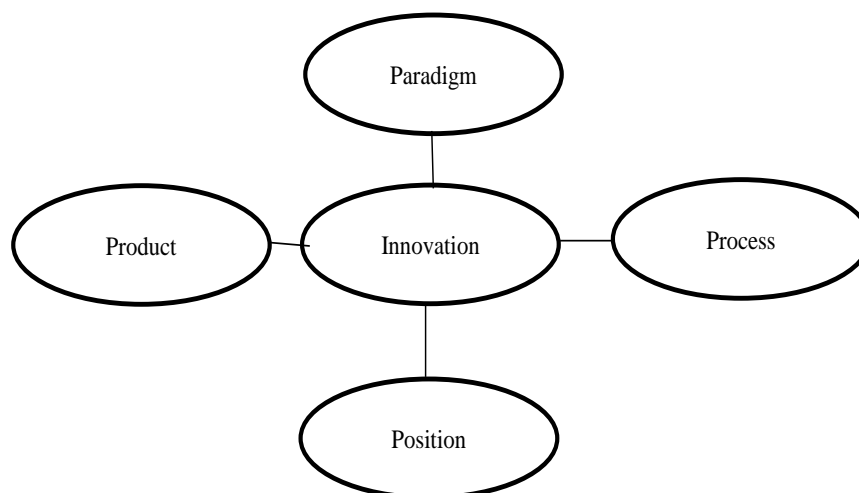
Anoher type of binary innovation is radical and incremental which is the third classification which is base on the level of newness of innovation. Radical innovation is a “fundamental change” while incremental innovation is an add-on to a previous innovation without changing its essential concept (Dewar and Dutton, 1986). For example a material used to make a product can be improved or the previous design can be updated. Other type of innovation shown below are closed related base on first principle since it deals with product and process , although considering administrative and people which is quite different from the illustrated types of innovation in figure five , we will take a close look of the other type and how it is related from the first model by knight .



**Figure 9. Binary types of innovation from 1960s to 1980s**

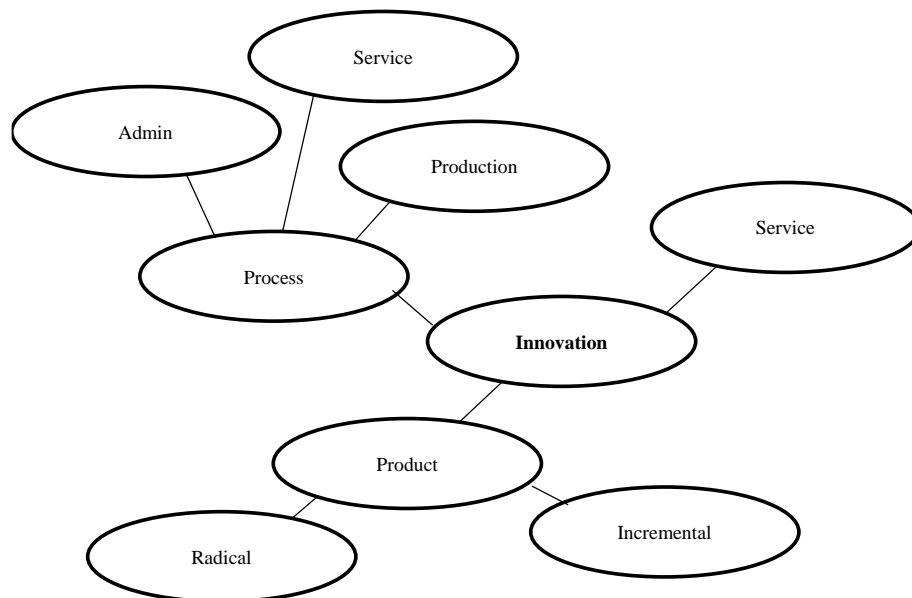
In the about figure 9, is a diagrammatic overview of different framework. It shows the evolution and trend of innovation from past (1967) to present and the basic classifications, which makes it easier to understand, and the relationship between them which clearly state different authors or researchers views on types of innovations. The important aspect to draw from their point of view is that, there is a shift from the focus on binary frameworks of 1970s and 1980s towards 21st century basic structures.

In the developing economies, Small and Medium Enterprises (SMEs) have been recognized as one of the driving force due its contributions to economic growth and development especially in technological innovations, creation of employment. Because of these, SMEs should innovate in other to benefit from market environment. Therefore, innovation and modern technologies in automobile sector has the potential to increase the growth of SMEs.



**Figure 10. Innovation mapping (Francis and Bessant, 2005)**

Referring to above structure, from different literature they all recognise the need to manage different types of innovation and their descriptions for each stage changes as technology advances, though the model basically have things in common. For example, process innovation, product innovation, and administration features in different levels. Trott (2005) introduces marketing innovation, and Francis and Bessant (2005) propose the related concept of position innovation.



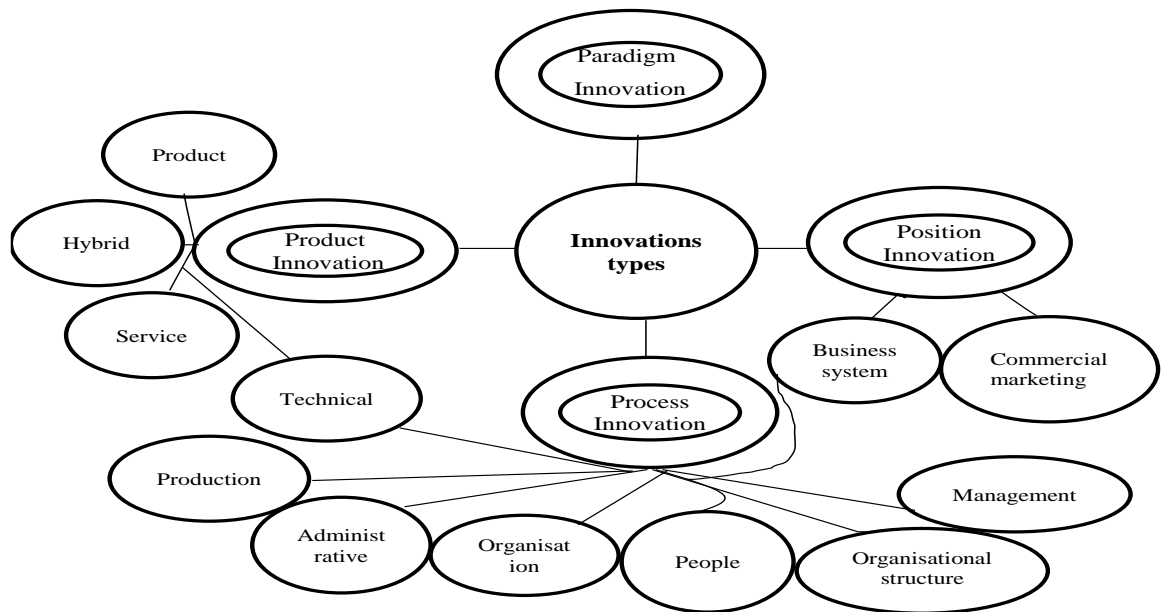
**Figure 11. Innovation mapping (Oke et al., 2007)**

The structure by Oke et al. (2007), identified the main type of innovation, product, process, and service, identifying characteristic between service innovation and product innovation, it also recognises firm innovation level initiated by management. The structure makes links between this main type of innovation e.g. it suggests product innovation result in incremental or radical, whereas service result improvement in delivery strategy, also improvement in production as well as administrative.

Also, some innovation joined together for example while some frameworks distinguish between product innovation and service innovation, others subsume them both under product innovation. Some innovation by one author to another might be different in terminology, e.g. the terms administrative innovation, organization innovation, and business system innovation can be classified considering the degree or shared meaning. Eventually, earlier framework is being used, not replaced just modifications.

Another type of innovation, which could be added to the previously mentioned categorization is hybrid products also known as product and service systems. Hybrid products are integrated solutions, which are a mix of product and service (Velamuri et al., 2008). This type of innovation is important as organisation recognises the need to innovate both product and service features. Hybrid products are “the result of an innovation strategy, shifting the business focus from designing and selling physical products

to selling a combined system of products and services which are jointly capable of fulfilling specific client demand. (Velamuri et al., 2008, p. 2, quoting Manzini and Vezzoli, 2002).



**Figure 12. Innovation type mapping tool (Francis and Bessant, 2005)**

The pattern in figure 12, the double circle refers to the four main types of innovation defined by Francis and Bessant (2005) the ovals represent the other terms used to describe innovation types in various other studies. The above proposed model has been mapped by Francis and Bessant's structure by matching the definitions offered by previous authors and the definitions offered by Francis and Bessant (2005).

This pattern reveals:

1. Process innovation:

- innovations in this category seem to be of two distinct natures: technical, or organisational (administrative based);
- there are many different terms for process innovation, including administrative, technical, production, organisational, management, and business system;
- Also, technical and production innovations overlap, as they are both concerned with the technical side of operations.
- there is an overlap between administrative, organisational, management and business system innovations, as they all refer to innovations within the administration and management side of organisational operations

2. Product innovation: Product, service and hybrid innovations can be grouped together under product innovation, and there is an obvious representation between them as a hybrid innovation is a mix between service and product innovation.
3. Position innovation: Position innovation has otherwise been described as commercial or marketing innovation and to some extent business system innovation. There is an overlap between these two categories when business systems innovation is concerned with both administrative and marketing side of the operations.
4. Paradigm innovation: there has been no previous focus on paradigm innovation, which arguably is likely to generate further product, position, and process innovations. Consequently, there has been instances for the introduction of variant terms to describe this type of innovation. Paradigm innovation, in common with position innovation, would therefore, benefit from further study.
5. As we can see from figure 12, there is partial covering of the different types of innovation such as administrative, organisational structure, and people, and there is no contrast between process and product as a product innovation may involve several process innovations, or a position innovation might lead into product innovations.

The reason for types of innovations is important for researchers, and it is road map for many authors and different field of study which tend work on innovation without ideas on innovation in different areas. This work by Francis and Bessant review and classified innovations according to its functional groups which will help interpret and understand innovation better and enhance consistency in future work most study in this field is based on this literature review. The innovation mapping tool is both for academic and practitioners to have a clearer view on innovation.

In quest for innovation more work need to be done. Researchers in this area and practitioners should be able to communicate clearly about different types of innovation. Though it is difficult to identify various kind of innovation since it is viewed from different angle by different researchers, but the most vital point is that different types of innovation is closely related. Some authors believe that pursuit for an innovation would not be successful since innovation is viewed from different perspectives and can be considered as strategic innovations that can change a firm concept and position in marketplace. So, it is therefore important to have a strategic plan in other to be successful.

Nevertheless, from the previous studies researchers could derive a better understanding, on types of innovation, usefulness to firms in terms of production of goods and service and other importance of innovation to administration and people, this is important step to consider that innovation is not just base on firm or goods and services but also people and administrative changes in other to improve. It is clear prove that researchers have been able to build a better knowledge on terms of innovation and have been able to put it into practice and further research is very important for development and better understanding and proper management of previous work which is very essential for firm to succeed and

have a better strategic plan. The past literature has been able to prove that there is still a lack and this position and specific pattern of innovation that impose some challenges for researchers to study further and explore further on this innovation types which will make innovation more reliable.

### **2.2.3. Benefit of innovation to SMEs**

Brown (1998) research on organisation, economic, and project orientation innovation. The study of economic oriented show that SMEs represent important aspect of innovation and is driving force in enterprises. This illustrate the factors that it contributes to organisation success, also networking, regional support, business planning, and strategies contribute to SMEs innovation. The structure of an organisation brings about effective and efficient management of innovation.

To build a structure of innovation in an organisation, it is important to examine how innovation occur and benefit of innovation, and why firms need to innovate what is firm strategy and market need before a firm can decide what the focus would be in order to make decision. In an environment where there are more competitors with lower concentration and lower barrier, tend to have better performance in product innovation. These authors' findings are in support of other academics' views that, lack of competition curbs innovation (Dasgupta, 1980; Kraft, 1989), but contradict the traditional Schumpeterian theory, which claims that competitive pressure has a negative effect on innovation. The dynamic nature of most markets makes it impossible to find a company that does not engage in innovation (Hurley and Hult, 1998). It is difficult to find a firm that does not engage in innovation one way or the other, therefore, companies need to innovate because of competition and globalisation.

SMEs customers drive innovation, and firms develop new products to meet their requirements and at times new ideas might come from customers which has an impact in development. Their influence is visible in developing new product ideas, launching a new product or process innovation. When firms innovate, it increases the chances of growth and long lasting of the companies so innovation is very important for every organisation. It also helps the sales of product and profit for companies, generally it helps productivity which is incremental process and manufacturing of firms.

Product improvement has a greater influence on growth, and profit performance than process improvement, Wolff and Pett (2006). It supports previous study on new product development in an organisation. A firm can innovate if they have the ability and capacity and resources available for innovation. Available resources refer to financial and workforce and innovation and lack of suitable skilled or trained personnel is a major business obstacle to SME innovation in the manufacturing sector (Scott et al., 1996; Freel, 2005; Laforet and Tann, 2006).

SMEs success depends on a flexibility and open culture with communication and right decision as well as able to plan. Also, communication network is very important as it can bring lots of benefit to a company as it leads to positive innovation, the firm get awareness about new innovations and risk ahead



of time which will enable them to make decision. Innovation require more insight to examine the relationship between productivity, and operational efficiency which will impact financial performance and development of a firm. The impact of innovation on SMEs financial performance must be relatively much higher, Innovative companies have an innovation orientation, risk-taking attitude, willingness to Learn, and an innovation strategy as part of their overall business structure. Sylvie Laforet, (2011).

Positive outcomes or benefit of innovation:

- ❖ Customer satisfaction
- ❖ Operational excellence
- ❖ Expertise-technical ability
- ❖ Employee satisfaction
- ❖ Improve financial performance (profit margin)
- ❖ Enhance companies imagine and reputation
- ❖ Employees performance
- ❖ Skilled workforce acquisition
- ❖ Sustain innovation process
- ❖ Improve efficiency
- ❖ Easier ways of working
- ❖ Improve working environment (health, safety and moral)
- ❖ Cost benefit
- ❖ Transparent for quality purposes
- ❖ Simplification
- ❖ Speed and quality

The benefit of organisational innovation cannot be overemphasised, it leads to operational excellent, market advantage and high profit margin customers and employee's satisfaction among others, innovation also lead to improvement in company image and reputation which will help solve global challenges and aid long term benefit. It also helps working condition of a firm, self-fulfilment and job satisfaction which will improve technical knowhow and professionalism. Innovation helps to recruit more skilled workers which will enable more expertise in the company, it leads to more conducive working environment and promote good character and company technical ability.

In summary, benefit of innovation relate to operational excellence, market advantage, reputation of company as well as imagine, employee's satisfaction and job security with higher salary. Regarding network effect on innovation, as it drives innovation and it is part of an innovative company, but it cannot ascertain what extent it contributes SMEs innovative performance if it impacts directly or indirectly to new product development, technical ability, acquisition of skills workforce and sustained innovation. It is important to consider satisfaction of customers in developing new product to meet market demand

and customer's needs. Process innovation could have a positive effect on improved efficiency also improved ways of working, and working environment and safety.

#### 2.2.4. Barriers of innovation in SMEs

An idea must be created and implemented before it can be innovative. There are some major problem facing SMEs in innovation implementation which is illustrated in the table below, consistent with the approach and definition adopted by Piatier (1984), four types of barriers to innovation have been identified:

- ❖ informal barriers
- ❖ formal barriers
- ❖ environmental barriers; and
- ❖ Skill barriers.

**Table 5. Barriers to Innovation in SMEs**

Authors	External	Internal	Environment	Skill
Piatier (1984)	Technological information, raw materials, and access to finance Customer needs, foreign market limitations	Lack of internal funds and skilfulness	Various government regulations, and measure of policies	Attitude of top manager to risk, employee resistance to innovation
Baldwin and Gellatly (2004)		Missing market know-how		Shortage, and hindered access to, qualified personnel
Acs and Audretsch 1988)	Raw materials and access to finance	Financial bottlenecks		
Ylinenpa (1998)			organisation management hurdles(bureaucracy)	
Hadjimanolis (1999)			Lack of intellectual property rights	
Silva and Leita (2007)	Lack of finance	High cost of innovation	Government regulations	Lack of skilled personnel
Tourigny and Le (2004)	Lack of information about technology	High economic risk Lack of customer		
Madrid-Guijarro et al. (2009)		Cost of innovation		

- ❖ Formal barriers are related to entrepreneur behaviour to innovation in SMEs
- ❖ Informal barriers are optimistic related to manager's behaviour to innovate in SMEs
- ❖ Environmental barriers are related to manager's behaviour to innovate in SMEs
- ❖ Skill, technology, and information barriers are negatively related to entrepreneur behaviour to innovation in SMEs

Limitation to innovation affect the growth of a firm and its competitiveness. Small and medium enterprises(SMEs) failure to grow decrease income generation, employment opportunities and the GDP of any country. In developing countries this aspect is very crucial in other to increased globalization and competition for the market of SMEs. This reduce the scope and prospect of a firm and impact negatively to firm's goal and development. These barriers are examined a range of formal, formal, skill and environmental behaviour.

Entrepreneurship has developed gradually and grown considerably over the last few years and innovation approaches is changing as new innovations and techniques is introduced into the market. SMEs face several barrier from internal and external resource, environment factors as well as shortage of skills , higher barriers to innovation than their larger counterparts (Griffith et al., 2009).Innovation by definition is development process with ether risk or reward in response to change , changes to innovation might be profitable to a firm, or alternatively bring risk to companies as it is difficult for them to acquire capital for raw material .They Lack the necessary managerial skills to cope with increasingly complex organisational processes (Sirmon et al., 2007). It is important for managers to identify their limitation in other to response to market changes in local and international organisations.

External environment of a company also affect the limit of innovation which is shortcomings for business owner in terms of competitiveness and strategies in developing and developed economies, some barrier includes; political and cultural behaviour, socio-economic factors, legal and government policies. The size of local market and lack of government support, high rate of tax and social insurance this are some barriers that need to be overcome in other for SMEs to be successful (Teece, 1996).

Piatier (1984) differentiated between external barriers to the firm innovation (e.g. Demand, supply and environmental) also internal challenges to SMEs owners for example availability of resources and employee resistance to innovation. Rules and regulations governing a region in starting up a new business might be a barrier if the rules are not favourable to the firms willing to emerge in that region, which will impact negatively and discourage new business start-up. Several authors have their view about some major barrier that affect SMEs, which is similar but some of the authors did not refer to all four factors of limitation. In developing countries, firms face more challenges because of inadequate technological infrastructure and lack awareness to new market changes, also the location of firm is and its sizes play a prominent in reaching customers because business located in strategic areas will have higher number of customer and more sales.

In developing countries and developed countries, Small and medium enterprises (SMEs) account for economic significant proportion of economic activity and represents a dominant segment of their private sector (World Bank, 2004; Akman and Cengiz, 2008). This important sector has different challenges, such as; economic change decreasing product lifecycle, rapid technological development, globalisation of markets, changing consumer needs and increased competition (Utterback, 1994; OECD, 2009). Innovation needs to spread throughout all area of SMEs SME operation, including production, finance, planning, human resource management (HRM) and marketing. (Drucker,1985) defines continuous innovation as “the specific tool of entrepreneurs” and views the owner-manager as an entrepreneur who creates wealth and endows existing resources with enhanced potential for creating wealth. For owner-managers seeking to gain and maintain competitive advantage in the market place and increasing their capacity to generate wealth, innovation represents an investment in personal as well as social wealth creation (rucker,1994). Barriers to innovation tend to limit owner-managers competitive scope and impact negatively their firm’s growth prospect tend to face higher barriers to innovation than their larger counterparts (Griffith et al., 2009; Nieto and Santamaria, 2009), larger counterparts, which makes innovative processes harder to initiate or complete successfully (Akman and Cengiz, 2008).

Innovation, by definition, is an evolving process, with high risk and reward factors attached to it. In addition, Small and medium enterprises (SMEs) experience difficulties in acquiring external capital and often lack the necessary managerial skills to cope with increasingly complex organisational processes. The external environment both influences and limits the innovative capacity in SMEs and disadvantages managers in terms of their competitive strategies. Country specific barriers to innovation can include socio-economic, political, and cultural influences, legal considerations, ease of limitation by competitors, long payoff period, the size of domestic market and lack of government support Cooney and O’Connor (1996). SMEs across the country has been recognized to very helpful in developing the country in terms of income generation, employment opportunities and contribute to Gross domestic product (GDP) of nations. However, for any country to tackle some barrier in implementing innovation in SMEs for development this major challenges should be take care off. The barriers to innovation mentioned above are the major causes of limitation on the implementation of technological innovation in automobile sector, issues like lack of adequate skills, technical knowhow, lack of knowledge in implementation and management of these technologies as well as capital for investment are few among many other challenges faced by SMEs in the implementation process. Decision making on strategic issues that are directly or indirectly related to the implementation of technological innovations also could be another factor challenging SMEs automobile companies, wrong decision can jeopardise companies’ effort and, carries negative consequences to SMEs. Decision and knowledge about new technologies must be carefully made in other to avoid creating problems that might complicate the process of implementing technological innovation in SMEs.

### **2.3. Theoretical model for evaluation of innovations in small and medium automobile companies**

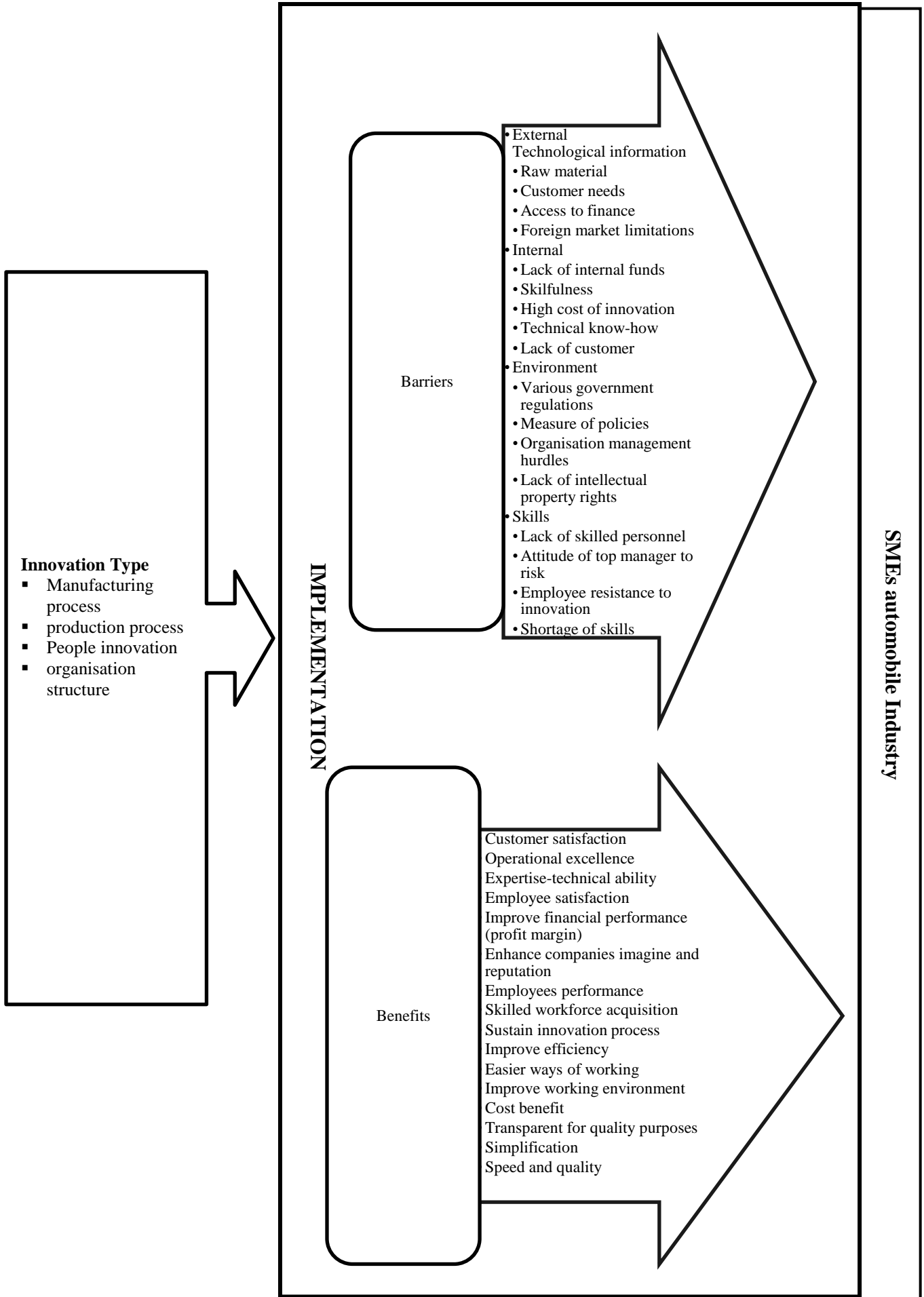
Innovation is recognized to play a central role in creating value and sustaining competitive advantage. Bessant et al. (2005) when discussing the role of innovation in renewal and growth emphasize that; Innovation represents the core renewal process in any organization. Unless it changes what, it offers the world and the way in which it creates and delivers those offerings it risks its survival and growth prospects. Previous definitions, models, frameworks and classifications relating to types of innovation, contribution to clarity in innovation research and practice through offering insights into the definitions of the different types of innovation, and, specifically, the relationships between them.

In a dynamic work environments, innovation is of vital importance. Many companies fail to realize the expected benefit of innovations that they adopt. The key reason is not innovation failure but implementation failure, that is failure to gain targeted employees skilled, consistent, and committed use of innovation in question, Knight's (1967). This thesis review implementation process, and outlining the reasons why implementation is so challenging for many teams and organizations. This is done by questionnaire to find out organizational characteristics and small and medium companies opinion to enhance the likelihood of successful implementation.

Innovative approaches in smaller firms is unpredictable on the level of risk assumed by managers as well as their allocation priorities relating to scarce internal and external resources. Importantly, SMEs tend to face higher barriers to innovation (Griffith et al., 2009). This is because of lower levels of internal resources and expertise, which makes innovative processes harder complete successfully.

The benefits outcomes of innovation have been found to influence company's innovative performance. Cooperation with customers and the public sector are positively associated with product innovation success. Cooperation with suppliers and universities are positively associated with process innovation success Sylvie Laforet, (2011). It has also been suggested that external networks provide SMEs with the opportunity to develop radical and perhaps sustainable innovation.

Figure 13. Below illustrate and unite different part of this thesis from types of innovation, how innovation can be implemented, barriers to innovation and benefit of innovation to small and medium enterprises (SMEs) this idea can be used to explore new technology resources in the development of radical innovations in companies. It entails improvements and incremental innovations which is the first part, it includes the major types of innovation. Then benefit derived from innovation which is characterized by radical innovations; new technologies are the key outcomes of company's success. Similarly, this thesis adopts query to examine organizational innovation in the SMEs context; use of innovative technology in SMEs automobile companies, barriers in implementing innovation in SMEs and benefit of innovation to small and medium automobile companies.



**Figure 13. Theoretical model for evaluation of innovations in small and medium automobile companies**

### **3. RESEARCH METHODOLOGY FOR EVALUATION OF INNOVATIONS IN SMALL AND MEDIUM AUTOMOBILE COMPANIES**

#### **3.1. Research Instrument**

The aim of this research is to get a better understanding on the importance of innovations in small and medium enterprises (SMEs) automobile sector. Which is the main research objectives and to find the barrier or limitation to innovation in this sector, this would be achieved through the process of this research. The query for this research is based on the main theoretical aspect, major problem facing local automotive companies relating to innovation and types of innovation being used, implementation of innovation and how would SMEs benefit immensely from innovation and, barriers or problems faced by small and medium automotive companies in summary evaluate the economic and financial benefit of innovation. This will depend based on questionnaire and correspondent mind-set towards lack of new technology and to development strategic plan to engage in this process.

This represents the selection of the research methodology. It includes the aim of the study and the research questions that the study is trying to answer. The chapter goes into details regarding the strategy and the design of the methodology. This is the most critical and challenging part of the thesis and a sincere attempt is being made to extract valuable conclusions regarding the researched topic.

The conceptual model in figure 13 represents the structure and factors involved in the research and the conducted analysis. It shows the first part which

identifies the types of innovation and barriers and benefit which is the main objectives of the company by analysing the internal and external factors related to successful implementation of the innovation. The company as seen in the conceptual model will have to analyse the capacity as a company by evaluating their technological capacity, the company will have to analyse the market and customers based on demographics, product evaluation based on customer needs and the level of their current technology compared with the available technology in the market and their competitors. Subsequently, the company will have to make decisions based on the effectiveness and efficiency of those factors and then move to the implementation stage of the selected choices. The last stage of the model will be the evaluation of the benefits of the implemented innovation process.

This model is abstracted from theoretical part of the thesis but is more simplified for better understanding. It aimed at describing the evaluation and implementation process of innovation SMEs for overall better performance both within the company and its external environment. Each stage of the process is considered critical to the process for maximum value delivery and deserve careful analysis and due attention for the successful implementation process of innovation in small and medium companies. This process innovation and new ways of working are should be well understood in order to implement this idea. This will help develop a conceptual framework for SMEs and explains organisational innovation, and how SMEs can benefit from its occurrence to end results.

Gillhan (2000) created a comparative study regarding the advantages, disadvantages, and the main differences between a questionnaire (quantitative analysis) and an interview (qualitative analysis). According to his study a questionnaire is not only much less time-consuming but also costs less than conducting an interview. For this research, opinions and experiences of employees will be used to elaborate on innovation in small and medium automobile companies. Taking the time factor into consideration the researcher aims to conduct a research on SMEs automotive industry as a case study.

The questionnaire is created using a Likert scale where the respondents can review the statements and rate them accordingly. The Likert scale is measured with “Strongly Disagree” =1, “Disagree” =2, “Neutral” =3, “Agree” =4 and “Strongly Agree” =5. The statement is formed based on the theoretical part of this thesis.

Bryman and Bell (2007) describes research design as the framework for collecting data and its analysis. The main aim of the research questions in this thesis is to answer the most basic questions outlines in table 7. Below. The research questions prompt the researcher to adapt to a quantitative research methods. This will enable communication with respondents, which gives the real feedback about situation of innovation in SMEs the factors of success in their various companies. According to these answers, it could be reached the complete picture of the success in SMEs. The questioner was created based on main aspects of success and Table 5. The main questions are given in the Table 7. The interviews based on their own feelings about success of innovation in SMEs and some questions were connected to the experience from work environment. Respondents were from two major countries Nigeria and Lithuania. Interview in Lithuania was conducted in person by visiting SMEs automobile companies.

The research topic was chosen because of the value and importance of automobile companies and its economic impact on SMEs and nations. Having a clear understand on the level of innovation implementation and all the factors affecting the process will help determine where improvements are needed to achieve desired goal. This automobile industry is very importance to the economic development of the country and deserve proper investigation. Innovation is very significant in development for any sector or production as well as building a nation, advanced economy has been able to achieve great result because of technological innovation, so it is inevitable. This research is very important and needed now to help create a model that will be beneficial to developing medium size automobile companies.

The table 6, below gives a clearer view from previous research on innovation in automobile sector and the result that have been achieve by different authors in research and development, it is therefore, important to review it as a road map for upcoming researchers. It also comprises of the different part which is divided into four section; which include open minded question to gain more insight on how respondent feels about innovation in two major companies.



**Table 6. Explanation of survey instrument**

<b>Groups of questions</b>	<b>Authors</b>	<b>Questions</b>
Section 1: Introduction part	-----	Introduction questions: Respondent Age Position Years of firm existence Work experience Department No of employees
Section 2: Use of innovative technology in SMEs automobile companies	Ylinenpa (1998) Madrid-Guijarro et al. (2009) Piatier (1984) Baldwin and Gellatly (2004) Trott (2005), Francis and Bessant (2005) (Knight, 1967)	Question for section 2: Does your company have a strategic plan for innovation? Does your company devote resources for innovation? Does your company have a support system to encourage employees to innovate? What area / aspect of innovation does your company use for innovative development? Have your company implemented innovation in the last 3 years? Which area of Innovation are you planning to implement?
Section 3: Barriers in implementing innovation in SMEs	(D'Aveni, 1994). Silva and Leita (2007) Tourigny and Le (2004)	Question for section 3: External factor Internal Factor Environmental factor Skill
Section 4: Benefit of innovation to small and medium automobile companies	Sylvie Laforet, (2011) Wolff and Pett (2006).	Question section 4: What are the main benefits, you gain due to Innovation implementation in your company?

From this questionnaire, quantitative method is preferred because It provides the researcher the opportunity to add further interpretation and meaning to the quantitative findings. Qualitative research usually uses interviews as means of collecting data to explain the researched topic. With this series of question in table six. it addresses personally to respondents which is clearly defined questions and several options narrated to enables responded to choose the best option that suit their companies.

All the interviewed companies were based in Kaunas, Lithuania and Lagos, Nigeria, operating in the manufacturing, engineering, electronic, construction, and business-to-business service sectors. All companies have an innovation orientation or in the process of organising for innovation. The company

size is less than 100 employees making them a SMEs. Each interview took place either via skype for company in Nigeria, and for Kaunas at company site, which lasted for about 5 to 15 minutes for each participant. They informed areas of innovations which include their strategic plan to innovate, are of innovation; manufacturing, production etc. In what ways have they implemented innovation in the past three years or what aspect of innovation are they planning to implement, also, possible barrier to innovation and some benefits of innovation. Descriptive research questions and open-ended questions were used to enable the interviewer to clarify and gain respondent opinion on the topic of the research.

The automobile companies remain at the forefront of innovation in manufacturing technology which has spread to other industries. The government and other important stakeholders play an important role in shaping automobile companies. For the study, most of the participants do not think that their companies distinguish themselves positively from their competitors in terms of using intellectual property rights to protect their products and processes. The reasons for this finding might be that many of the manufacturing processes are common for most of the companies, the results furthermore show that the investigated companies pay relatively little attention to innovation. The importance of freedom and allowing employees to show their entrepreneurial spirit was also mentioned several times during the interviews as one of the major challenges. The analysis provides statistical evidence for manufacturing based SMEs in the research, from what we can see in table 6, highlighted previous literature from theoretical aspect of this project which is significant for SMEs it also indicates the barriers to innovation, the findings of this study are consistent with other research on barriers to innovation. The research aimed at recommending the key aspects needed for ultimate performance of those SMEs in the domestic and international markets, therefore, key factors are chosen in consideration of opinion of companies.

The identified initiatives are then assessed against the key evaluative criteria to reveal their actual or potential contribution to meeting the sustainability challenges of the automobile companies. Improvement, function innovation, involves taking the underlying product function as the starting point for an investigation of new and innovative ways to deliver this functionality. New technology, the high cost of innovation and a lack of qualified personnel impact on SMEs. Understanding barriers can assist owner-managers in encouraging an innovative culture by supporting new ideas, facilitating positive attitudes, and lowering overall resistance to innovation amongst their employees. Innovation is increasingly important part of the process, product or producing entirely new products and disposing of used ones becomes increasingly. Earlier studies have already suggested to this potential. A growing and successful automobile SME sector would have direct and positive impact on employment as well as on its economic growth and stability. entrepreneurs as innovators who possess the ability to exploit emerging opportunities, connect local, regional, and global markets as well as combine various resources into new or innovating ways to satisfy unfulfilled customer demand.

### **3.2. Data collection and research significance analysis**

The main participants of this research were managers, staff or general employees working in SMEs within SMEs automobiles companies in Lithuania and Nigeria. This is meant for SMEs within employee range of below 100. The questionnaire for SMEs in Nigeria was filled through skype interview, it was schedule through skype to gain insight about SMEs automobile companies. These group of employees where targeted because of their knowledge and experience within the automobile sector and overall innovation advancement within the industry and the country in general. Several copies of the research questionnaire were printed out and taken to the various SMEs for the employees to fill, from the research conducted in Lithuania I decided to analyse 20 for ease and time management. Respondent were selected based on their age, position, work experience, department etc. This is because respondent answer gives idea and is important in decision making and the implementation process of the innovation within their various small and medium companies.

The theoretical section of this Master's thesis is mainly derived from various research articles, existing work on innovation on automobile companies. The researcher also applies his own knowledge and experience gained from his academics and preliminary study of technological innovations in small medium enterprises. The reason is to develop investigate the major barrier companies face and propose a method to tackle the challenges of Small and Medium-sized Enterprise (SME) sector, with potential to innovate, capability to respond rapidly to evolving economic environments and adaptive resources to successfully integrate in the rapidly changing networked society. It is widely acknowledged that a favourable business environment and progressive government support are fundamental to innovation and entrepreneurial growth, Innovation and new venture creation have long been the focus of researchers and scholars in entrepreneurship and it is claimed that these have a positive impact upon local, regional, and national economic growth and for employment and gross domestic product (GDP) which in turns yield positive result for any companies. In moving towards technological development for SMEs, it is important to carry out further research to find out stake holder and employment opinion or mindset to innovation and changes brought innovations brings to companies in terms of product, manufacturing process, infrastructural or institutional context. For example, in the automobile industry, a change in powertrain technology, such as the introduction of sophisticated electronic control systems, may dramatically improve the fuel economy of the internal combustion engine (ICE), but would not mean any changes to the prevailing petroleum-based refuelling infrastructure. This is a typical change in process which is incremental changes, it is important to know the kind of technology adopted in this two companies (UAB Autotoja and Innoson motors) this will enable to determine the important of said technology or area of improvement.

Table 7 shows the two major companies which is the object of this research, the researcher aim to discover the opinion of respondent towards innovation in their companies and their objectives.

Respondent from two companies namely; “Innoson motors” and UAB “Autotoja”. Twenty respondent participated in this survey due to some limitation, eight respondents from UAB Autotoja due to language barrier. While twelve respondents from Innoson motors because of time constraints, inability to schedule more respondent for interview via skype, as the company is in Nigeria. Because of said limitations it decreased number of responses. However, with the available responses received the main insights about innovations in these companies was made and the goal for the survey was achieved.

**Table 7. Profile of companies interviewed respondent**

<b>Company name</b>	<b>Activities</b>	<b>No of employees</b>	<b>Respondents</b>	<b>Date established</b>	<b>Respondent</b>
UAB, AUTOTOJA	<ul style="list-style-type: none"> <li>• Auto sale and service of product/B2B</li> <li>• Car parts dealers</li> <li>• Car Inspection</li> <li>• Maintenance repair business</li> <li>• Registered packaging importers and / or manufacturers</li> <li>• Registered taxable goods (batteries and accumulators)</li> <li>• Registered oil producers for automobile</li> </ul>	83 workers (insured)	8	1998	Managers Staff Employees
Innoson Vehicle Manufacturing (IVM)	<ul style="list-style-type: none"> <li>• Product line SUVs, mini and long buses, heavy-duty vehicles, patrol vans and pick-up vans</li> <li>• Auto sale and service of product/B2B</li> <li>• Car dealers, inspection, taxable goods, export</li> </ul>	100 workers (insured)	12	2010	Top managers Managers Staff Employees Consultants R&D director Innovation/Technical manager

## 4. RESEARCH FINDINGS OF INNOVATIONS IN SMALL AND MEDIUM AUTOMOBILE COMPANIES

### 4.1. Analysis of the results

The results were analysed from all the questionnaire questions to derive specific results based on the participant's responds to each question and in each section. The results will be represented and analysed below as follows:

The first section of the questionnaire was framed to understand the company's approach to innovation and results on each of the questions is as shown.

**Table 8. Does your company have a strategic plan for innovation?**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes, we have	17	60.7	85.0	85.0
	We are planning to have	1	3.6	5.0	90.0
	I do not know	2	7.1	10.0	100.0
	Total	20	71.4	100.0	
Missing	System	8	28.6		
Total		28	100.0		

From table 8 above answers the question to section two of questionnaire respondent give their opinion about strategic plan for innovation in their various companies. It is noticeable that most respondents agreed their companies have a strategic plan for innovation with about 85 valid percent while 5 percent from various department are planning to implement a strategy with only 10 percent either planning to implement or have not decided the aspect of innovation to implement, which means they do not know. This shows a positive approach to the overall results on the side of the company's approach towards innovation implementation. This also indicate that companies understand the important of innovation and when properly implemented it will boost production capacity, despite challenges they are determine to innovate which is the only way a company can be successful.

Another question is to find out if the companies devote capital for innovation.

**Table 9. Does your company devote resources for innovation?**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes, we have	14	50.0	70.0	70.0
	No, we don't have	1	3.6	5.0	75.0
	we are planning to have	3	10.7	15.0	90.0
	I do not know	2	7.1	10.0	100.0
	Total	20	71.4	100.0	
Missing	System	8	28.6		
Total		28	100.0		

Capital may refer to resources like finance, Company's assets and infrastructure are important for successful implementation of innovation, and from respondent opinion it show that majority devote resources for innovation implementation. with 70 percent agreed they have devoted resources while 15percent have plans to devote resources to support their innovation process and success and 10 percent do not know because of inadequate funding, finally, 5percent do not have due to lack on fund. This is also an important aspect because companies cannot innovate without funding with majority of respondent responding positive to that their company devote capital for innovation.

Small and medium companies (SMEs) would be able to harness innovation by encouraging innovation in all area, including employees to innovate.

**Table 10. Does your company have a support system to encourage employees to innovate?**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes, we have	8	28.6	40.0	40.0
	No, we don't have	5	17.9	25.0	65.0
	we are planning to have	4	14.3	20.0	85.0
	I do not know	3	10.7	15.0	100.0
	Total	20	71.4	100.0	
Missing	System	8	28.6		
Total		28	100.0		

As shown above, the percentage of individual who agreed that their companies have a strategic plan to support system to encourage employees to innovate is 40 valid percent (%) below average which is a major setback for Small and medium companies (SMEs). In other to be competitive and hoarseness innovation adequately SMEs should encourage system and employee's innovation, system innovation stresses the flow of innovation and information among people (employees) and companies etc. which is the importance process of innovation. Other 25% either do not have plan or not sure how to support system and employees to innovate, 20 % have plan to support which is not enough and this aspect should be encouraged if a company want to be successful. 15% do not have plan to support system or employees to innovate due to lack of funding.

Since majority of individual stresses the fact that their company does not encourage individual to innovate, it is important to find out what area or aspect of innovation their companies engage. However, companies use to organize training programmed to support system innovation as a development tool, also, they involve in participation in international conferences, meeting, seminars and other events which shows that their company's development tool is organizing meeting among employees to share innovative ideas among workers and management team.

**Table 11. What area / aspect of innovation does your company use for innovative development?**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Manufacturing process	7	25.0	35.0	35.0
	Production process	6	21.4	30.0	65.0
	People innovation/Human resource	2	7.1	10.0	75.0
	Organization structure/Administrative	5	17.9	25.0	100.0
	Total	20	71.4	100.0	
Missing	System	8	28.6		
Total		28	100.0		

Above question illustrate different aspect of innovation in other to identify the most important area these companies develop or invest more; manufacturing process has the highest 35 %. It also indicates that medium size companies should improve since they are below average. It is followed by production process with 30% and people innovation has 10% it might be change of staff or employment of professional or skillful personal to replace strategic positions. 25% innovation in organization and administrative which is another vital aspect of company as it deals with reducing uncertainty within the organizational system, also responsible for product-market strategy and organization's future capacity.

It is also important to know how often the companies innovate or the last time they implemented innovation in their firms because day to day innovation changes and companies should be able to follow the trend of innovation and update previous technologies to meet with market demand.

**Table 12. Have your company implemented innovation in the last 3 years?**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	17	60.7	85.0	85.0
	No	1	3.6	5.0	90.0
	I do not know	2	7.1	10.0	100.0
	Total	20	71.4	100.0	
Missing	System	8	28.6		
Total		28	100.0		

The above figure shows that small and medium companies(SMEs), based on responses from individual have been able to implement innovation. Most of the respondent answered yes for implementing innovation within the last 3 years, with 85 valid percent with is very successful approve to innovation and it indicate that years to come they would be able to benefit from innovation if they continue to implement new ideas and update outdated technologies. With just 5percent said no meaning

they do not have adequate information or lack awareness to innovation, it might also be because of lack of funding. The other 10 percent are not sure what aspect of innovation to implement or due to some restrictions or limitations to useful information. It shows that SMEs have understood the importance of innovation, they realize innovation could improve the company’s reputation and tackle global challenges and performance of their companies.

For companies that has not been able to implement innovation in several areas it would be important to know the areas or department they plan to implement innovation.

**Table 13. Which area of Innovation are you planning to implement?**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Manufacturing-process	10	35.7	50.0	50.0
	Product or service	4	14.3	20.0	70.0
	People innovation, relating to changes to the people (staff)	2	7.1	10.0	80.0
	Organizational structure	4	14.3	20.0	100.0
	Total	20	71.4	100.0	
Missing	System	8	28.6		
Total		28	100.0		

Table 13, illustrate answer from respondent from question 6, it compares the frequencies of companies that have a manufacturing process innovation with majority of respondent from Innoson motors since the company manufacture automobile of different kinds, while UAB Autotoja is more into service company, organization structure and administrative functions, they incorporate with other firms to sell already finished products and engage in disruptive innovation by renovating damaged cars and salvage cars from other firms. On the other hand, Innoson motors manufacture their brand name, that is brand new cars. 50 valid % of respondent argued that they are planning to implement more on manufacturing process while product and services has 20% and 10 % for changes in strategic position or because of technical knowhow and as a result companies decide to employ new professionals to handle strategic position for change to occur in the firm in other to enhance production and maximize profit. Another 20% goes to organization structure because the structure of a company is very important in terms of positions and, ensuring information’s availability.

Barriers in implementing innovation in small and medium enterprise (SMEs) will be analyzed as follows to find out respondent opinion to major barrier preventing innovation in their companies. This aspect of question the interviewer asked respondent to select the least and most important from several factors and illustrated and below is the analysis of the result: **What are the major barrier in implementing Innovation in your company?**



**Table 14. External factors describing barriers**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Customer needs	3	10.7	15.0	15.0
	Access to finance	12	42.9	60.0	75.0
	Foreign market limitations	5	17.9	25.0	100.0
	Total	20	71.4	100.0	
Missing	System	8	28.6		
Total		28	100.0		

Most of the respondent believe that one of the major barrier to innovation from external factor outlook is access to finance they said they do not have enough capital to facilitate innovative idea two respondents said customer need changes as a result oppose some innovative strategies, which twelve respondents generally believe that government policies is a major problem the companies are not doing well because they lack adequate funding. Finally, five of them out of twenty said they do not have access to foreign market as a result it restricts companies to innovation and funding.

**Table 15. Internal factors describing barriers**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Skillfulness	2	7.1	10.0	10.0
	High cost of innovation	1	3.6	5.0	15.0
	Technical know-how	12	42.9	60.0	75.0
	Lack of customer	5	17.9	25.0	100.0
	Total	20	71.4	100.0	
Missing	System	8	28.6		
Total		28	100.0		

Considering internal factor from respondent point of view 60% said they lack technical knowhow that is professionalism which is important factor of manufacturing or production process. 25% respondent from Innoson motors, which is more into manufacturing said they lack customers that is foreign market reach because the brand name is yet to reach global market, though they incorporate with other firms to reach their desired goal.

5% suggested that high cost of innovation would be a major drawback in company's goal, other 10% agree that skillfulness is very important for company growth and as a result lack of adequate skills would reduce the performance of the companies, generally, considering of internal factor, technical knowhow is important factor to consider with highest number of respondent which suggest lack of professionalism will affect company's growth.

**Table 16. Environmental factors describing barriers**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Organization management hurdles	2	7.1	10.0	10.0
	Lack of intellectual property rights	13	46.4	65.0	75.0
	Political instability	5	17.9	25.0	100.0
	Total	20	71.4	100.0	
Missing	System	8	28.6		
Total		28	100.0		

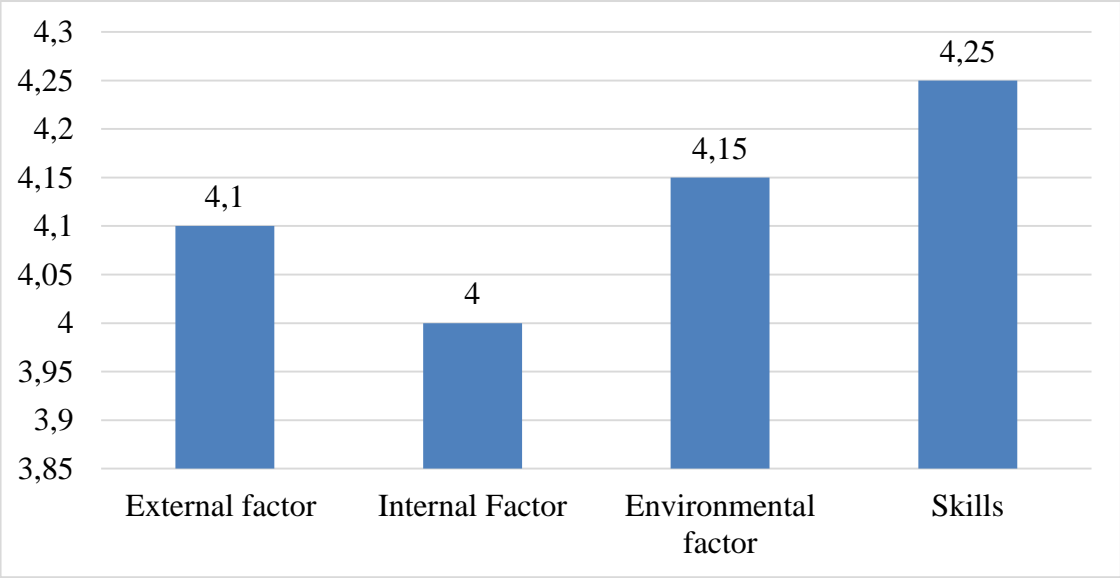
Another important area of a firm is the environmental factor. Respondent also gave their opinion on how environmental factor could be a major barrier to firm performance with 75% which is majority of them argued that lack of intellectual property right because of government measure of policies or new laws and high cost of taxation is major drawback to innovation. While 10% said that the way an organization is being managed can impose treat to growth and development.

**Table 17. Skills describing barriers**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Employee resistance to innovation	5	17.9	25.0	25.0
	Shortage of skills	5	17.9	25.0	50.0
	Inexperienced personals	10	35.7	50.0	100.0
	Total	20	71.4	100.0	
Missing	System	8	28.6		
Total		28	100.0		

Finally, from respondent opinion to skills, 50% valid percent said that inexperience personal is barrier to innovation, which is the highest number of respondent. 25% said shortage of skills and awareness to right innovation, while another 25% of respondent said employee resistance to innovation, most employee resist innovation because they do not know the outcome since it is new to them. Below is also a descriptive analysis with same value as mention above. It seems most SMEs have understood the importance of innovation in terms of skills development, majority of responses shows that they lack adequate skills to encourage the development of SMEs in one way or the other, they believed innovation could improve the performance of their companies. It is most likely that majority of the department implementing innovation are lack modern knowledge about new innovations from either old technological approach to new and innovative ones, whichever ways, the results indicate they lack skills and professionalism which is very important in development SMEs.

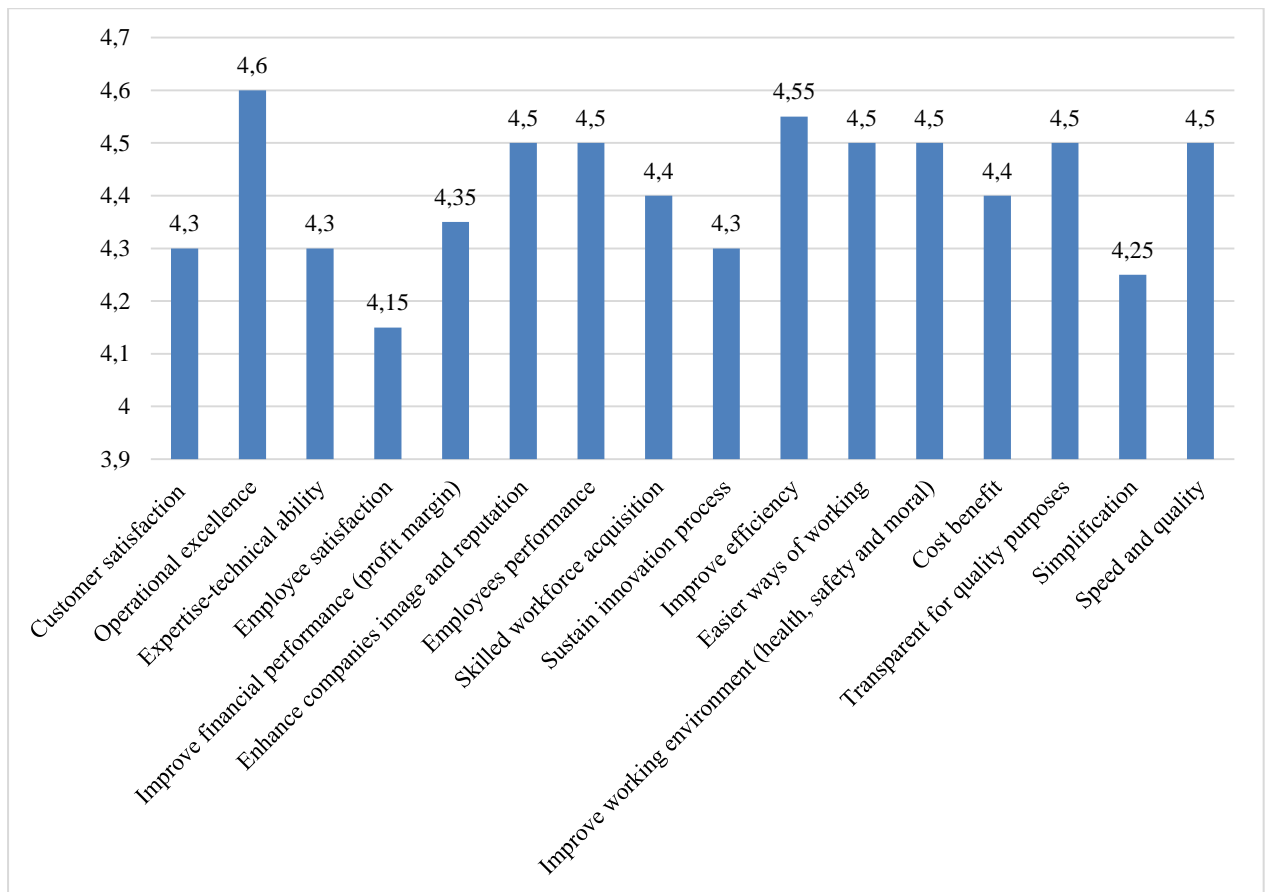
Descriptive representation of mean value of the analysis, the results shows that almost all the factors are important. It is further shown below with graphical representation which clearly shows how the factor hindering innovation implementation process within the sector, it is clear from the graph that medium size automotive companies lack adequate skills which has higher value, and important barrier is environmental factors which include government policies rules and regulations, closely followed by external which is related to lack of adequate information and raw materials and lastly internal factors due to team management .



**Figure 14. Barriers in implementing innovations, mean value**

The question 7 which is the barrier to implementing innovation in your company? Have been divided into sub-categories namely external factor, internal factor, environmental factor, and skills. This will enable responded to understand what interview required from this aspect and give them clear understanding on which section the SMEs are having the most problems. The results came our indicating almost all the factors on the having an average problem. This means that all the problems indicated almost on the same level or similar from the mean value which varies about 4.0 meaning “Important” to 4.25 meaning “Most important on the scale of 1 to 5. This clearly shows how serious these problems are preventing development and implementation process of innovation within the SMEs automobile companies. And, finance is very important factor if government can grant loan it will help improve the development of SMEs and harness innovation.

In summary, respondent was also asked major benefit of innovation from detailed list with answers from scale of 1 to 5 and majority agreed that innovation is inevitable for company’s growth.



**Figure 15. Benefits of innovations, mean value**

The number 8 question is designed to evaluate the benefit of innovation in small and medium enterprises (SMEs) due to Innovation implementation in their company, and we see the impact is enormous. The companies have benefited greatly from innovation, the results are impressive, it has been implemented in several areas of which include manufacturing process, production process, organization structure etc. considering other companies which serve as road map for smaller firm, innovation have a great impact to the success of SMEs, therefore companies tend to innovate for competitiveness and high reputation. The most important aspect is that innovation help company's operational excellence which is the goal of every company and it has the highest mean value 4.6 from the graph, another benefit will be to improve efficiency of a company with average mean 4.55. Most respondent agree that innovation help speed and quality, transparent for quality purpose, improve working environment and easier way of working, enhance employees' performance, enhance companies image and reputation with 4.5 mean result which "strongly agree" above 4.0 which is "agree". Other factors with average mean 4.2 simplicity, expertise technical abilities, customer's satisfaction, sustain innovation process within the industry which will also help to motivate SMEs to engage in innovation having seen it have a positive impact on their performance. Research on SMEs show that the implementation of innovations in companies is both labor intensive and capital intensive. The ideal study of team or company's innovation implementation, is one that examines the implementation of a single innovation, or a common set of innovations, across a

sample of adopting organizations or teams over time. We can see different opinion from several respondents about effect of innovation on organization and lack reason for lack of innovation due to capital and shortage of skills as well as companies does not encourage individual to innovate. From this aspect of question, we notice that impact of innovation in both companies that have implemented innovation and still researching on new technologies that would help the growth of their companies cannot be overemphasized. It is said that innovation is the solution to development of companies.

We can see that the automobile industry has a major influence on transportation development, with vast benefit. From the above result the responded has demonstrated that companies need innovation for growth and car industry are critical to the radical change necessary with huge development costs, long development cycles and global competition, therefore, significant amounts of resources should be invested to development of this sector for automobile manufacturing and operations. However, opportunities are emerging innovative SMEs and companies would be able to take advantage to benefit from new electronics devices, software etc., car entertainment, as well as the development of relevant infrastructure. This companies would be able to benefit from this new trend of technologies and be able to create more innovation in the car industries as the responded agree that research and development is one of the major way companies can enhance production. In addition, respondent said that product life cycle, and quality are also factors driving innovation business model dictates that “to develop new things”; “We keep developing new products, and raising quality, and keep it interesting” it just can’t rely on one product to develop a lot of products they believe that innovation is driven by a desire for success, national pride creating for the future and, keeping their companies alive and a willingness to improve working conditions. Respondent from both companies (UAB Autotoja and Innoson motors) also indicate that they have We have good working conditions, and the people enjoy coming to work because they want the best for their companies which is a good working culture and conducive atmosphere. The results of the respondent suggest highest margin with operational excellence, meaning innovation will enable companies to derive quality product and national pride, and willingness to improve working conditions are major innovation drivers with respect to quality and efficiency. They thought organizational innovation was required measured as well as their perception of their own position in relation to these respondents think that innovation relates to attitudes of top managers to risk-taking they suggested that “Innovation is about attitude towards innovation and risk-taking”. Thus, firms with less “qualified personnel” show a lower tendency to innovate and this serves to reinforce wider perceptions amongst SME owner-managers that without access to qualified personnel, innovation in smaller manufacturing firms is unlikely to succeed. It advisable for smaller firm or medium size companies to employ the service of skilled workers with many years of experience in other to impact knowledge to upcoming ones this will help the growth of automobile and boost production.

## 4.2. Research findings and discussions

This research gives insight on major challenges faced by small and medium enterprises (SMEs) within automobile sectors. There are several challenges but the major barrier is lack of skills, that is technical knowhow and professionalism it is obviously clear from graphical representation in the evaluation results, and companies encounter financial challenges and a result of rules and regulation from environmental factor, there is no support from government and some policy may likely affect innovation. Though there are some policies that encourages innovation and grant loan to SMEs but sometimes requirement is rigorous and almost impossible for upcoming companies without reputation to acquire loans. In most occasion interest rate is high and therefore discourage companies to apply for loan but the advent commercial banks and other financial institution might reduce high rate of interest and it would make loans accessible for SMEs companies which will encourage them to innovate. It is very important for SMEs to innovate; therefore, innovative idea is crucial from both employees and Top managers. Companies should have strategic plan to encourage innovation among workers and also, government should make loan accessible to encourage innovation within the companies, as this is noticeable from research findings employees does not have enablement for individual innovation therefore they lack basic skills to innovate and also, lack of capital , innovation is capital intensive government should encourage innovation by creating policies that reduce high grant to companies willing to innovate or invest in most recent innovations in other for SMEs to implement their ideas.

From this research, considering two companies (UAB Autotoja and Innoson motors), it is obvious that both are automobiles companies but differs as one of the company “UAB Autotoja” is more of service company, this type of innovation is mainly focused on improving already existing structure and policies within the company to achieve better results or performances. While “Innoson motors” are more into disruptive technologies manufacturing of new automobile with brand name, both companies play a significant role in development which will boost nation’s gross domestic product (GPD) also, create employment. It also seems to be the most appropriate for an industry like UAB “Autotoja” as a service to repair most salvage cars deemed a total loss by an insurance company, it is also believed to have better results in terms of benefits for the overall performance of the companies to implement such ideas. Alternative, it is almost impossible to start up new manufacturing automobile companies considering some factors like skills shortage, environmental challenges etc. but Innoson motors prove that abortive by manufacturing first African automobile brand name “IVM” (Innoson Vehicle motors) in Nigeria. There is growing demand for vehicles and innovation should be major priority for SMEs. Another interesting aspect of the research was the way and manner the companies implemented innovation within the last 3 years with results showing that out of the twenty respondents, seventeen which is about 85 percent agreed that their companies have implemented innovation within the last three years. Most of the respondent answered yes for implementing innovation within the last there years, which is very

successful result, it also indicates that years to come they would be able to benefit from innovation if they continue to implement new ideas and update outdated technologies. Respondent suggested that one of the reasons they innovate is to tackle global challenges and limitations in business, also to improve the company's reputation and technical knowhow, it will also improve production outcomes and companies will benefit immensely. It helps SMEs save costs in various ways and improve their competitive strength within the domestic and international markets. Innovation is introduced to the market annually and SMEs need to utilize the opportunity it brings and increase their results and growth in both local and international levels.

In addition, other respondents suggested that companies did not implement innovation due to a lack of adequate information or they lack awareness; they are not certain about the aspects of innovation to implement, considering the importance of innovation which is again very strategic for the success of the companies. SMEs need a good organizational structure and culture for growth and development. Adequate management of organizational resources to ensure the sustainability of a company is very important and the activities and processes involved in achieving organizational goals in both short and long term should be considered by the management team and stakeholders to achieve the desired result. It is also very important to consider innovation as a key factor in the performance of SMEs and to be evaluated within certain periods to ensure the companies are in a proper position. The research shows a positive approach to the overall results on the side of the company's approach towards innovation implementation. This also indicates that companies understand the importance of innovation as a basis for successful operation and continued growth of SMEs and when properly implemented. The performance evaluation from both companies that implemented innovation in one way or the other shows significant improvements and huge benefits in both product and process. The overall results stipulated that Innoson Motors and UAB Autotoja have implemented innovation and they agree that it is both beneficial and of utmost importance.

Most importantly, innovation is beneficial for SMEs within the automobile industry and should be applied and adequately managed for existing and operating SMEs within this sector. Despite challenges faced by companies, innovation is a key factor in ensuring their success and suitability. Companies should encourage planning for adequate resources for innovation, and expose employees to new innovative ideas and implementation; this will be the only way innovation will be effective for SMEs within automobile companies. Every company willing to succeed in innovation should strategically plan and research for new innovation and invest in innovation. It is very difficult or almost impossible to innovate without devotion; stakeholders should devote time for research and resources for innovation implementation. Top managers should encourage employees to innovate for professionalism and high reputation of SMEs. It is also of utmost importance to innovate or improve in all aspects of innovation as technologies are changing; companies should research to meet the demand of customers and compete with other companies if the barrier is managed properly, then SMEs would benefit from current innovation.

**Limitations of this study:** All respondents cannot speak English in Lithuania, interviewers seek for firms where respondent has basic knowledge of English speaking abilities, the interviewers had to interpret questions in English. Due to differences in language, just 8 persons from UAB “Autotoja” could take part in interview. In addition, a study with Nigerian company was provided via Skype. This issue decreased number of responses too because of time constraint

Furthermore, From the Categories of innovation respondents responded to innovation implementation different 35.7% for Manufacturing process, while product and service comprises of 14.3%, people innovation that is innovation relating to change of people (staff) human resource was the lowest with 7.1% and finally organizational structure also share the same value with respondent view to product and service, which is 14.3 % organizational structure also refer to as administrative. Majority of respondent for Manufacturing process are from Innoson motors since the company manufacture automobile of different kinds, while product and service UAB Autotoja is more into service company.

**Future research directions:** There is considerably more work to be conducted in this area of Innovation in small and medium automobile companies, this research was conducted in two companies UAB “Autotoja” and “Innoson” motors due to above mentioned limitations, researchers could also conduct further studies in other companies in Lithuania or Nigeria and, Small and medium automobile companies in other parts of the world.

One of the potential difficulties in implementing innovation is “technical knowhow”, researchers could also conduct studies in this area to improve innovation and other problems that arises in implementing innovation e.g. external barrier to innovation, internal barrier to innovation and environmental barrier to innovations. However, a deeper understanding of innovation is required and, innovation types, or, in other words, a clear understanding of the priorities in the outcomes of an innovation process. Barriers relating to innovation and types of innovations will make it possible for researchers to build a strong evidence and knowledge base to inform practice and further research, and will be able to understand innovations of different types, which are essential to organizational success.

In line with the above directions, technological knowledge applied in research and learning are minimal rather than focusing much on basic research among employees. Due to the limitations and weaknesses this appear from the literature evidence. Most of the structures of the technology-centered institutes which have been established to promote technology development and to support innovation should be able to conduct further research to tackle barrier to innovations in automobile sector.



### **4.3. Factors to improvement in innovation implementation process in SMEs automobiles companies**

In other to improve innovation in SMEs it is important to tackle some issue that is challenging development in automobile industry. Considering the results of this study. There is no doubt that many factors which are needed to contribute significantly to the development of SMSs identified in the research. Due to the limitations of this study. The author chooses to highlight the most important ones to suggest improvements. These tools and factor will be listed and briefly described below.

**Lack of Capital:** Capital was one of the major problem as indicated by the result of the study. These problems exist because of lack of government support or due to their failure in regulating financial institutions. As a result, they have very high-interest rates for loan. This effect discourages SMEs Government lending agencies and other institution requirements for granting loan is high and competitive which discourages SMEs to access funds needed for their growth and development. This factor has an economic effect on the government in terms of high rate of layoffs by some SMEs that could not afford the cost of running a business due to lack of access to loans. This result to rising in unemployment and low contribution to the GDP of the countries.

**Inadequate skills:** Skills and professionalism that is technical knowhow is one of the major barrier to innovation in small and medium automobile companies with highest average mean value of 4.25, which mean that it need to improve for companies to achieve their desire goal. The government, and other institution should create educative and technical programs to enhance professionalism, in other to train and equip individuals especially youths willing to work in SMEs in other for automobile companies to reduce emission during manufacturing. This will create skilful employees that will be useful to the SMEs and in overall be innovative and efficient, also awareness program is important to foster innovation.

The solution to this problem lies in both the SMEs and the government. The SMEs also need to motivate their employees which might include organizing free training programs within their companies, create knowledge and information flow among workers support employee's by giving incentives as source of encouragement for training events which will help boost their innovative knowledge and skills.

**Organizational structure:** Human resources that is internal structure is another major issue the SMEs indicated they were facing is lack skilled and qualified human resources to effectively run the affairs of the companies. This problem is known to be related to funding of these SMEs. They lack adequate funding to hire skilled workers and well qualifies personnel's, so therefore the management system tends to hire low cost workers, that is cheap labor which is not productive because they lack adequate skills to be efficient enough to tackle global challenges. To hire skilled workers, it is cost effective and human resource need fund for innovation implementation, this aspect is very important for companies to improve and be resourceful. Government should support by enforcing laws to encourage innovation, this would help companies to benefit and make good use of available resource for production.

## CONCLUSIONS

1. Based on theoretical analysis the main types of innovations were highlighted:
  - Administrative innovation
  - Technical innovation
  - Radical innovation, and
  - Incremental innovation
2. In addition, based on scientific literature analysis theoretical model for evaluation of innovations in small and medium automobile companies was constructed. It involves innovations types, benefits and barriers, which companies face during innovation implementation, was constructed.
3. Operational excellence (mean 4.6) and Improve efficiency (mean 4.55) were highlighted as the main benefits of innovations in explored organizations. However, enhance companies image and reputation, employee's performance, easier ways of working, improve working environment, transparent for quality purposes and speed and quality got evaluation of 4.5. Moreover, innovations have the lowest impact on employee's satisfaction (mean 4.15) based on respondents' answers.
4. As the main barrier of innovations implementing in analyzed company's internal factors were highlighted. Lack of intellectual property rights (mean 46.4 - Environmental factor), Access to finance (mean 42.9 - External factor), Technical know-how (mean 42.9 - Internal factor) and Inexperienced personals (mean 35.7 – Skills) were revealed as the main barriers in every group of barriers.

The results of this research study could prove useful for SME owner-managers who are attempting to engage in innovation not only in both companies but also in similar emerging economies. Understanding barriers can assist owner-managers in fostering an innovative culture by supporting new ideas, facilitating positive attitudes and lowering overall resistance to innovation amongst their employees.

### **Based on conducted study, following recommendations could be provided:**

1. Systematic approach towards the perception that is essential for SMEs to collaborate with institutions for research and development (R&D) in order to constantly improve their methods and strategies to compete better and control a larger share of the market. This should be able to help them have an edge over their competitors always if they are able to have up-to-date information on markets, customers, technologies and financial support news. Also, by practicing training skills and using specific tailor-made methodological tools.
2. Having in mind that the methodology of the preparation of a professional instructor could determine the results of Innoson motors and UAB Autotoja activities in the future, special attention should be paid to the motivation of the participants during the training.

During the training, peculiarities of each target group should be taken into consideration in this regard the main possible mistakes and shortcomings, which are frequently faced by instructors while organizing and conducting trainings are necessary to be acquainted with.

3. Seeking to organize and conduct efficient training activity, the instructors prepared should apply various training methods in a complex manner, i.e. not only to deliver theoretical information but also to apply practical methods as individual practical assignments, work in pairs or small groups and role play under prepared scenarios.
4. For training purposes motivating employees to participate fully in innovation activities within their companies will have a great impact on innovation. But from the research it is noticeable that both companies do not consider this aspect which is important factor for innovation objective. This will enhance employees in abilities and enable them to benefit from innovation and the companies prospect in a long-term would also be achieved for better sustainability and development.
5. Adequate training will help create attractive career opportunities which will draw high potential talent. Creating a wider talent base through effective technical soft skills training programs is equally important, especially for development of SMEs automobile companies. Institutions that offer automotive focused courses will further assist this effort.
6. As the SMEs automobile companies seeks immediate growth, the government must simultaneously push it into the future, largely through sustainability. Policies on road and vehicle safety systems and emission controls must be to global standard. incentives and infrastructure investments will help automakers gear up for next generation transportation such as electric, hybrid, and alternative fuel vehicles.

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## ANNEXES

### Survey on Innovations in small and medium automobile companies

Survey on **innovation in small and medium automobile companies** is carried out by Collins O. Osaneb, regarding final thesis for MSc in technology management; a student of Kaunas University of Technology, Lithuania.

This query will help to obtain the necessary data to complete my master's thesis.

**Sample firms (N=20)**

#### Questionnaire

**Section 1.: Introduction part. Please mark the most appropriate box below**

**Respondent Age:** 20 – 25  26 – 36  37 – 47  48 – 57  above

**Position:** CEO  Top Manager  Staff  employee other  please specify: \_\_\_\_\_

**Years of firm existence:** 0-3  4-6  7- 10  above

**Work experience:** 0-3  4-6  7- 10  above

**Department:** Manufacturing  Marketing  Finance  Research  HR  Technical   
Other

**No of employees:** 1-10  11-20  21-30  31-50  above

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#### Section 2: Use of innovative technology in SMEs automobile companies

**Please tick the box that best defined your opinion below.**

1. Does your company have a strategic plan for innovation?

Yes, we have  No, we don't have  we are planning to have  I do not know

2. Does your company devote resources for innovation?

Yes, we have  No, we don't have  we are planning to hav  I do not kno

3. Does your company have a support system to encourage employees to innovate?

Yes, we have  No, we don't have  we are planning to have

I do not know

4. What area / aspect of innovation does your company use for innovative development?

- Manufacturing process
- Production process
- People innovation/Human resource
- Organisation structure/Administrative
- Other

5. Have your company implemented innovation in the last 3 years?

Ye  No  I do  not know

6. Which area of Innovation are you planning to implement?

Manufacturing-process



- Product or service
- People innovation, relating to changes to the people (staff)
- Organizational structure

### Section 3: Barriers in implementing innovation in SMEs

Please choose the box that best defined your opinion as described below.

The Likert scale is measured with 1= Not important, 2=Less important, 3=Neutral, 4=Important, 5=Most important

7. What are the major barrier in implementing Innovation in your company?

<b>External factor</b>	<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5	
1	2	3	4	5			
<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5	Technological information	
1	2	3	4	5			
<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5	Raw material	
1	2	3	4	5			
<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5	Customer needs	
1	2	3	4	5			
<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5	Access to finance	
1	2	3	4	5			
<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5	Foreign market limitations	
1	2	3	4	5			
<b>Internal Factor</b>	<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5	
1	2	3	4	5			
<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5	Lack of internal funds	
1	2	3	4	5			
<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5	Skilfulness	
1	2	3	4	5			
<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5	High cost of innovation	
1	2	3	4	5			
<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5	Technical know-how	
1	2	3	4	5			
<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5	Lack of customer	
1	2	3	4	5			
<b>Environmental</b>	<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5	<b>factor</b>
1	2	3	4	5			
<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5	Various government regulations	
1	2	3	4	5			
<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5	Measure of policies	
1	2	3	4	5			
<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5	Organisation management hurdles	
1	2	3	4	5			
<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5	Lack of intellectual property rights	
1	2	3	4	5			
<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5	Political instability	
1	2	3	4	5			
	<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5	<b>Skill</b>
1	2	3	4	5			
<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5	Lack of skilled personnel	
1	2	3	4	5			
<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5	Attitude of top manager to risk	
1	2	3	4	5			
<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5	Employee resistance to innovation	
1	2	3	4	5			
<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5	Shortage of skills	
1	2	3	4	5			
<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5	Inexperienced personals	
1	2	3	4	5			

### Section 4: Benefit of innovation to small and medium automobile companies

Please choose the box that best defined your opinion as described below.

1= strongly disagree, 2=Disagree, 3= Neutral, 4= Agree, 5=Strongly Agree

8. What are the main benefits, you gain due to Innovation implementation in your company?

<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5	Customer satisfaction
1	2	3	4	5		
<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5	Operational excellence
1	2	3	4	5		

1	2	3	4	5	Expertise-technical ability
1	2	3	4	5	Employee satisfaction
1	2	3	4	5	Improve financial performance (profit margin)
1	2	3	4	5	Enhance companies image and reputation
1	2	3	4	5	Employees performance
1	2	3	4	5	Skilled workforce acquisition
1	2	3	4	5	Sustain innovation process
1	2	3	4	5	Improve efficiency
1	2	3	4	5	Easier ways of working
1	2	3	4	5	Improve working environment (health, safety and moral)
1	2	3	4	5	Cost benefit
1	2	3	4	5	Transparent for quality purposes
1	2	3	4	5	Simplification
1	2	3	4	5	Speed and quality

**CONFIDENTIALITY**

**THANK YOU FOR YOUR ANSWERS AND CORPORATION!**

**PLEASE NOTE THAT THIS IS FOR EDUCATION PURPOSE ONLY AND INFORMATION  
WILL NOT BE TRANSFERRED TO THIRD PARTY!**