

Nigeria`s WEEE Market

(Business Opportunity for Finnish SMEs)

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Acknowledgements

In order to graduate from Masters` Degree Program in International Business Management at Lahti University of Applied Sciences, a thesis study is required. Hence, this research project with target to developing markets in Africa, with Nigeria as a focus was undertaken. The study is made to crucially expose the opportunities in the target market to Finnish companies in the environmental business field.

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"The greatness in a man does not lie in his built and guilt, rather in his accomplishments, for the difference among men is determined by drive and goal. Therefore, for that purpose one has set ones heart to accomplish, is an essence of will and power; and time witness them all".

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Abstract

The act of indiscriminate and irresponsible disposal of e-waste, coupled with governmental inefficient and unconventional systematic control of it in any society is undeniably dangerous to the society`s economy and public health. The untreated e-wastes pose tremendous threat to public health and the quality of life of the people. It also destroys and renders the environment inexplicably unproductive. In addition, it is the socially and economically weaker populace of the society, which suffers the most in such situations.

In as much as these are true, the economic benefit of WEEE through recovery and recycle of the materials, which can later be reused and re-sold as secondary materials is a good source of job creation for individuals and revenue generation for businesses.

In this paper, the problem of e-waste and its treatment as related to waste management in Lagos State of Nigeria has been critically examined. The existing environmental management system and framework seems mostly regulatory in nature and focuses on command and control approach.

With the increasing number of the people buying electrical and electronic equipment, Nigeria is used as a global dump ground for e-wastes, and weaknesses in governmental waste management processes has made WEEE become a serious dilemma for local, state and federal governments of Nigeria. Earlier the environmental and sustainability management of e-waste has received low priority. Lack of financial resources, institutional weaknesses, improper choice of technology and public unawareness towards WEEEM are some of the factors that contributed to the upward slide of seeing e-waste as a problem in Nigeria. However, the Lagos State government, understanding both the environmental problem as well as the economic benefits, has set up a project with incentives to attract both local and foreign investors.

The findings in this paper relate to evaluation of the situation of WEEEM in Lagos, with bases on online published information and field trip to Nigeria in June 2011. As a result of this, an approach to design a sustainable environmental business model and market entry is evaluated.

Key words: E-waste management opportunity, Business models and strategy, Lagos, and Nigeria.

Abbreviations

WEEE	Waste Electrical and Electronic Equipment
E-Waste	Waste Electrical and Electronic Equipment
WEEEM	Management of Waste Electrical and Electronic Equipment
EU	European Union
GDP	Gross Domestic Product
3R	Recovery, Recycle and Reuse
FDI	Foreign Direct Investment
NGO	Non-Governmental Organization
LASEPA	Lagos State Environment Protection Agency
LAWMA	Lagos State Waste Management Authority
EIA	Environmental Impact Assessment
EnRA	Environmental Risk Assessment
ERM	Environmental Risk Management
EPR	Extended Producer Responsibility
GHGs	Green House Gases
EPR	Extended Producer Responsibility
MRFs	Materials Recovery Facilities
UNEP	United Nations Environmental Program
PCBs	Printed Circuit Boards
PBCM	Process-Based Cost Modeling
CSR	Corporate Social Responsibility

EEE	Electricals and Electronics Equipment
AAS	Atomic Absorption Spectroscopy
ICP	Inductively Coupled Plasma
AES	Atomic Emission Spectroscopy
PVC	Polyvinyl Chloride
CRT	Cathode Ray Tube
Cd	Cadmium
Pb	Lead
Hg	Mercury
BFR:	Brominated Flame Retardant
Cr:	Hexavalent Chromium IV
Be:	Beryllium
Ba:	Barium

Definition of key concepts

WEEE/E-waste	an electrical or electronic item that is close to its end-life or already a junk or obsolete that is disposed
Collection	means gathering and removal of e-wastes from collection points or any other location
Disposal	is final disposal of e-wastes in terms of the specified measures to prevent contamination of ground water, surface water and ambient air quality
Waste generators	are individuals or establishments generating e-wastes
Dismantling	is the act of manually disengagement or break-down of an e-waste into different components of which it is made of
Segregation	means the process of sorting the different components of each item into a group
Recycling	means the conversion of e-waste into a re-usable item either through a manual or technologically automated process
Recovery	means to gather e-waste items for recycling and also extracting precious items from e-wastes
Secondary material	is recovered material from e-wastes
PBCM	is a mathematical transformation, mapping a description of a process and its operating conditions to measure the cost of process performance
Stakeholder	is one who can promote or destroy a business through his or her actions towards that business

Area boy	is a local resident male between the age of 16 to 55 that is relatively illiterate and jobless; and engages in vices and crimes as means of making a living
Waste pickers	a group of people who make their living by picking up waste items for reselling from dump grounds or any place

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1 Introduction

This chapter depicts the research background, purpose, objective, mission, research method investigative questions, research limitations, and field trip experience.

1.1 Background

Nigeria (see appendix B) as an emerging market is currently experiencing a steady growth in its GDP. This in-turn increases the purchasing power parity of the national currency. The combination of these factors has also enhanced the rise in the purchasing power percentage of the middle class, who literally has more spending power and also exercise it by buying and discarding lots of electrical and electronic gadgets as they wish. Undoubtedly, the quality of the electrical and electronic items affects their longevity and life cycle, whereby majority of them do not have a long lasting life cycle. Furthermore, the country has a thriving free market economy that encourages the participation of private companies in many sectors, of which the most recently was the liberalization of the Telecom Sector in 2001. This act has seen the sudden and steady rise of digital mobile lines connection. Presently, over 120 million Nigerians use telephones. An average Nigeria possesses between 2 to 3 telephones. In addition, about 35 million Nigerians are currently using on personal computers, whereas business centers businesses are increasing in number (DoingbusinessNigeria.com.).

However, the country was not adequately prepared to contain and control the e-waste generation that accompanies such reforms as well as societal development such as technological upgrading and modernization. Hence, the advantages of the country's technological emancipation is rather constituting a societal problem. The actions undertaken by individuals and companies in the quest to attain a greater level of modernization through increasingly purchase of electrical and electronic gadgets and maximum utilization of the underscored business opportunities through the importation and selling of electrical and electronic equipment to the private and public sectors as well as the general public are clearly efficient ways of generating e-wastes. For example, the

Telecom sector liberalization in 2001 resulted in the preference of mobile telecom services to fixed lines. Consequently, the usage of fixed lines dropped from 95% in year 2000 to less than 10% in March 2005. These fixed line telephone sets, which are over 3 million units are either disposed unconventionally or stockpiled.

The nation`s phenomenal progress in upgrading its information technology has resulted in the generation of large quantities of electronic waste in the country. As a matter of fact, large quantities of mobile phones and accessories including secondhand and remanufactured products are being imported to meet the pent-up demand (Osibanjo & Nnorum 2007, b; DoingbusinessNigeria.com. 2011).

Therefore, with no material recovery facility or appropriate WEEEM infrastructures in place for e-waste treatment, there are serious environmental and public health problems. In the urban cities such as Lagos, these electrical and electronic gadgets at the end of their useful age are indiscriminately dumped into the waste stream, open dump, open air, unlined landfills, streets and water bodies. The unskilled waste pickers with crude or no protective gadgets visit these open areas to extract scrap for either reuse or resell. In as much as such action sustains the livelihood of these waste pickers, it, on the other hand exposes them to toxic materials and terminal diseases. In earnest, the littering wastes poisonously threatening the environment, health and lives (Osibanjo & Nnorum 2007, b).

The governments of Nigeria have not intervened enough in the monitoring and controlling of the indiscriminate dumping as well as e-waste management. This can be attributed to the fact that the government has relatively low ability and capacity to handle such situation because of the requirements such as education, infrastructure, technical know-how, finance, training, and experience. Hence, in order to foster the condition, the Nigerian government has inaugurated a private-public –participation program that will help it solve such problem through the participation and partnering with private sectors, most especially foreign investors. In addition, Lagos State Government has provided incentives to attract FDI in this sector. In February 2011, it conducted its first e-waste summit, which saw the participation of many professionals in such matter. The acknowledgement of e-waste as a big problem has made the government to take such initiative, in order to find solutions on how to convert e-wastes to resources.

This topic is very important to the author for many reasons. Firstly, there is great need for education and enlightenment on the grave risks that indiscriminately e-waste disposal poses to the environment, health and lives of common Nigerians. Secondly, Nigeria also serves as one of the global e-waste dumping ground. For instance, according to reports from The Basel Action Network, Greenpeace, Ibadan University and Abia State University in Nigeria, in 2005 more than 15,000 tonnes of colour television sets were exported from the EU to Nigeria. Furthermore, an estimated amount of 500 containers of secondhand computer-related electronic equipment of various states of condition and age enter the country each day (Puckett et al., 2005, 2 - 12; Osibanjo & Nnorom 2007, 497). When such volume of waste and its generation are not managed properly, it becomes societal nuisance. Therefore, if Nigeria intends to continue in this direction, it needs to learn from countries such as China and India, who has converted such wastes to resources through capacity and capability development. Finally, there is a global trend of secondary material market. This can serve as a business opportunity, job creation and revenue generation possibilities for both firms and the nation.

Therefore as the author`s interest grew, the author understood that the information in the Internet is not enough to give a clear picture of the current situation of e-waste in Nigeria. Hence, there was an urgent need for a field trip research in Nigeria. In the month of June 2011, the author embarked on the field trip. The findings from the trip are intriguing, and they will be tendered accordingly in this report. The author is highly motivated because the study will expose the business opportunities in Nigeria`s WEEE market.

Study Overview Presentation

This study will provide an overview on first, the current situation on Nigeria`s WEEE market. Second, the Lagos State Government capacity and support for investors, interested institutions and stakeholders. Third, the business opportunities as it relates to the market environment and globalization. Finally, the business models, strategies and entry modes that fits the target market.

1.2 Research Purpose, objective and mission

Every action undertaken in any venture or project must have a purpose, objective it aims to fulfill, and mission it sets out to accomplish. Therefore, this study is not an exception.

The Purpose

The purpose of this research is to assess the existing state of WEEE in Lagos State, Nigeria with the aim of identifying its efficiency, the prospects for improvisation of the e-waste management system and highlighting the potential business opportunities. Lagos as a location choice is a strategic choice based on the facts that Lagos is the biggest metropolitan city in Nigeria with a population of close to 20 million. In addition, it is the vibrant economic hub state of Nigeria. Moreover, its geographical location is a great advantage, since it has the country's first international airport and major ports. Furthermore, the WEEEM strategy that endured in Lagos can be duplicated in all other 35 states of the country. This paper intends to identify problem and measures to tackling WEEE in the target market. Hence, the purpose of the research can be summarized as to highlight the opportunities, right business model, market entry mode, strategy and stakeholders for Finnish SMEs.

The objective

In order to effectively convert e-waste into economic value in a society, such society must be able to develop and implement a low cost efficient management method. In addition, such method ought to be able to maximize its services in healthy environment creation, protection and business profits generation. Hence, this research will provide clear and concise information, which will help foreign companies' internationalization into Nigeria.

The research will take into account the target market micro and macroeconomics, the existing e-waste market industry structure and the available stakeholders. The study will focus on Nigeria's e-waste as it is currently, present environment and health issues, the

attributes of recycling and resource recovery, the aspects of livelihoods, employment and poverty alleviation through WEEEM. All these aspects will also be analyzed from the business perspective. The aim is to provide a validated and valuable information as it is presently, which will be used in internationalization decision making by Finnish SMEs. Nevertheless, due to the vast area of this study, limited time frame and limited available resources, the researcher concentrates more on e-waste management, handling and the mechanism used in the target market, concerned stakeholders and the business environment.

To summarize the research objective, the main points are, firstly, analyze the target market WEEE current situation. Secondly, highlight the business opportunities. Thirdly, provide information on the potential stakeholders. Fourthly, indicate the issues and risks in the target market.

The mission

The mission of this study is to promote the implementation of 3R in the target market. Looking at the present climatic conditions in the world today, one cannot doubt the increasing pressure on the natural resources. Hence, the climax issue in today`s world business is “sustainable business or sustainability or sustainable business practices”, with respect to the environment. Due to the success of this phenomenon in the developed markets, the researcher agrees that it can also be applied in developing markets such as Nigeria. 3R has proved its capability to be economically vital and responsive as well as its ability to provide a healthy and sustainable environment in developed nations. Therefore, an environmentally sustainable business is a healthy business.

1.3 Research method, main and investigative questions

E-waste management research provides the relative information to carry out an effective and efficient management practices. Description of the research work has been outlined in the form of questions below, however, first it is necessary to explain the method used in this research work.

The research method

There are two methods applied. They are literature review and field trip research. The literature review comprises the studying and collection of data from books, Internet, and publications, whereas the field trip involved the conducting interviews and market observation.

The main and supporting investigative questions

Main Question: How can Finnish SMEs benefit from Nigeria`s WEEE market?

Supporting investigative questions:

Question 1: How is the Nigerian WEEE market condition?

Question 2: What is the right business model and entry mode for the target market?

Question 3: Who are the potential stakeholders and their respective importance or influence?

These questions were structured with serious consideration to the objective, purpose and mission of the study, as already presented earlier in sub-chapter 1.2. The result of this study will provide Finnish SMEs with professional, concise and descriptive view of Nigeria`s WEEE market, with focus on Lagos state. Furthermore, it will depict the most

appropriate business model and entry mode to apply as it relates to this present time and situation.

1.4 Research Limitations

Nigeria is a big country; the research scope concentrates on WEEEEM in Lagos State. The study focused at the rate of e- waste generation, collection, handling, and the 3R effect. In addition, it is necessary to take into consideration what an average Nigerian stakeholder thinks regarding the e-waste problem.

This study has its limitations, which are first, irregularities in the published data on the internet. Second, difficulty in accessing recorded data at Lagos, Nigeria. Third, the understanding of how politics plays a big role in making social issues decisions in Nigeria.

1.5 Field Trip and Interview Description

A field trip to Lagos, Nigeria was undertaken by the author during the month of June. The aim was to access the local data of the target market, to observe the e-waste management current situation, and to interview some of the stakeholders.

The places that were visited for observation were Alaba International Market, Ikeja Computer Village, LASEPA Secretariat, the scrap companies industrial area, and Apapa Warf.

The author structured two different sets of interview questions (see appendix A), of which one was directed to the importers and retailers of used or second-hand items. The other was for the government officials. Moreover, some of the discussion that ensued between the author and some ordinary Lagosians are taken into consideration in this report, as it was part of the observation process.

During the field observation, the author took pictures (see appendixes E, G, H, I, J, and K) and notes of the state of the environment, the market place, and landfill. In addition, some pictures of the local waste pickers and repairers in their state of work were also taken. These respondents were eager to give answers and recommendations during the interview sessions. These responses were applied in the study analysis.

In general, the findings of the field trip are presented in the result and analysis section of this thesis.

1.6 Thesis Structure

In this sub-chapter, a table is presented to illustrate the thesis structure. This is to enhance easy readiness.

Table : Thesis Structure

Investigative Questions	Theoretical Background Chapter	Result and Analysis Chapter
1) How is Nigeria's WEEE market condition?	Chapter 3 Sub-Chapters : 3.3.1, 3.1.2, 3.1.3, 3.2.1, 3.2.2 & 3.3.1	Sub- Chapter 5.1
2) What are the right business models and entry modes for the target market?	Sub-Chapters: 3.3.1 & 3.3.2 Chapter 4 Sub-Chapter: 4.1 Sub-Sub-Chapters: 4.1.1, 4.1.4, 4.1.5, & 4.1.6	Sub-Chapter 5.2
3) Who are the potential stakeholders and their respective	Sub-Chapters: 4.1.2 & 4.1.3,	Sub-Chapter 5.3

importance and influence?		
4) Main investigative question	Chapters: 3, 4 & 5	Sub-Chapters: 6.2 & 6.3

The author's intent by providing the table is that the reader will be able to find the relevant theories and analysis to respective investigative questions with easiness.

2. Theoretical Background

Several books and publications have been accessed to help in this study. These books, publications, and articles serve as the theoretical background of the research.

S Chatterjee and Krishna Kumar (2009), in their published academic journal titled *“Effective electronic waste management and recycling involving formal and non-formal sectors”*, pointed out the problems facing developing nations with regards to management of e-waste. The authors argued that WEEEEM can be a profitable business if managed professionally. In addition, they observed that technology is a vital tool in e-waste management process, as they referred their point to e-waste-to-resources management in developed nations. Moreover, they did not fail to point out that for effective and efficient WEEM practices, the formal and non-formal sectors of the society ought to collaborate.

Matthew J. Realff, et al. (2004), in their publication titled *“E-waste: an opportunity”*, understood that designing a waste management system could be a big problem for nations, most especially the developing nations, where the most part of e-wastes end up. These authors pointed out that in order to achieve an efficient e-waste management system that government, individual and business must have a common goal. This goal must reflect sustainable development; hence it requires education, innovation and legislation.

John Dada and Bida Bala (2010), in their publication titled *“E-waste: Is Nigeria a dumping ground?”* tend to respond to the issues of the need for education, innovation, collaboration and legislation as described by Matthew J. Realff, et al. They explained that the acknowledgement of the e-waste management problem in Nigeria has pushed the government to undertake a research on how to solve the problem. In addition, they pointed out that the Nigerian government has taken a tough stand in enacting environmental policies, regulations, creating bodies and parastatals that were enforced with the duty of overseeing how waste management facilities are created and implemented. Furthermore, their report showed that the Nigerian government has also

made bold steps by registering and associating with accredited global e-waste management institutions.

Antoinette Van Schaik and Markus A. Reuter (2010), publishing titled "*Dynamic modeling of e-waste recycling system performance based on product design*", talks about how recycling process can be effective in product quality generation through the heuristic modeling of liberation behavior. They looked at the relationship between product designing, composition and usage; and how these affect the recycling process such as physical separation, shredding, and material liberation. Furthermore, the article depicts the cost effect of different model of recycling.

Jérôme Raffely (2007), titled "*Assessing cost implications of applying best e-waste recovery practices in a manual disassembly material recovery facility in Cape Town, South Africa, using process-based cost modeling*", investigated the cost as it relates to the nations` economy, the general public health, the environmental degradation and loss of precious material due to crude and inefficient methods of e-waste management and material recovery. In addition, it also looked at more efficient methods to recover precious material from e-wastes as well as the economic benefits that comes with employment, revenue generation from the sale of the precious materials; and also increase in quality of life environment and health. Furthermore, it analyzed the cost models such as PBCM and processing cost, thereby finding their relevance with waste volume.

Mathias Schluep et al (2009), with a title called "*Sustainable innovation and technology transfer: recycling from e-waste to resources*", is an interesting publication because the study reflected the market situation and e-waste management condition in 11 countries that cut across the whole globe. It's a peculiar study as it talks about the market creation concepts, market potential concepts; and stages of e-waste recycling as it relates to both technologically innovative markets and developing nations. Moreover, it went further to state that that the market potential of innovative recycling technologies is defined through the critical volumes, which can justify the transfer and installation of technologies in order to manage e-waste in the most sustainable way. Hence having a market potential doesn't

necessarily mean that an operation can be run in a self-sufficient way, which means paid by the sales of recycling output fractions or materials. The report went further to stress on how to make the business of e-waste-to-resources sustainable and profitable.

Julius Fobil et al (2010), in a published article titled "*Waste management financing in Ghana and Nigeria: How can the concept of polluter-pays-principle (PPP) work in both countries?*" The paper explained that since waste management is a capital intensive venture, there is need to create an avenue whereby people can be conscious of waste generation and pollution. The idea is to find a way to instigate environmental sustainability and cleanliness into the mind of the masses. The paper argued with the implementation of PPP, people will pollute less and government will also generate revenue through the process.

Mathias Schluep (2009), titled "*Market potential for innovative e-waste recycling technologies in developing nations*". The study looked at issues of sustainability in more economical manner. It also indicates the possibility of creating economically and environmentally e-waste management businesses. Nevertheless, it took into consideration the social implications and local context of operation as it relates to developing nation(s). It did not fail to point out the barriers and risks for effective e-waste market and business development in developing nations.

William B. Weather, Jr and David Chandler (2011), in their second edition book titled "*Strategic corporate social responsibility: stakeholders in global environment*" were very discrete in their presentation of the CSR as it affects business sustainability in both the national and global perspective. In addition, it elaborated on the importance of organizational CSR policy as well as the implementation of it. The book took a good look at the power of shareholders in any business and thereby gave recommendations on how an organization can tap into the power and resources of its stakeholders for the benefit of the growth of that organization

Masaaki Kotabe and Kristiaan Helsen (2001), concentrated on globalization and internationalization. They concentrated on issues such as development of competitive marketing strategy, product policy decision, global pricing, communicating with the world customer, sales management, market entry modes, logistics and distribution; and risk management.

Arthur A. Thompson, Jr. et al (2008), exposes crafting and executing strategies guidelines. The excerpts from this book that were inscribed into this thesis are building competencies and competitive capabilities; evaluating a company's external environment, tailoring strategy to fit specific industry and company situation, the five generic competitive strategies, strategy, ethics and social responsibility; and managing international operations.

Using the theories

Due to the fact that these authors have personal view of their respective topic, their theories were adapted into this study in the manner that it meets the study objectives, purpose, and mission. Furthermore, they were help in understanding and structuring the investigative questions and observations conducted during the field trip. Discretion and carefulness were implemented so as to maintain objective of the thesis, while explaining and providing the necessary and important information.

3 E-Waste and Management Methods

This chapter depicts the definition of concepts. In this chapter, the reader will understand the meaning of WEEE as it will be explained in broader aspect. In addition, e-waste categories as indicated by EU WEEE and Swiss ORDEE Directives will be highlighted. Furthermore, the material composition of an e-waste item and causes of e-waste generation were explained. Moreover, the hazardous effects of untreated WEEE to both public health and environment were highlighted.

3.1 Definition of concepts

This area depicts the definition of the major concepts applied in this thesis. The definition given by some authors were tendered, which was later supported by the thesis author's own definition.

3.1.1 E-waste:

This is a term used to describe old, end-of-life or discarded appliances using electricity (Amchamindia.com 2011). In addition, it can be defined as consumers and businesses electronic equipment that is near or at the end of its useful life (Calrecycle.com, 2011). The European Union directives defined it as equipment, which is dependent on electric currents or magnetic fields in order to work properly; and equipment for the generation, transfer and measurement of such currents and fields, and designed for use with a voltage rating not exceeding 1000 volts for alternating current and 1500 volts for direct current (Naturaledgeproject.net, 2011.). Considering these three definitions, the author defines e-waste as all electrical and electronic equipment and appliances that are discarded based on the reason that they are not useful to the owner anymore or close to their end of life.

WEEE is a very broad and growing concept. It's main focus is on sustainable development. E-waste comprises of both household and industrial appliances and

equipment. The household appliances include computers, refrigerators, personal cellular phones, cookers, air conditioners, personal stereos, lamps, televisions, personal power generators, video players, etc. On the other hand, the industrial e-waste is industrial generators, electric cables, telephone-line cables, cooling system, etc. Therefore, by understanding e-waste as a compound of various items makes it easier to understand its hazardous and useful aspects.

3.1.2 E-waste categories

It is defined as the grouping of the items referred as e-wastes. This grouping provides a great deal of help especially during the process of waste recovery and recycling.

Both Swiss ORDEE regulation and EU WEEE directive agreed on e-waste categories as well as their respective sources as tendered in the table below.

Table : E-waste categorization according to Swiss ODREE and EU WEEE Directives respectively.

WEEE CATEGORY	SWISS ODREE	EU
Household Appliance	Washing machines, dryers, refrigerators, coffee machines, iron, toasters, vacuum cleaners, air conditioners, etc	Large household appliances: Washing machines, refrigerators, air conditioners, dryers, etc
		Small household appliances: Vacuum cleaners, iron, coffee machines, toasters, etc
Office, Information and Communication Equipment	PCs, Laptops, Mobiles, Telephones, Fax Machines, Copiers, Printers etc.	PCs, Laptops, Mobiles, Telephones, Fax Machines, Copiers, Printers etc.

Entertainment and Consumer Electronics	Televisions, VCR/DVD/CD players, Hi-Fi sets, radios, etc	Televisions, VCR/DVD/CD players, Hi-Fi sets, radios, etc
Lightning Equipment	Fluorescent tubes, sodium lamps etc. (Except: Bulbs, Halogen Bulbs)	Fluorescent tubes, sodium lamps etc. (Except: Bulbs, Halogen Bulbs)
Electric and Electronic Tools	Drills, Electric saws, Sewing Machines, Lawn Mowers etc. (Except: large stationary tools/machines)	Drills, Electric saws, Sewing Machines, Lawn Mowers etc. (Except: large stationary tools/machines)
Toys, Leisure, Sports and Recreational Equipment	Electric train sets, coin slot machines, treadmills, etc	Electric train sets, coin slot machines, treadmills, etc
Medical Instruments and Equipment Surveillance and Control Equipment Automatic Issuing Machines	Medical Instruments and Equipment Surveillance and Control Equipment Automatic Issuing Machines	Medical Instruments and Equipment Surveillance and Control Equipment Automatic Issuing Machines

Source: Adapted from Amchamindia.com, 2011

Table 2 depicts the categories of e-waste mainstream by both Swiss ODREE and EU WEEE Directives. From the table, one can easily gather that both directives agree in the classification of e-waste into categories or group.

3.1.3 E-waste Material Composition

This is defined as the different elements or substances that make up a particular equipment or appliance. In other words, they are the substances that can be found in an item.

Different professional researchers have proved that electrical and electronic appliances possess valuable elements. These elements are originally found and extracted from the

earth crust. These elements are described in table 2 with reference to their amount in the earth crust.

Table : EEE Waste material elements

Quantity	Element
Bulk	Tin, Copper, Silicon, Carbon, Iron and Aluminum
Small	Cadmium and Mercury
Trace	Germanium, Gallium, Barium, Nickel, Tantalum, Indium, Vanadium, Terbium, Beryllium, Gold, Europium, Titanium, Ruthenium, Cobalt, Palladium, Manganese, Silver, Antimony, Bismuth, Selenium, Niobium, Yttrium, Rhodium, Platinum, Arsenic, Lithium, Boron, Americium

Source: Adopted from SCRIBD 2011

The table 3 shows the valuable materials that are used in the manufacturing of electrical and electronic equipment in their amount in the earth crust. It further indicates that the recycling of WEEE equipment leads to the recovering of some or most of these precious materials.

A recent study conducted on the available quantities of these valuable materials in the earth crust has turned out to be alarming. The result of the study showed that these elements are diminishing rapidly from the earth crust due to human activities such as increase in the exploration, extraction, and usage rates. Hence, the need for sustainability arises, which can be implemented through many measures including 3R.

To support table 3, the material composition of a personal computer is presented in figure 1, below

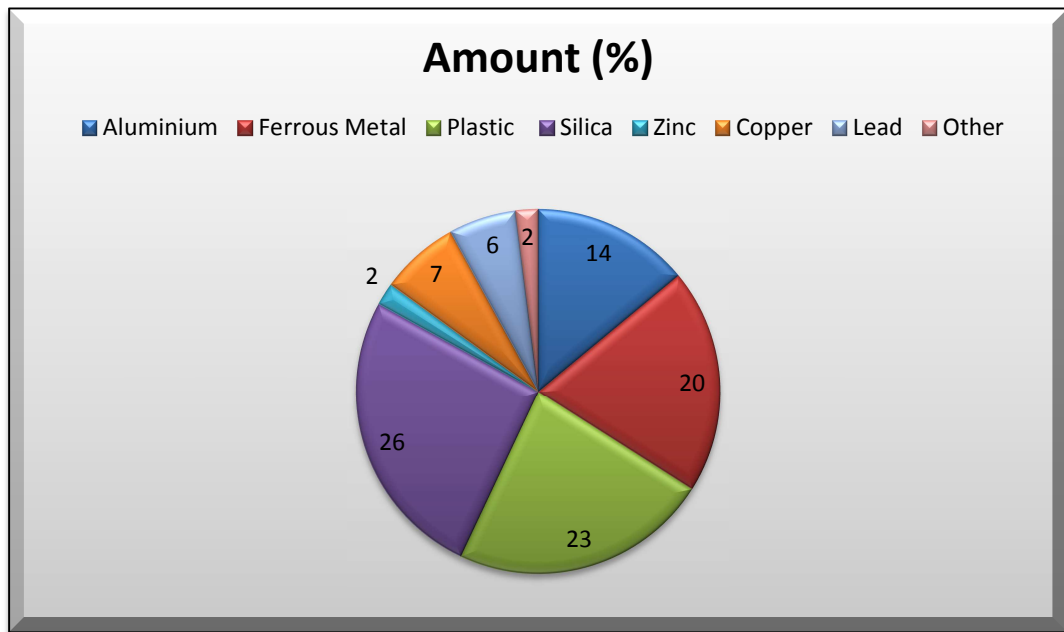


Figure : Material composition of a personal computer

Source: Environment Canada 2011

A personal computer comprises of about Aluminum (14%), Iron or ferrous material (20%), plastics (23%), Silica (26%), Zinc (2%), Copper (7%), Mercury (0.002%), Cadmium (0.009%), Lead (6%) and other (2%). Therefore, imagine how much of these elements are laid to waste when over 1 million personal computers are not recovered and recycled. In addition, imagine how much damage that is being perpetuated to the environment and earth by increasing the extraction of these materials to manufacture personal computers, rather than recovering the components and re-using them in manufacturing of either personal computers or other appliances.

3.2 Causes and Effects of E-waste

In this section, the reader will understand that the poor management and treatment of generated e-waste can cause serious problems. In addition, the main causes of the e-waste generation will also be discussed. The first sub-sub-chapter dealt with the causes of e-waste, whereas the second one dealt with its effects.

3.2.1 Causes of e-waste

Great development in science and technology, which results in manufacturing of technological devices coupled with the insatiate desire in humans to acquire and use these devices is a factor that encourages WEEE generation. Inhabitants of both developed and developing nations are catching on with the fever to use technologically enhanced devices. As a result of this, there is constant growing number of units produced since there is a constant growing number of a user.

It must be noted that these products do have life span ranging from 18 months to 5 years respectively, depending on the type of product. However, since majority of the bulk of e-waste originates from large and small-hold appliances, then the life span of such appliances are relatively 2 to 3 years (ScienceDirect 2011.).

It is estimated that 20 to 50 million metric tons of e-waste are discarded worldwide each year. About 305 million and 266 million brand new computers were sold worldwide in 2009 and 2010 respectively. In addition, 211 million and 280 million brand new televisions were sold worldwide in 2009 and 2010 respectively. Furthermore, 1.211 billion brand new cell phones were sold in 2009 worldwide; while about 174 million brand new smart phones were sold worldwide during the same year. Presently, there are about 4.5 billion users of cell phone globally, and over 1 billion computers in the world today. Moreover, 1 billion brand new camera phones are expected to be sold in year 2011 (Electronictakeback 2011; ITU 2011.).

Nigeria generates e-waste through the importation of new and used appliances (see appendixes D and E). For instance, by February 2011, there are over 91 million users of mobile phone, and over 17 million owners of personal computer (Isaac Anyira & Anthonia

Nwabueze, 2011.). The Nigeria middleclass is rapidly growing; hence people can easily acquire technology devices for personal usage.

3.2.2 E-waste effects

There is an acknowledgement of the negative effects of WEEE in developed nation and growing concern in developing nations, most especially those that serve as global dump ground. Therefore, Nigeria as a member of the global dump ground for WEEE has a growing concern on the impacts of e-waste to both the environment, public health and the economy at large. This was highlighted in the 1st EKO E-waste Summit, organized in February 2011. This summit, which was orchestrated by the governor of Lagos State, Mr. Babatunde Fashola acknowledged the negative impact of poor waste management as well as the economic benefit. The summit, which was attended by both national and foreign dignitaries and experts in this field deliberated on finding solution to the negative effects, as well as exploring for avenue to convert “*waste to resources*” for the economic development of the state.

When proper measures in the disposal and recycling of WEEE are not taken, the consequences on both the environment and human health are grave. EEE waste contains over 1 000 substances. Some are valuable and others are toxic. Therefore, their treatment and disposal method requires appropriate mechanism and infrastructures. The act of using landfill and burning (see appendixes K, L, and G), as a disposal management methods contributes immensely to environmental and public health problems. Uncontrolled and poorly managed dumping in the landfill can result to poisonous substances being leached into the soil and water bodies, thus contaminating the soil and water bodies. In addition, burning can also leak harmful contents into the atmosphere, which can be inhaled by livestock and humans, or can dissolve in rainwater and is assimilated by plants (Scribd 2011, 10.).

It is absolutely necessary to understand the negative impact of some of the material compositions in electrical and electronic appliances, in order to take proper precautions and measures for their management. Researches have shown that in most developing nations such as China, India, Pakistan and Nigeria where crude and unconventional

means of WEEEEM are used, most of the workers in this area end up with perennial life threatening diseases and illnesses.

Table : Computer composition elements and respective health effects

WEEE Source	Element Composition	Health Effect
Chip resistor and semi-conductor	Cadmium (Cd)	<ul style="list-style-type: none"> • Neural damage • Accumulation in kidney and liver, which can cause breakdown of these organs • Teratogenic • Toxic irreversible effect in Human
Solder in printed circuit boards, glass panels and gasket in motherboards	Lead (Pb)	<ul style="list-style-type: none"> • Damages the central periphery nervous systems and kidney • Affects brain development in children
Relays, switches and printed circuit boards	Mercury (Hg)	<ul style="list-style-type: none"> • Severe and chronic brain damage • Respiratory and skin disorder as a result of bioaccumulation in fishes consumed
Plastic housing of electronic equipment and circuit boards	Brominated flame retardants (BFR)	<ul style="list-style-type: none"> • Disrupts the function of the endocrine system
Front panels of CRTs	Barium (Ba)	<ul style="list-style-type: none"> • Muscle weakness • Liver, heart and spleen damage
Motherboards	Beryllium (Be)	<ul style="list-style-type: none"> • Carcinogenic effect • Skin disease such as wart • Chronic beryllium disease or

Computer and cabling housing	berylliosis	
	Plastic including PVC	Dioxins causes <ul style="list-style-type: none"> • Reproductive and developmental problem • Interference with regulatory hormones • Immune system damage •
Corrosion protection of untreated and galvanized steel plates, decorator or hardener for steel housing	Hexavalent Chromium IV (Cr)	<ul style="list-style-type: none"> • DNA damage • Asthmatic bronchitis

Source: Adapted from Scribd 2011, 11.

The health hazard posed by unconventional recycling methods as well as improper and unsustainable management of WEEE as tabled in table 3 is indisputably horrendous. Cases of the mentioned diseases and effects in the table has been reported in developing nations such as China, India, Nigeria and Ghana, where people make living through collecting, recycling and reselling of recycled materials.

Unsustainable management of e-waste is bad, crude and unconventional means of its management is worse, and its potential negative impacts to both health and environment is worst. Nevertheless, there are still good benefits that it provides if 3R is well implemented. These benefits include, first, a clean and healthy environment. Second, nature is conserved and preserved. Third, energy efficiency is generated and developed. Fourth, jobs and businesses are created, which in-turn promotes economic growth and developed.

3.3 Sustainable E-Waste Management

This sub-chapter deals on the e-waste generation, the generators segments, the generation flow chart, and the ideal generation process. Furthermore in the immediate

following sub-sub-chapter, the e-waste management is dealt with emphasis on the collection, transportation and storage methods; the recycling method, recycling process flow chart

3.3.1 E-waste Generation

Most common WEEE are generated in enormous amount in the developed nations such as United States of America, Europe, Japan and South Korea. Majority of these e-wastes end up in developing nations in Asia (China, Vietnam, India, Malaysia and Pakistan) and Africa (Nigeria, Ghana, Kenya, and South Africa). The developed nations who have greater knowledge and resources in managing the bulky amount of the e-waste prefer to export them to developing nations who have lesser knowledge, capacity, resources and capability in handling such amount of waste. This action is also necessitated by the growing need for technological appliances by the masses of these developing nations. In addition, these developing nations generate a great amount of EEE waste internally

There is no standard definition of e-waste generation and generators. The author defines e-waste generation as the process whereby electrical and electronic equipment as well as appliances are produced, sold, purchased, used and discarded within a defined territory. In addition, the e-waste generators is defined by the author as the companies, association, individuals and others that engage in the activities of producing, selling, buying, using and discarding of manufactured electrical and electronic appliances.

Through these giving definitions, the author is trying to establish the consensus and relationship among the different generators. It is often ruled out that electrical and electronic manufacturers are generators. However, looking at it from the perspective of the flow of e-waste main stream generation, there is clear evidence that they are part of the major generators.

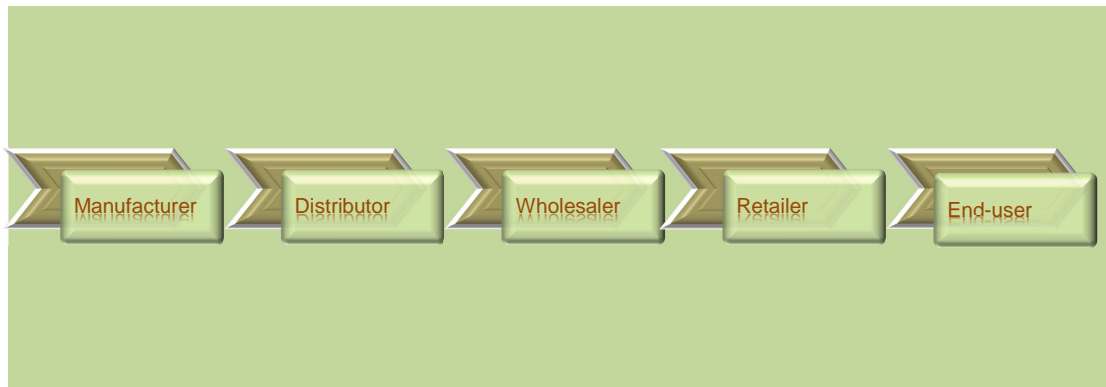


Figure : E-waste main stream, generation flow chart

In figure 2, the relationship in the waste generation sequence that exists among the participants is demonstrated. The binding factor among these players is the “end-user”. In other words each of the players can equally be the end-user. In addition, it is important to understand the wholesaler and retailer segments. In addition, the distributor can also play the role of wholesaler and retailer in some cases.

The different segments in the generators respectively are highlighted in figure 3 below.



Figure : Waste generators segments

In figure 3, the different segments of the generators are depicted. The generators can be categorized into three sectors, which are individual and small businesses; large corporation, institutions and governments; and Original equipment manufacturers (OEM) (SCRIBD 2011, 5). However, further breakdown grouping of the generators into large

and small generators were done in the study analysis section. It should be understood also that these generators make up members of WEEEM stakeholders.

The individual and small businesses sector: In this sector, electrical and electronics equipment are often discarded by households and small businesses sometimes not because they are broken but because new technology has rendered them obsolete and undesirable. In developed nations, this sector accounts for about 36% of WEEE (SCRIBD 2011, 8).

The large corporation, institution and governments sector: A large user upgrades and replaces employee computers regularly, perhaps between 18 months and 36 months. In developed countries, it accounts for about 20 percent of the total e-waste generated. In addition, industries and factories replace their older equipment and appliances with new ones, thereby producing a good amount of waste. These segments together contribute to about 55% of the total waste generated in most developed countries (SCRIBD 2011, 8).

Original Equipment Manufacturers (OEMs) sector: This sector generates waste usually when units coming off the production line do not meet the required standard. This sector accounts for about 9% of the total waste (SCRIBD 2011, 8).

The *wholesale and retail segments* as they pertain to Nigeria are very interesting. It is sub-segmented into foreign based importers and home-based importers. The importers segment is demarcated into brand new importers, second-hand or used items importers; brand new and second-hand importers, brand new wholesalers, and second hand wholesalers. Meanwhile, the retailers' segment is less fragmented. It comprises of three main segments, which are the brand new retailers, second-hand retailers; and brand new and second-hand retailers.

In Lagos, Nigeria, the large percentage of e-wastes is generated by second-hand importers, second-hand retailers and second-hand items end-users. The population is huge and hence the demand for both new and used products is relatively high. According to LASEPA, about 500 containers of used electronics and computers arrive at the port in Lagos per day (LASEPA, 2011). On the other hand, the Nigerian Custom says that an estimated amount of 180 to 250 containers of brand new electronic and electrical items enters Lagos port on each day.



Figure : The ideal e-waste generation process

In figure 4, the ideal process in generation of e-waste materials in Lagos, Nigeria is first, the purchasing action. This is followed by usage and discard.

While considering the large quantity of wastes generated, one can observe that there is a strong relationship existing between the rate and volume by which these different phases are carried out by the generators and product life-cycle of these items. For an example, an importer of used items, such as telephones knows quite well that the items are already either obsolete or closer to their end-of-life before importing them and selling them to end-users. This means that, within few months, say between 4 to 8 months the closer to end-of-life items become totally unusable. Hence, they become disposed by the owners. Therefore, the importers being quite aware of this phenomenon imports more used items because they are sure that those customers, who have disposed their unusable items will need to purchase again. Therefore, this irresponsible plan and cycle continues to increase the amount of e-waste generated.

The Federal Government of Nigeria stated that the uncontrolled increase in generation of wastes coupled with the indiscriminate dumping of waste into the waste main stream as well as the poor environment management costs the nation an estimation of USD 5 billion per year (John Dada & Bidi Bala, 2010).

3.3.2 WEEE collection, transportation and storage

Storage of waste deals with storing waste at its point of generation until collection by waste managers. The collection and transportation of waste involves the collection of waste from its storage point to a final place of treatment or disposal (Kofoworola 2007, 2.).

Waste collection and its administration vary from countries to countries due to differences in infrastructures; and management capacity, capability and schemes. Some nations have and are trying to involve the participation of public and private sectors into waste management. It is no more seen as the job of only the government or municipality.

In Lagos, Nigeria, the illegal and indiscriminate dumping of the waste is on rise. Since about 75% of the container content of second-hand items imported from Europe, North-America and Asia are relatively obsolete (see appendix D). The importers, wholesalers and retailers must find a way to dispose these items. Currently, they use two unconventional and unsustainable waste disposal approaches. First, is to classify them as untested and therefore, sell them very cheap. Second, is to dispose them through their paid networks known as the area boys.

To classify them as untested and sell them very cheap

This involves the grouping of both the same or different junk items and sells them off relatively cheap as untested items (see appendix E). The “untested” classification makes it easier for the seller in that the buyer cannot come for refund, because there is no guarantee that the item is in good working condition. Therefore, when one purchases such item, it means that such is doing so with back in mind that the product will either work or not. Therefore, the buyer bears the risk burden.

To dispose them through area boys

In this process, the importer, wholesaler or retailer engages the service of the area boys to dispose these items. They do so to avoid problem with the law. The dread area boys, who are very familiar with having skirmishes with the authorities, come in handy with their

service. These area boys takes the wastes either in truck, van or push cart to a creek, open field or wherever they do prefer and dump the items there. Sometimes, they set them on fire (see appendix G). Usually, they are well known by the authorities, and can take up a fight with police or another law enforcement organization without concern for the consequences.

Furthermore, individuals also play their role in indiscriminate and illegal dumping. E-wastes are put into a trash bag or load and dumped at road sides, creek beds, water bodies, open field, alleys, and wherever they deem fit. These actions usually take place during the late hours of the night.

The management and treatment of these waste has been left to the state and local governments to handle. According to John Dada and Bidi Bala (2010, 2.), the specific challenges in all Nigerian states concerns its collection and disposal. The regulatory environment for these activities is either non-existent or poorly managed. Unlike in China and India, where the informal collection method is efficient, Nigeria's` informal collection method relies on local unskilled and ill-equipped push cart owners. These push cart owners does not mind the consequences of environmental degradation and public menace they constitute by indiscriminate disposal they effect, since they are more concerned by their daily livelihood. There is no doubt that the collection, transportation and storage of waste requires adequate machinery and equipment (Kofoworola, 2007,2), such as trucks, vans, safety and protection gadgets. These are huge investments for a poor government. In which case, such government seeks for alternative measures to implement the collection and transportation processes. In Nigeria`s case, the push-cart owners provides the easy alternative.

As ineffective as the push-cart owners can be in being responsible in waste management, they however, do help a little bit by conveying the waste generated by individuals to a decimated dump ground in some cases.

Hence, understanding that the inefficiency of the local push cart owners adds more in term of monetary cost in waste management and also coupled with its incompetency in their ability and capability to deliver a very good waste management service to the public, through their established parastatals on environment protection and management. The Lagos state government has set up agenda that will involve private sector. This agenda was later signed into bill as "*Private Sector Participation*", commonly known as PSP. By

doing so, they showed their concern and interest in the growing e-waste epidemic that is about to engulf the nation.

3.3.3 The Recycling treatment

Sustainable business development as a phenomenon centers on the 3R, which are *“recovery, reuse and recycle”*. Recycling is a means of treating e-waste, which involves processing the waste material to recover materials (Kofoworola 2007, 2). Schaik and Reuter (2009, 194.), states that the recycling principles and dynamics are the same for all e-waste materials, however the difference is the composition of each item as well as the toxic elements it contains. There are two set of views that comes up, during recycling process, the first set is *“to shred-or-not-to-shred”*, whereas the second is *“the environment and the economic values”*

Recycling could be either manual or automated. In both methods, there are set out processes they follow. It requires infrastructure in order to be effective in the treatment and valuable material recovery processes. This set of processes is described in figure 5.



Figure : Valuable material recovery process flow chart

Source: Adopted from Chatterjee and Krishna Kumar (2009, 8)

The figure 5 above depicts the four major steps that must be undertaken in WEEE recycling, with concentration on material recovery. In step 1, the collection aspect has been described in sub-sub-chapter 3.3.2. The rest of the methods speculated in step 1 to 4 will be described further.

Step 1: Disassembly and Segregation.

Disassembly is divided into two. One involves the removal of hazardous products and other high or low grade including component, part, or group of parts, or a sub-assembly from a product, which is known as partial disassembly. Another involves the separation of a product into all of its components. This is also referred to as complete disassembly. Disassembly can be manual, semi-automated or automated. It can also be classified into destructive and non-destructive methods. The non-destructive recovers the certain disassembled parts for reuse, whereas the destructive disassembles focuses on the total separation of each material type for recycling processes. However, the problem with the feasibility of the non-destructive disassembly is the rate of speed of technological

changes in products and their respective designs with addition of lot of functionalities. In addition, the method whereby the valuable materials are soldered nowadays makes it also impossible to use the non-destructive method to recover valuable materials (Chatterjee & Kumar 2009, 5.).

According to Chatterjee & Kumar (2009, 5.), the disassembled materials are classified into three main categories, which are *first, small and large structural metal parts and heat sinks. Second, refers to the small and large structural plastic parts. Third, refers to printed circuit boards with IC chips, electronic components and connectors*

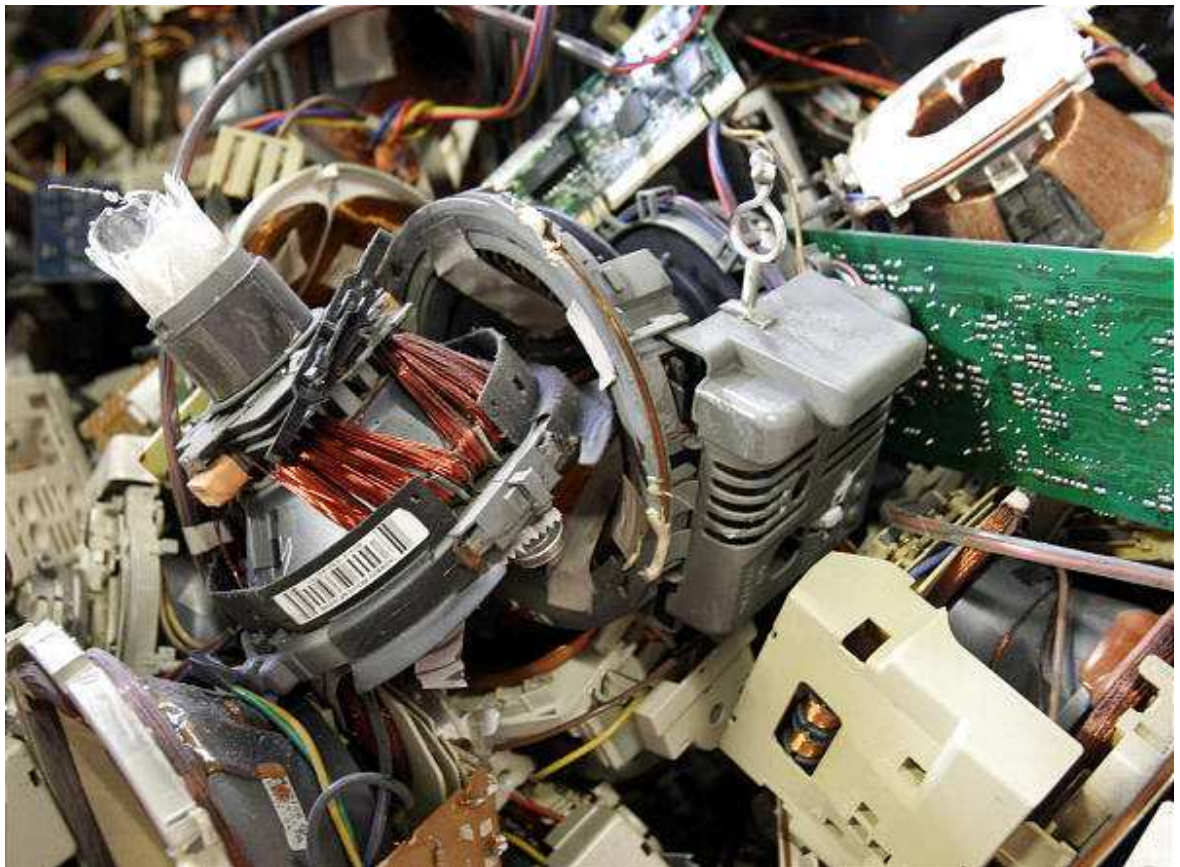


Figure : Disassemble computer showing circuits, chips and connectors

Source: Chatterjee & Kumar (2009, 6).

In figure 6, a computer is disassembled into its components. These components will be segregated into particular categories as they relate to their respective recovery techniques.

Segregation is a process whereby the disassembled materials are further grouped into various categories with respect to their material contents. From the picture in figure 6, the disassembled components from the computer are further segregated into different groups for easiness in further recycling process. The segregation process makes it easier for the recycler to know the type of technique to apply to certain group regarding the material recovery purposes.



Figure : Segregated computer motherboards

Source: Chatterjee & Kumar (2009, 8).

Figure 7 depicts segregated computer motherboards, which will be further crushed into fine samples to facilitate the extraction of valuable elements.

Step 2: Shredding, Pulverization and Crushing

These processes are carried out to make homogenous mixture of the populated various segregated categories, and hence, to primarily assess the various saleable metals present. During the shredding process, the materials are broken down into a smaller size or sizes to allow the downstream separation equipment performance efficiency in material recovery (Chatterjee & Kumar 2009, 9.) .

The idea of pulverization is to maximize the metal separation from plastics to which it is normally adhered to. During this process, particles are separated with their different types of metal components, and also metals are liberated from plastics parts of individual components and laminate (Chatterjee & Kumar 2009, 9.).

The crushing is the further compression and breaking down of plastics and metals into smaller sizes.



Figure : Crushed motherboards

Source: Chatterjee & Kumar (2009, 11).

In figure 8 above, crushed motherboards are depicted. These are subjected to different recovery techniques and applications professionally, whereby the end result is recovery of valuable elements.

Step 3: Valuation for metal content

This process requires the touch of professionals with adequate instrumental analyzing facilities, whereby the homogenous shredded and pulverized powder full of valuable metals is subjected to analysis. Valuation of metal content applies methods such as, “atomic absorption spectroscopy (AAS)” or “inductively coupled plasma (ICP)” or “atomic emission spectroscopy (AES)”, in the identification of the economical values of the metal contents. These methods are used in the determination of elemental components of a sample by its electromagnetic or mass spectrum (ANDOR 2011).

AAS is a method whereby the presence of metals in liquid or solid samples is detected through the application of ultraviolet light on the defined sample.

ICP is an analytical technique used for the detection of trace of metals in an environmental sample. The main goal of ICP is to get elements to emit characteristics wavelength light, which can then be measured (CEE 2011).

AES uses quantitative measurement of optical emission from excited atoms to determine analyte concentration (Elchem 2011).

Step 4: Metal recovery

This phase is the main goal of recycling, whereby after the valuation metal content phase, the samples are then segregated into various groups and different types of recovery techniques matching each group characteristic is applied. For example, the magnetic separation is used for iron, nickel and Cobalt. In addition, eddy current is used for aluminums. The end result in this step is recovery of valuable materials.



Figure : Recovered gold scrap metal

Source: CNET 2011

In figure 9, recovered gold scraps from recycled computers and other e-waste is displayed. This gold can later be used in the manufacturing or resold.

3.3.4 Sustainable Disposal

Sustainable waste disposal is a vital issue that requires a great deal of care in planning and implementation. The reason is because it involves the processing of e-waste by rendering it innocuous and also the final removal of it without harmful effect to both humans and the environment (Kofoworola 2007, 2). Disposal is the end process of WEEEEM.

There are various issues to be taken into consideration when planning waste disposal facility. Issue such as waste types, type of residue from the waste that needs disposal, the level of the toxics in the waste, the destination to be used as a dispose site, the availability of the land or site for construction of waste disposal facilities, the right design for waste disposal facility with respect to the waste decomposition process and byproducts, and the involvement of the right stakeholders.

Taking these points into consideration provides a good base for designing an efficient waste management mechanism. Moreover, it provides a destination for scientific and technological experiments on the classes of wastes disposed. In addition, it makes the WEEEEM safe and sustainable.

In both developed and developing nations, there are many types of disposal methods. However, the commonest and sustainable ones used in developed nations are landfilling and incineration for energy generation. While in developing nations such as Nigeria, where the necessary infrastructure are relatively low or unavailable, the most common methods are open field dumping, landfilling, open burning and incineration.

Landfilling:

It is a method of waste disposal in which refuse are buried in between layers of dirt so as to refill or reclaim low-lying ground (Freedictionary 2011). This is a common practice and often established in disused or abandoned quarries, burrow pits, mining voids and in erosion sites. The usefulness of a landfill is dictated by its design, management and mission it aims to achieve (see appendix L). A well designed and properly managed landfill can be an effective hygienic and in-expensive method. On the other hand, a poorly designed and poorly managed one can create numerous environmental problems such as breeding ground for diseases, pollution and eyesore. It is important to note that landfill has a byproduct, which is gas. This gas is mostly composed of carbon dioxide and methane. These gases contribute to greenhouse gas emission, air pollution and acidic rain water. The acidic nature of methane could be dangerous to vegetation. In some landfills, a gas extraction system is constructed to combat this problem. Furthermore, it is also important to note that landfill is prone to leaking. Poisonous elements such as mercury could leach from the landfill into the soil or ground water. Moreover, when landfill gets overloaded, burning approach is applied to reduce the waste volume, thereby exhaling toxins into the surrounding atmosphere.

However, considering the toxic substance in EEE, landfill is not a sustainable disposal method. In many European countries regulations has been enacted to prevent electronic waste being dumped into landfill due to its hazardous content (Greenpeace 2011).

Incineration:

It is the thermal destruction of waste or process of destruction of waste by converting the organic material into carbon dioxide and water by fire (Saincincinerator 2011; Pollutionissues 2011.).

This method if poorly managed can release poisonous heavy metals such as lead, mercury, cadmium and ashes into the air. Mercury released into the air can bio accumulates in the food chain, particularly fish, which could eventually be consumed by livestock and the general public.

However, modern incinerators are equipped with state-of-art technology devices to control air pollution and capture pollutants and toxics from emitting into the air. Unlike other method, incineration major benefit is that it thermally destroys the waste rather than disposing or storing it.

Open field dumping

This is an uncovered site used for disposal of waste without environmental controls. This practice is bad for the ecosystem because toxins are release into the surroundings during the oxidation process of the waste.

Open burning

This process involves the collection of waste and setting them on fire either in a designated or non-designated site. The negative impact of this action to both the environment and health is grave.

Chapter 4: Sustainable Business Development and Internationalization

Business internationalization in this context is defined as the act undertaken by businesses and corporations to operate their business activities beyond national borders or boundaries. The internationalization aspect is discussed broadly in sub-sub-chapter 4.1.4.

Sustainable development is defined as the development which meets the needs of today without compromising the ability of future generations to meet their own needs (Tufts 2011).

A sustainable business development is measure used by business to ensure that sustainable development is not compromised in any of their business activities. An entity that carries out its business activities in a more environmentally friendly manner thereby ensuring that the environmental concern is adhere to in its business principles, while maintaining the profit margin can be referred to a sustainable business. In a simpler form, it means that the enterprise has none or very low negative impact on the environment, society and community through its business dealings or practices.

Sustainable business has three main core functions, which is known as the “*triple bottom line*”. The triple bottom line is the value creation of an organization with respect to global and local eco-system, its corporate social responsibility, and its financial performance. An organization`s business model is said to be effective if it incorporates and implements the triple bottom line. The implementation of the triple bottom line can be explained as follows:-

Eco-system: - such an organization must endeavor to enforce sustainable environmental practices, in that it benefits the nature as possibly as it could. This is done through the reduction of the carbon footprint, energy consumption, natural resources consumption, and amount of wastes produced. Moreover, the company ensures that toxic wastes are rendered less toxic before disposal; disposal is conducted in a safe, environmental friendly and legal manner.

Corporate Social Responsibility: - refers to the value, which the enterprise creates for the local community, employees and other stakeholders through its business activities. An

organization that endorses triple bottom line seeks to benefits its stakeholders, rather not to endanger or exploit any or group of them.

Financial Performance: - The main aim of every enterprise is to make financial profits. Profit can be defined as the positive gain from an investment or business operation after subtracting for all expenses (Investorsword 2011). It is an economic value that takes into consideration all the business cost including those of the eco-system and corporate social responsibility application.

The durability of a sustainable business principle relies on the organizational strategic approach to designing and implementing it. It requires a certain degree of discipline and steadfastness, especially when it comes with cost of its implementation. The strategic approach encompasses three main points, which are first understanding your business, business environment, the meaning of sustainable business development, and triple bottom line. Second, is the identification of the opportunities; and involving your employees and other stakeholders in sustainable development plan and implementation. Finally, involves the creation of short-term and long-term objectives and accountability; as well as regularly reviewing, monitoring and reporting the objective plans transparently to see what's working and where you need improvements.

4.1 WEEEM as a sustainable business development

The speedy pace of technological change in the electronic and electrical industry has made these appliances both affordable and widely used. These factors coupled with high market growth rate, usage rate, and obsolescence rate results in huge amount of these appliances being added into the waste mainstream. The good part of it is the creation of a new industry known as the "e-waste recycling industry". Each year about 20 – 50 metric tonnes of EEE wastes as discarded by both businesses and individuals globally. The e-waste recycling is a lucrative business because valuable metals such as gold, copper, plastics etc are recovered and re-sold as secondary materials (Ewasteguide 2011; Cnreviews.com 2011.).

The surge in the prices of metals before and presently has also defined the process of e-waste recycling and material recovery. For example, in 2007, the total amount of revenue generated by e-waste recycling businesses in United States of America was about USD 3 Billion (Ewasteguide 2011)

In addition, some nations are developing the national capacity and capability in this sort of business. India and China, has seen the increase in SMEs in this industry as well as the economic benefit of the industry (Ewasteguide 2011).

Today, there are good technologies in the form of “state-of-art” technology that makes the process of recycling much easier, safer and environmentally friendly. Nevertheless, in the developing nations such as Nigeria and Ghana the unconventional and crude recycling processes are mostly used. These methods has tremendous disadvantages such as health hazards, littering of waste in the environment and surrounding, loss of valuable metals due to inefficient recovery equipment and skill; and economy problem that arises the combination of these factors. However, in developed nations such as German and Finland, where education and knowledge supported by availability of necessary infrastructure makes the recycling business a lucrative one, safe and less hazardous, the economic benefit of such industry is positive.

Delving into WEEEM business requires in an unfamiliar market, such as Nigeria requires the understanding of some factors, which are the target market business environment, crafting a business strategy, designing a model, and developing market entry mode.

4.1.1 The Business Environment

Despite the lucrative picture painted of EEE waste management, it does having potential problems and challenges associated with it as it relates to the business environment. Business environments differ greatly in geography, attributes and characteristics. The European business environment is totally different from its African counterpart. In Africa, the Nigeria business environment is different from that of the Egypt.

In order to achieve a successful business in any business environment, an international company entering a new market must first of all understand the host nation`s structure in

the form of politics, environment, social, technology, economy and legal. This is referred to as PESTEL, and it is useful in the analysis of both the macro and micro-economics of a target market.

Political factor: this refers to factors such as the type of government, the stability of the country, the government policy such as the degree of intervention in the economy, what good and services does the government want to provide, to what extent does the government believe in subsidizing firms, its' priorities in terms of business support; and the existing trade barriers and banned goods. The political aspect of a target market is very vital for any new business entrant because political decisions can apply a great of impact on many vital areas of the business (OUP.com 2011).

Economic factor: this looks on the economic situation of the nation. It takes into account the interest rates, taxations, economic growth rate, development rate, income rate, inflation and exchange rate. All these determines if a business will be successful or not in the target market. In addition, it helps the business manager to develop an effective business strategy for its business operations.

Social factor: it relates to the education level or state, the language(s), the culture, trends and changes, living standard, unemployment rate, beliefs, religion(s), the buying behavior, trade cycles, modes of doing business with the locals and way of life existing in the target market. The importance of considering and understanding these factors is because every business deals with humans and are created for human usage.

Technological factor: technology makes business operations much more efficient, effective, safer and easier. Technology can reduce cost; create values and innovations, which are beneficial for both the consumer and the manufacturer.

Environmental factor: the societal need, geography, weather, temperature, transportation system, availability of suppliers and buyers, the competitors, stakeholders and product substitutes.

Legal factor: this section cannot be ignored or underrated by any means because it can render a successful business impotent if properly followed. This concerns the rules, regulations, laws and legal system existing in the target market. It includes the labor laws, competition laws, health and safety legislation, consumer laws; and the legal dispute settling authorities.

4.1.2 The Concepts of Formal and Informal Sectors

The formal sector comprises all those employments that offer regular wages and hours, which carry with them the employment rights and of which income taxes are paid. This can be segregated into public and private sectors. The public sector organizations are usually referred to as state owned or publicly owned. They usually deal with production, delivery or allocation of goods and services by and for the government or its citizens in national, regional or local areas of concern. On the other hand, the private sector is that part of a nation's economy, often called the citizen sector, which is run by private individuals or groups as an enterprise for profit making, and is not controlled by the state (Investorswords.com 2011). The types of businesses associated with private sector are the following:-

Sole proprietorship: is a business structure in which an individual and his or her business is considered as a single entity for tax and liability purposes. It is a company which is not registered to the state as a limited liability company. The sole proprietor does not pay income tax separately for the company, rather he or she reports business income or losses on his or her income tax return. In addition, the owner is inseparable from the sole proprietorship; hence he or she is liable for any business debts (Investorswords. com 2011.).

Private limited liability partnership (LLP):- this is a type of business that combines the characteristics of both the partnerships and corporations. It's different from general partnership and also limited partnership, because all the partners are shielded from wrongful act or negligence of other partners. In LLP, all partners have limited liability from errors, negligence, omissions, incompetence or malpractice committed by other partners or employees. Notwithstanding, any partner(s) involved in wrongful doing or negligence behaviors are still liable, but other partners are protected from the liability of those acts. In addition, in LLP, all the partners have the same general management responsibilities (Biztaxlaw.com, 2011.).

General Partnership: - is a partnership formed with only general partners. That is to say that each partner is involved in the day-to-day running of the business. Moreover, each partner bears personal responsibility for the liability of the partnership (About.com, 2011.)

Private limited company, with shares open to the public: - this is a company that offers limited liability to its shareholders, but places certain restrictions on its ownership. The restriction is meant to prevent hostile takeover attempt. Some of the restrictions includes that the shareholders cannot sell or transfer their shares without first offering them to other partners to purchase. Secondly, shareholders cannot offer their shares or debenture to the public over a stock exchange. Third, the number of shares cannot exceed a fixed figure (Businessdictionary.com 2011.).

The informal sector

The informal sector plays an important role. It covers a wide range of labor activities within a society. In addition, it is formed by the coping behavior or activities of individuals and families in an environment where earning opportunities are scarce. The creation of informal sector could be attributed to the rational behavior of entrepreneurs who act in order to evade state regulations. The role of the informal sector can be defined as important and controversial. It's important in that it creates jobs, thereby bolstering entrepreneurial activities. However, in most cases the job is very low-paid coupled with poor job security. The controversial aspect of it is that the entrepreneurial activities enhancement comes at the detriment of the economy through factors such as tax evasion, non-compliance with the labor laws and regulations; and breeding crime and other societal vices. The size of informal labor market varies from country to country. In the high-income level nations, it's between 4-6%, while in low-income level countries, it's usually above 50%. The size and role of informal sector is influenced by a nation's economic downturn and periods of economic transition and adjustment (Worldbank.org 2011.).

The informal sector workers are important stakeholders in Nigeria. There exist skills and motivated workers, which are very essential in the activity of e-waste management. Understanding this sector is a necessary baseline to be underlined when planning for effective business operation in EEE management in Lagos, Nigeria. The reason is because, undermining the importance and role of the workforce in informal sector can be disastrous, in which they feel that their source of livelihood is tampered with. Moreover,

they are usually indigenous people with good connections and influence over other stakeholders.

The attractiveness of informal sector is characterized by factors such as, easy market entry, non or few skills are required, little capital is required to set it up, its small scale operation capacity, labor intensive, its reliance on indigenous resources, and because it is unregulated.

In Lagos, the informal sector or labor market can be useful for an enterprise by providing services, which are collection of e-wastes, disposal of recycled e-waste residue, and sorting of e-wastes into categories and groups.

4.1.3 Embracing the Stakeholders

A stakeholder is defined by Business dictionary as a person or group that has direct or indirect stake in a company because it can affect or be affected by the organization's action, objectives and policies. For any business to thrive very well in a given a market, there is need for such business management to acknowledge and embrace its stakeholders. Hence, WEEEM business is not an exception.

Stakeholders can be classified into two main categories according to their power of existence. They are "*importance and influence*".

Embracing these stakeholders requires an ardent stakeholder analysis, whereby their respective interest, importance and influence are analyzed. The result of the analysis will result in considering each stakeholder to be either active or passive.

An active stakeholder is one that has high interest in the activities of business, thereby utilizing all his or her means to promote, facilitate and improve the company. The company success is his or her paramount desire. On the other hand, the passive stakeholder, is one that is either less concerned with the operations of the company, however is interested but to a certain low-level. In addition, such one will neither go out of his or her way to ensure the survival of the company.

Government

The government has the authority to enact policies that regulates the industry and market environment. The role of the government in EEE management can be described to be both waste generator and management. The government generates e-waste by buying the equipment and appliances, which are used in the public sector. In addition, the government also provides policies that regulate the manufacturing and importation of electrical and electronic appliances. In developing countries, where importation of these products is poor regulated as well as its waste management, the government are burdened with finding lasting solutions to both problems. Moreover, the government is faced with providing financial mechanisms and incentives that will promote and enhance the development of the waste management industry.

Waste generators

This group through their activities sustains the availability of e-waste for recycling, (see sub-sub-chapter 3.3.1.).

Media

The media's voice sounds louder than normal. This group ensures that the other stakeholders, most especially the general public is aware of the things going on in their surroundings. In addition, they exercise the power to influence the public. The media include the television stations, social media, radio stations, newspapers and magazine providers.

Community

It is the area where an enterprise has its physical buildings or sites. The community is made up of indigenous inhabitants. They provide the land premise and other supports to a company. In Nigeria, community is very strong and cannot be neglected or ignored in such an issue as this.

Informal sector workers

These are individuals or families that operate in the industry, but rather in a lower unregulated section. Their existence shows the lucrateness of an industry. They are a force to reckon with in developing nations; since they have tremendous network within themselves and within the law enforcement agencies employees, which they support through their bribery and cut-backs.

NGOs

This is a legally constituted organization created by person or groups of persons, which operates independently outside a government but must be registered with a government. An NGO means “a non-profit organization”. This status helps them to be critical in their decisions and judgments, without any bias.

In waste management in Nigeria, they play active role such as helping the municipality in collection of waste and depositing them in collection points. In addition, they are involved in cleaning, beautifying and keeping the environment healthy. Moreover, they also provide awareness, education and support programs in waste management to communities. Further, they sometimes are involved in recycling process

Competitors

It is defined as one selling or buying goods or services in the same market as another (Merriam-webster.com 2011).

Competition in business environment is inevitable as the players compete for both resources and market share. Such attribute defines the strength and credibility of a company in a particular market. Competition can be described in four main forms, which are pure competition, monopoly, monopolistic and oligopoly.

Pure competition is defined as a market characterized by a large number of independent seller of standardized products or provider of standardized service. In this form of competition, there is low entry barrier, free flow of information, no main dominant

business and low exit barrier. Hence each seller or provider is a price taker, rather than a price maker (nvestorsword.com 2011).

Monopoly is a form of competition whereby a company has an exclusive control of service or commodity in a particular market. Here, the said company enjoys the privilege and dominance. Often, it is characterized by high market entry barriers and exit, price manipulation, and extreme regulation of information flow (nvestorsword.com 2011).

Monopolistic competition is one in which many goods sellers or service providers produces or provides similar kind of goods or services respectively, but slightly differentiated. Each provider or producer has the right to set its own price and quantity without affecting the market as a whole. In monopolistic competition, the known characteristic is free market entry. In addition, prices are set at the level of average cost and consumers' preference motive (nvestorsword.com 2011).

Oligopoly is a market structure whereby such market is dominated by a small number of participants who are able to collectively exert control over supply and market prices (Investorsword.com 2011). In other words, it's a market where sellers are so few that the actions of any one of them will materially affect price and have a measurable impact on the competition. It is characterized by high entry and exit barriers, strategic behavior by the player which is mostly self-interested and mutual interdependence of the players on each other (nvestorsword.com 2011)

Competition in e-waste management depends on factors such as the market size, and the levels existing in the management process. To say, in the collection and transporting, the competition can be pure competition because of the low degree of professionalism, skills and capital required in such business. However, in the recycling for precious materials, the competition can either be monopoly, slight monopolistic or oligopoly. This can be attributed to greater need for capital, human resources, skills, capacity, capability, consumer reach and technology.

4.1.4 Internationalization

Internationalization, otherwise known as foreign direct investment (FDI) is an action undertaken by a firm in order to enter into a new market territory. Companies undergo internationalization for various reasons. These reasons can be classified as either internal or external. However, in a nutshell the obvious reasons are search for growth and expansion, availability of resources in the new market, low or no entry and exit barriers, weak or non-existing competition in the new market, organization's international intent, revenue increment, interest in industry; favorable business regulations, opportunity to accumulate assets in a foreign market; gain experience and know-how; and to escape fierce competition in home market. Kotler and Armstrong (2001.) indicated the internationalization decision making process. It is a six phase process, first, looking at the global environment. Second, deciding whether to internationalize or not. Third, deciding which markets to enter. Fourthly, deciding the market entry mode-. Fifth, deciding on global marketing program. Sixth, deciding on a global marketing organization.

Internationalization Models

This aspect is very important especially because it refers to the decision undertaken to conduct business in a host business environment that is economically, politically, technologically, environmentally and socially different from its home. However, due to the vastness of this area, the author has chosen to narrow it to fit with the thesis topic with respect to SMEs and Nigerian market.

The author's chosen internationalization theories are "Eclectic Paradigm model(OLI) and Network Approach model".

The Eclectic paradigm model

The *eclectic paradigm model* otherwise known as *OLI paradigm* was created by Professor emeritus John Dunning. It provides a three-tiered framework for a company to follow when determining if it is beneficial to undertake a foreign direct investment. This theory is based on the assumption that institutions will avoid transactions in the open market when internal transactions carry lower costs (Investopedia.com, 2011.). The OLI

paradigm depicts that in order for FDI to be beneficial to a company; there must be ownership advantages, location advantages and internationalization advantages.

Ownership advantages:- These are advantages, which are specific to the firm and they relate to intangible assets such as core competencies, capabilities, products or services, comparative advantage, brand, and benefits of economies of scale. The advantage either gives rise to higher revenues and/or lower cost than the cost of operating at a distance or in an abroad location (Investopedia.com; Investandincome.com, 2011.).

Location advantages: - refers to the country's specific advantages relating to environment, production, politics, economy, and institution factors. In addition, it looks at where and how the company is set to derive greater advantage through the foreign establishment (Investopedia.com; 2011). That is to say that the geographical advantage of a country plays a key role in attracting FDI (Investandincome.com, 2011).

Internationalization advantages: - this holds the notion that it is better for the firm to exploit foreign opportunities itself, rather than through an agreement with a foreign firm (Investopedia.com, 2011). In addition, it considers the ability of the company to internally organize and manage its activities.

The Network approach model

The Network approach model was developed by Johansson and Vahlne (1990) as to highlight the importance of network in a firm's internationalization process. Here, market is seen as a system of social and industrial relationships among competitors, suppliers, customers, government and other stakeholders. Thus, the relationship among these parties influences the organizational decision making and can either serve as a motivational or de-motivational factor in the internationalization process.

Johanson and Mattson (1988), refers to internationalization as a situation whereby a firm establishes and develops in relation to counterparts in different networks. It assumes that individual firms are dependent on resources controlled by other firms. Therefore, for such an individual firm to gain access to those resources, it must establish a position within the network. Hence, based on this assumption, the main criteria in the network approach model is the relationship between the deciding three factors, which are actors, resources and activities.

The actor refers to main stakeholders that interact to exchange or facilitate exchange. They are institutions, firms and individuals, such as importers, exporters, manufacturers, financiers, governments, global bodies, governmental institutions and consultants.

The *resources* refer to raw materials, products, services, human-resources, finance, information, market access, technology, and network.

The *activities* refer to the different types of exchange that occurs within the participants that constitutes the network. This activity can be categorized into two forms, which are direct and in-direct. A direct activity is one that directly affects the exchange process in a situation of an individual company, while the indirect one is as a result of influence or interference by government or global bodies.

Still referring to Johanson and Mattson, internationalization is seen as a network developing through commercial operations carried out with other countries through three stages, which are prolongation, penetration, and integration. *Prolongation* refers to a firm's pursuit of integration into a network. *Penetration* is the development of position of the firm within the network and also the increment of its resources engagement. *Integration* focuses on the advanced stage whereby the firm becomes related to several networks and thus coordinates with them.

4.1.5 Entry Modes

Market entry mode can be defined as the path chosen by a firm to enter into a new target market. There are various entry modes, however with respect to the thesis topic, this study will reflect on four entry modes. They are licensing, acquisition, joint venture, and Greenfield investment.

Why is market entry mode very important? The choice can affect a business model and relative the revenue generation prospect of a firm. In addition, it is important because the target market is potentially different from the firm`s home country economically, politically, technologically, socially, environmentally and legally. There are a number of factors that influences a firm`s decision making on choice of entry mode. These factors are summarized in figure 9

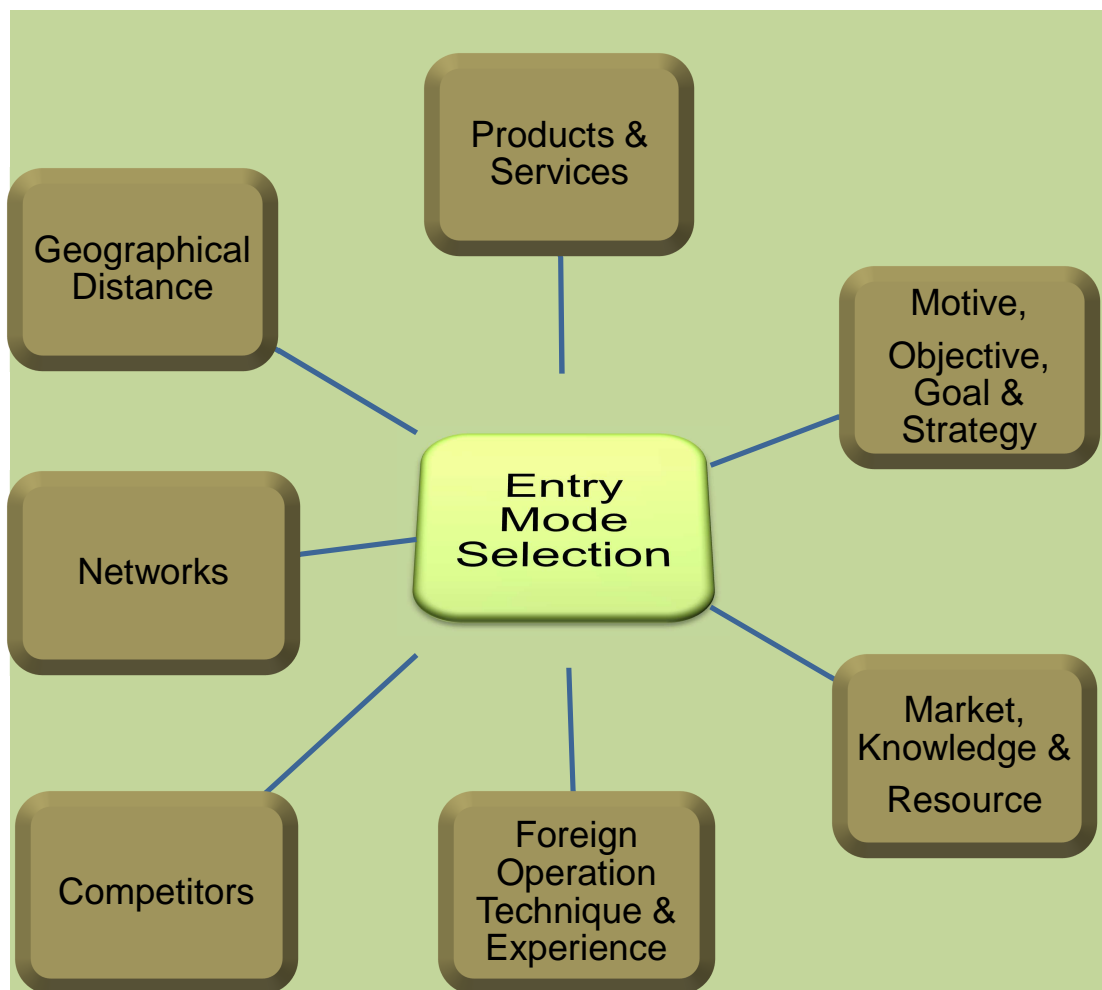


Figure : Factors influencing organizations` entry mode choice

These factors in figure 9 are sometimes conflicting with each other as the dynamic nature of an emerging industry is highly vague at the early stage, most especially in developing nations such as Nigeria. First, the product or service of the firm must be a viable need in the foreign market; this is the initial sign that promotes market entry decision. Second, the firms objective of becoming an international company must be clearly define. In addition, its motive and goal to achieve through internationalization ought to be clear and realistic. In addition, its` business management strategy is important, because the strategy for home market might not be the right strategy for foreign market. Third, it is necessary to conduct a good analysis of the new market environment, noting the business supporting factors and potential risks imminent and foreseeable. This means analyzing the opportunities and threats the market holds. Moreover, the firm has to

conduct internal analysis of its strengths and weaknesses as well as its available resources including finance, human and marketing. The result of these dictates if the company is ready for market entry. Fourth, is there any organizational foreign operations strategy and experience in the firm's management tool kit? Fifth, the competitors' business operation needs to be understood, in order to ensure survival and growth, because this focuses on the competitive structure of the market. Sixth, are there existing networks in the foreign market? This aspect looks at the consumers or customers as well as potential business partners. Seventh, this considers the geographical distance; this centers mostly on the cost effectiveness of the choice of entry.

Moving further, the common entry modes in e-waste industry are depicted in figure 10

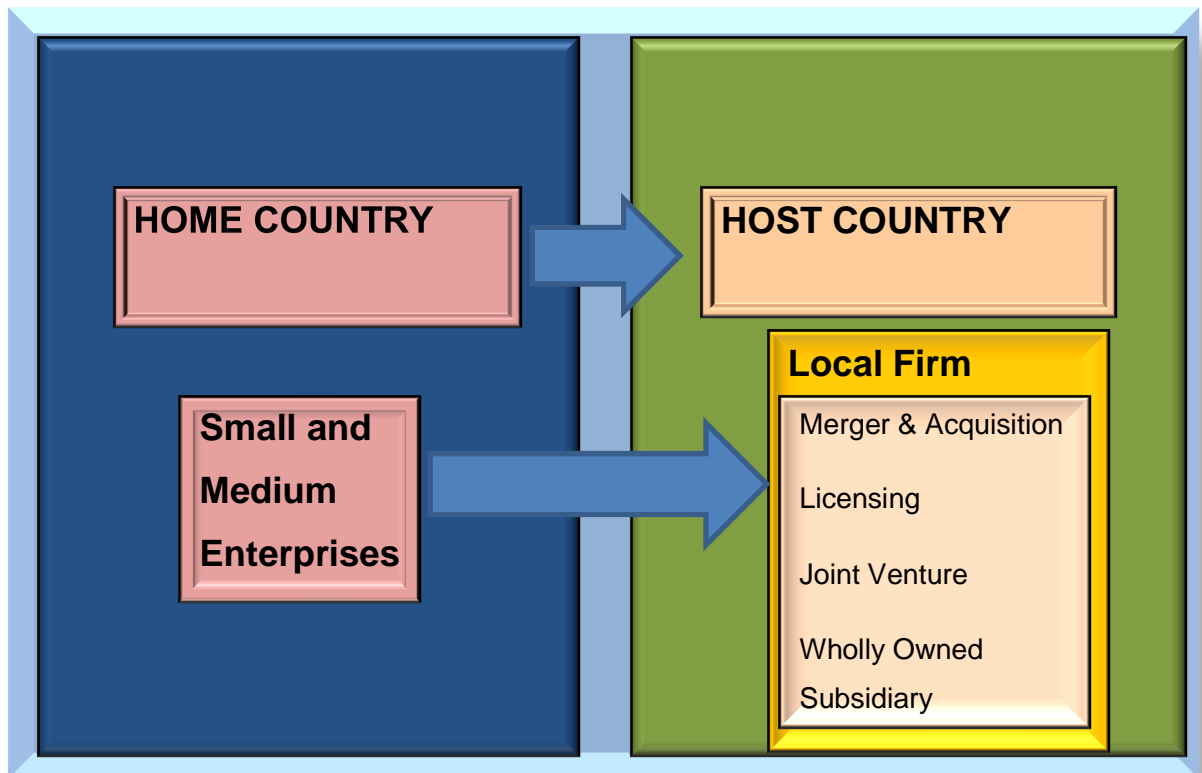


Figure : E-waste businesses common entry mode

Source: Adapted from Ruth Aguilera 2011.

LICENSING

Licensing is a type of contractual agreement whereby the licensor grants the licensee right to use its property, usually trademark, patents and production technologies (Entrprenuers.com, 2011.)

In figure 10, the model explains the relationship between a licensor and the licensee. The local firm, which is the licensee, receives the license as rights agreed in the terms of both parties in form of a contract, which enables him or her to use the properties of the licensor in the new market accordingly. According to Koch (2001), licensing entry mode may involve excessive know-how dissemination risk especially if the foreign market is not a signatory to the appropriate international conventions. Licensing provides advantages, which include avoidance of trade barriers, low initial investment, accessing the local

knowledge, and potential for utilizing location economies. On the other hand, it poses disadvantages such as difficulty in transferring tacit knowledge, lack of control over operation, and competitor creation potential. A question that ought to be addressed is when is licensing appropriate to be used? Firstly, when there is a well, detailed and clear codified knowledge of both the licensee and the foreign country. Secondly, could be when there is an existence of strong property rights legal protection in the new market. Finally is when the location holds great advantages for the Licensor (Ruth Aguilera, 2011.).

Wholly-Owned Subsidiary

It can be defined as a company while theoretical public traded, has all its common stock owned and controlled by a single parent company. Some of the wholly-owned subsidiaries belong to the same industry as the parent company, while some do not, but are part of the business diversification strategy of the parent company (Financial-dictionary.com, 2011). A firm can establish a wholly-owned subsidiary in a foreign nation through two main paths, which are “through acquisition of a local firm and through setting up a new operation”.

Wholly-owned subsidiary holds advantages such as reduction in the risk of losing core competencies, gives a firm tight control over its operation in different countries that is necessary for engaging in global strategic coordination; and provides support for firm to realize location and experience curve economies. However, on the other hand, it presents disadvantages such as the company bears the risk and full cost of setting up the new operation and local integration could yield unpleasant surprises.

Joint Venture

A joint venture is a strategic alliance where two or more parties, usually businesses form a partnership to share markets, intellectual property, assets, knowledge, and profits (Entrepreneurs.com 2011). Another definition says that a joint venture is when two or more business pool their resources and expertise to achieve a particular goal. The rewards and risks of the enterprise are also shared (Businesslink.com, 2011.).

This form of entry mode provides the participants with attributes such as, increased resources, greater capacity, access to experience, risk and cost sharing, expertise and technical know-how; and access to established market and distribution channel (Businesslink.com, 2011.).

Notwithstanding, entering into joint venture without critical evaluation of prospects and the impending partner can be disastrous and thus it embodies risks such as first, differences in culture, objectives, interest and management style can cause poor integration and co-operation. Second, different levels of experience, expertise and know-how can disorganize organizational strategy. Third, rise of communication problem among the parties. Finally, partners might lack the motive to provide enough leadership and support at the early stage (Businesslink.com 2011; Rpmery.com, 2011.).

Merger and Acquisition

A merger occurs when one firm assumes all the assets and liabilities of another, whereby the acquiring firm retains its entity while the acquired firm ceases to exist. This form of entry mode is adopted to achieve economic gain (Enotes.com, 2011.).

Acquisition can be horizontal, vertical or conglomerate. A horizontal acquisition occurs between two firms in the same line of business. A vertical one entails expanding forward or backward in the distribution line or chain, towards the source of raw materials, or towards the ultimate consumer. The conglomerate takes place when two unrelated businesses combine (Enote.com, 2011.).

Reasons and advantages of merger and acquisition varies, however it includes factors such as to achieve economies of scale, to combine complementary resources, to garner tax advantages, to eliminate inefficiencies, to obtain property rights to products or services, to penetrate new geographic locations, to shore up weaknesses in key business areas, and to increase market power by purchasing competitors (Enote.com, 2011.).

On the other hand, the noted disadvantages includes integration effectiveness problem due to differences in culture and management styles and diseconomies of scale if business become too large, which leads to higher unit costs (Tutor2u.net, 2011.).

4.1.6 Crafting Business Model and Strategy

A business model can be defined as a plan implemented by a company to generate revenue and make a profit from its operations (Investopedia.com, 2011). Dr. Alexander Osterwalder defines it as a simplified representation of a firm's business logic. It describes what a company offers its customers, how it reaches them and relates to them, through which resources, activities and partners it achieves this; and finally, how it earns money. Osterwalder and Pigneur (2010, 14.), states that business model describes the rationale of how an organization creates, delivers, and captures value.

Why is a business model important in e-waste management business in Nigeria? It is because of its nature of the market environment and e-waste industrial structure.

In describing the 9 building block business model concept, Osterwalder and Pigneur (2010) believe that a business model is a blue print for a strategy to be implemented through organizational structures, processes, and systems. That is to say that a business model enhances business strategy. The clear and realistic the business model coupled with effective implementation of it results to an efficient business strategy. The nine blocks cover the four main areas of business, which are customers, offer, infrastructure, and financial viability.

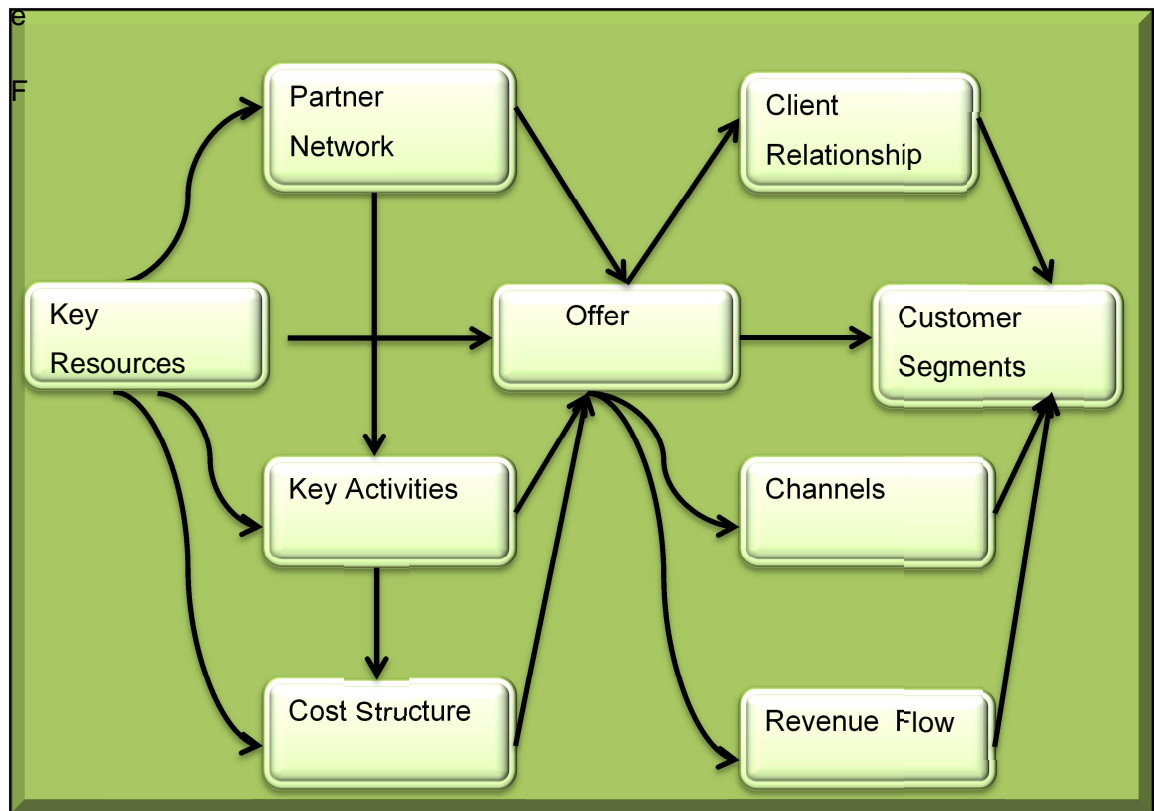


Figure : 9 Building blocks model concept

Source: Adapted from Osterwalder and Pigneur (2010)

The figure stresses the important areas in creating a business model.

The 9 building blocks as pictured in figure 11 provides the 9 core areas to focus while developing a model. These areas are as follows:-

Customer Segments (CS): the block defines the different groups of people or organizations an enterprise aims to reach and serve. Customers comprise the heart of any business model because it looks at whom the company is creating value for. In order to better the satisfaction derived by customers, a firm might group them into distinct segments with common needs, behaviors, type of distribution channels, types of relationships, substantially different profitabilities, willingness to pay for different aspects of the offer; and other attributes. Hence, an organization must make a conscious decision about which segment(s) to serve and which to ignore (Osterwalder & Pigneur 2010, 20-21.).

Value Proposition (VP): this describes the bundle of products and services that create value for a specific customer segment. This is important because it has huge influence over customers decision on who to patronize or not, because it solves a customers` problem or satisfies the need. In addition, it makes a firm to seriously consider what sort of value it intends to or delivers to its customers and stakeholders. In this sense, value proposition is an organization, or bundle, of benefits that a company offers customers (Osterwalder & Pigneur 2010, 22-23.).

Channels (CH): describes how a company communicates with and reaches its customers segments to deliver a value proposition. It takes into consideration the channels that the customers wants to be reached with, the integration of several channels to reach them if there is need for that, which one works best, and which one(s) are most cost-efficient. Outstandingly, communication, distribution and sales channels comprises a company`s interface with customers. They are customers' touch point that plays important role in their experience (Osterwalder & Pigneur 2010, 26-27.).

Customer Relationship (CR): this describes the types of relationship a firm establishes with its stakeholders and most especially with its specific customer segments. A company should clarify the type of relationship it wants to establish with each customer and external stakeholders. This involves looking at issues such as type of relationship each of stakeholders and customer segments expects the firm to establish and maintain with them, which ones have been established, how costly are they; and have they integrated with the rest of the firm`s business model. The customer relationship called for by a firm`s business model deeply influences the overall customer experience (Osterwalder & Pigneur 2010, 28-29.).

Revenue Flow (RF): deals with how a company generates revenue from each customer segment. The ideal questions a company must ask itself are, first "for what value is each customer segment truly willing to pay"? Second, what do they currently pay? Third, how are they currently paying? Fourth, how would they prefer to pay? Fifth, how much does each revenue flow contribute to overall revenues? The successful answering these questions allows the firm to generate one or more revenue streams from each customer segment. As each revenue stream may have different pricing mechanisms, such as fixed list prices, bargaining, auctioning, market dependent, volume dependent, or yield management. There are two different types of revenue flow that a business model can

involve, they are “*transaction revenues resulting from one time customer payments*” and “*recurring revenue resulting from ongoing payments to either deliver a value proposition to customer or provide post-purchase customer support*” (Osterwalder & Pigneur 2011. 30-31).

Key Resources (KR): the block describes the most important assets required to make a business model work. It asks what are the key resources required for value propositioning, distribution channels, customer relationship, and revenue flows. In other words, it seriously considers the resources that an enterprise requires in order to create and offer value proposition, reach markets, maintain relationships, and earn revenues. Key resources are peculiar on the type of business a firm is into. They can be categorized to be financial, physical, intellectual, or human. In addition, it can be owned, leased by the company or acquired from key partners (Osterwalder & Pigneur 2010, 34-35.).

Key Activities (KA): according to Osterwalder & Pigneur (2010, 36-37.), every business model calls for a number of key activities. These are the most important actions an enterprise must do to operate successfully. Such activities are required to create and offer value proposition, reach markets, maintain customer relationships, and earn revenues. Key activities can be categorized into production, problem solving, and platform/network.

Key Partnership (KP): here, the network of suppliers and partners that makes the model work is evaluated. The importance of a firm’s key partner cannot be underemphasized, in that the key partners are the backbone of its operational success. Imagine a firm without suppliers or distributors or buyers. Key partners help a firm to optimize its potentials and acquire economy of scale through cost reductions, which can be achieved through activities such as outsourcing, sharing of infrastructures; and acquisition of particular resources and activities. Moreover, in a competitive environment characterized by uncertainty, such as Nigerian market, key partners can help a firm to reduce its risks (Osterwalder & Pigneur 2010, 38-39.).

Cost Structure (CS): this is defined as the expenses a firm must take into account when manufacturing a product or providing a service. It can also be referred to as the ratio of fixed costs to variable costs (Investorsword.com, 2011.). A business model cost structure

looks at the cost incurred by creating and delivering value, maintaining customer relationships, and generating revenue. Such costs can be calculated after defining key resources, key activities, and key partnerships. Cost structure characteristics involves, first, fixed costs, which are costs that remain the same despite the volume of goods or services produced. Second, variable costs, which are costs that vary proportionally with the volume of goods or services produced. Third, economies of scale, which means a cost advantage that a business enjoys as its output expands. Finally, economies of scope, which is the cost advantage a firm enjoys due to larger scope of operations (Osterwalder & Pigneur 2010, 40-41.).

CRAFTING BUSINESS STRATEGY

Strategy is the direction and scope of an organization over the long-term, which achieves advantage for the organization through its configuration of resources within a challenging environment to meet market needs and fulfill stakeholders` expectations (Tutor2u.net, 2011). Strategy is also the competitive moves and business approaches for growing the business, creating a market position, attracting and satisfying customers, competing successfully, conducting business operations and achieving objectives (Ezinearticles.com, 2011).

Strategy crafting evokes traditional skills, dedication and perfection through the mastery of details. It involves the harmonization of thinking, reasoning, involvement, passion, experience, knowledge, commitment, formulation and implementation to evolve strategies. It is an embodiment of a venture..

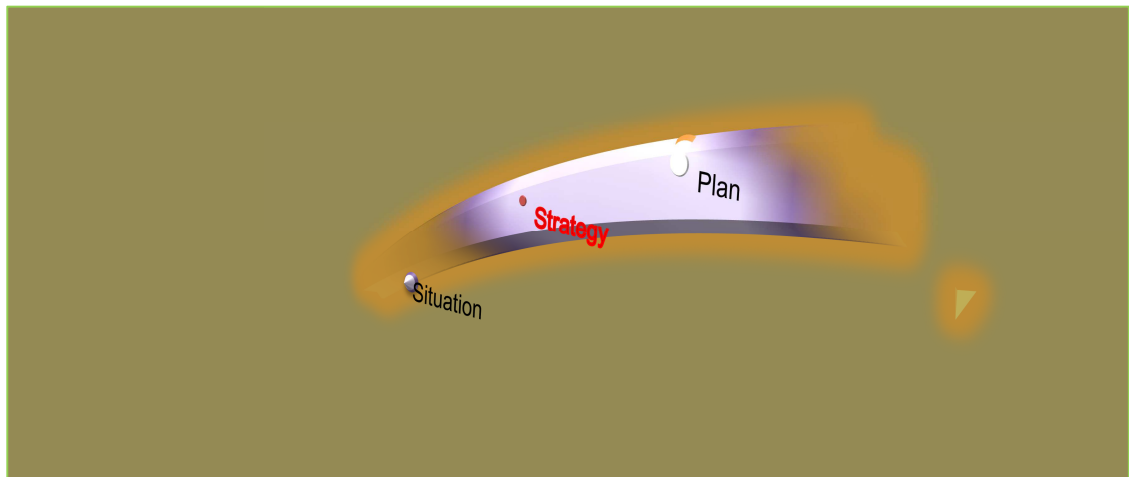


Figure : Corporate strategy development

From figure 13, developing corporate strategy or strategy crafting starts with understanding the market situation. The market situation gives the account of the market needs, demand, competition etc. Therefore, for a successful business operation in a foreign market, there is need for realistic business models and strategies. In doing so, the firm not only equips itself for competition, but also for undertaken and solving challenges. Crafting an effective strategy must take into account both the internal aspects of the firm as well as the internal factors of the foreign market. It is a combination of the past, present and future. The past relates to what has happened to the firm either in similar or different market. It is a gained experience and knowledge. The present relates with what the firm is experiencing currently either in similar or different market. The future relates with how the firm foresee the new market and its business in long-term.

Strategy has characteristics, which includes, first, strategy starts with focus. This focus is directed to key parts of a firm's market and product line.

Second, strategy should be tailored and specific to a firm. This is to say that there is no generic strategy that works. Thus, an organizations' strategy has to do with such organizations' competitive advantage, growth need, market position and reality.

Third, strategy must be a long-term process. Fourth, it must be realistic. Fifth, it is built on market demand and need, because demand drives growth. Finally, strategy recognizes