

## **PRODUCT LIFE CYCLE MANAGEMENT IN THE NIGERIAN CAPITAL GOODS INDUSTRY**

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**ABSTRACT:** *Authorities and specialists in marketing and product management have submitted variously on the theme of the study, Product Life Cycle (PLC). This, the researcher builds on so as to add to the body of knowledge by investigating problems such as low sales, consumer dissonance, early product withdrawal, and others, which all culminate into financial losses for organizations within the capital goods manufacturing/assemblage and sales segment of the Nigerian manufacturing industry. The study provides up to date information on the life cycle trends of capital goods, which will help in their manufacturing and stock holding decisions. Also, a construct depicting the relationship between Sales and PLC with reference to capital goods was developed. The data for this study was collected from both primary (four companies) and secondary sources. Questionnaire was adopted as a data collection instrument. The data was analysed using both descriptive and inferential statistics. Amongst other recommendations, the study recommended that Management of Product Life cycle should be taken into consideration in new product design and prototyping. This is essentially due to the influence of frequent foreign innovations that constantly render recent products obsolete.*

**KEYWORDS:** **Product Life Cycle, Capital Goods, Competition, Sales, Buying Behaviour.**

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### **INTRODUCTION**

As Marketing evolves from an element under the shadows of Management Science into a discipline in itself, a complete appraisal of all variables which affect consumer behaviour is highly essential. An important concept underlying most dynamic business planning models is the Product Life Cycle (PLC). Because a product's sales position and profitability changes over time, every firm needs to revise its product strategy periodically. Using the concept of the Life Cycle, the firm recognizes distinct phases in the sales history of the product and its market and thereby develop strategies appropriate to those various stages. Product Design, Engineering, Cost and Environmental implications also play important roles in Product Life Cycle. Muller (2011) emphasized that the life cycle of a product category in the market determines many aspects of the architecting approach, which includes four (4) phases: infancy, adolescence, mature and aging.

A discontinuity, positively or negatively, in market success is seen in the transition from one phase to the next phase. The explanation given is that the phases differ in characteristics and require different approaches. The right approach for one phase is sub optimal for the next phase. Therefore

like human beings, products, generally, also have a life-cycle. From birth to death, human beings pass through various stages e.g. birth, growth, maturity, decline and death. A similar life-cycle is seen in the case of products. The product life cycle goes through multiple phases, involves many professional disciplines, and requires many skills, tools and processes.

Product life cycle (PLC) has to do with the life of a product in the market with respect to business/commercial costs and sales measures. Product Life Cycle can be measured in terms of its sales in the market place or space as the case may be, or in terms of its longevity in the product portfolio of the firm.

### **Statement of the Problem**

The capital goods segment of the manufacturing industry in any economy is key to infrastructural development. This is more so as equipment and machines needed to develop, infrastructure wise, are manufactured and sold by this industry, which includes, Earth Moving Equipments (EMEs), Excavators, Drills, Alternators, Power Generating sets, Trucks, Lifts etc. The Nigerian Manufacturing Industry, as large and diverse as it is, has a minute segment of it devoted to the assemblage, manufacturing and sales of capital goods. This is largely due to the huge capital (fund) requirement, thereby necessitating the presence of multinational organizations with huge financial strength to invest in a long term venture like capital goods. Considering the huge funds injection and increasing cost of capital, it is worrisome that Product Life Cycle as a marketing management concept is perceived to be relatively new and yet to be fully appreciated in the Capital goods manufacturing and sales sector of the Nigerian manufacturing industry. This exists despite the threats of Early product obsolescence, Product failure and rejection, Product recall, Consumer dissonance and other problems associated with Products life cycle, with the attendant effects of consumer dissonance, and warranty claims. Kotler (2005) opined that Product defects, failure, and rejection by consumers are part of the symptoms of bad PLC management strategies.

This trend is no longer limited to consumer goods but now traceable to industrial goods (Thietart and Vivas; 1984). Recently, Toyota of Japan, manufacturers of Toyota brand of motor vehicles recalled thousands of its Hybrid brands which were recently launched into the market in Africa and Europe, due to rejection and rising complaints by users. This translated into huge warranty payments to the company. Further in Nigeria, local manufacturers/assemblers of computer products and accessories are battling with huge piles of unsold stock, early product death and other problems associated with foreign innovations which affects local products life cycle. This necessitated the Manufacturers Association of Nigeria's call for a ban on the importation of wholly assembled computer products into the country.

This study was motivated by recent events in the manufacturing sector, where competition has become stiffer and newly launched products are forced into maturity without giving commensurate returns. Any failure in such industry, traceable to the core purpose of the industry (Products) will have spiral effects on the economy given that the operators in this industry are few in number due to the huge capital requirement of the business. It is worthy of note that Nigeria currently relies on

this industry for the supply of its power needs, as the supply from the national grid is grossly inadequate for the nation.

This situation calls for a repacking/remodelling which comes at a huge cost. Also, advancement in technology, especially in developed Asian countries like Japan and China, has a counter effect on goods manufactured locally, as frequent innovations from abroad tend to push locally manufactured/assembled goods out of their profitable stages earlier. This trend also has effects on the chain of distribution of affected products as intermediaries are not willing to take large inventories, due to the fear of early obsolescence. Ultimately, companies bear the brunt, and the sector has witnessed cases of unsold stock, stagnant sales, consumer apathy, company closures, mergers and liquidation, which are traceable to poor PLC management. Furthermore, the complexity of the business environment in Nigeria, especially in segments which involves huge capital injection, demands a continuous review of existing product development strategies and constantly checking whether they are working towards attainment of set objectives.

### **Objectives of the Study**

The specific objectives of the study are itemised below:

1. To determine the effects of PLC management on consumer buying behaviour.
2. To identify the adaptation strategies of firms to the change in their PLC.
3. To evaluate the effect of competition on the management of the life cycle of capital products.
4. To investigate the effects of Life cycle changes on different product lines.
5. To evaluate the effect of cost on the management of the life cycle of capital products.

### **Research questions**

The following are the related research questions:

- 1) To what extent does Product Life Cycle dictates marketing strategies adopted?
- 2) How do the companies respond to changes in their product life cycle triggered by competition?
- 3) To what extent does a life cycle change affect consumer loyalty and market share?
- 4) How do life cycle changes in a particular product line affect the operations of another product line?
- 5) To what extent is PLC maintenance cost affecting company profits?

### **Research hypotheses.**

Two research hypotheses were formulated to find answers to the research questions, which arose from the objectives of the study; all directed at providing solutions to the stated problems. Specifically, the first hypothesis tested variables which provide solutions to research questions one, four and five. These include variables directly relating to profit and cost implications, marketing strategies adopted, and how changes in a product line affects another product line which all culminate into sales. In the same vein, research hypothesis two which provide solutions to research question two and three, measured variables relating to changes in PLC triggered by competition and effects of changes in PLC on consumer loyalty and market share.

1. H<sub>0</sub> – Management of Product Life Cycle does not have significant effect on organizations sales.  
H<sub>1</sub> – Management of Product Life Cycle has significant effect on organizations sales.
2. H<sub>0</sub> – Management of Product Life Cycle does not have significant effect on consumer loyalty and market share.

H1 – Management of Product Life Cycle has significant effect on consumer loyalty and market share.

### **Decision Rules**

Using student F-test at 5% level of significance and k-1, N-k degree of freedom

F- test statistics

$F_{cal} > F_{tab}$ , reject  $H_0$  and accept  $H_1$

$F_{cal} < F_{tab}$ , reject  $H_1$  and accept  $H_0$

## **LITERATURE REVIEW AND CRITIQUE POSITION**

Any organisation that relies heavily on selling products needs to be fully aware of the way that their products are placed in the market and the various product life cycle stages that each of the products passes through. As a product travels through its life cycle, it will be subject to different market forces and requirements in terms of marketing and development. Not only do products at different stages in the product life cycle produce different returns, but they also require different support levels where administration, technology and marketing are concerned. A product, during the early part of its product life cycle, will naturally require more input in terms of research and development as well as in marketing and even administration costs. This investment is based not on the initial income that the product is bringing in, but the possibilities that the product has for the future stages of the product life cycle.

Amongst the four traditional elements of the marketing mix, the product is the most important as the actions of all other elements (Price, Promotion and Place) revolve round the product; hence, it is of great importance to understand the dynamics of such element as it relates to its longevity and profitability in the market place, which are the hallmarks of a Product's life cycle. Products can be basically classified into two that is, consumer goods and industrial goods. The differentiating factor between the two is destination. It is of necessity to state at this point that the focus of this study shall be directed at capital goods, which is a form of industrial goods.

Cravens (2000) submitted that relevant issues in PLC analysis includes: determining the length and rate of change of the product life cycle, identifying the current PLC stage and selecting the product strategy that corresponds to that stage and, anticipating threats and finding opportunities for altering and extending the PLC. By considering the concept of the product life cycle, managers are accepting some key assumptions that are made in relation to the products they are selling.

Firstly, the product life cycle model assumes that products have a finite life and that they will at some point no longer be a valid marketable product. In most cases, this concept is true; however, there are some products such as Airplanes, Scissors, Jeans, Milk and Butter that will always be popular. Consumers will continue to want to purchase these goods throughout time, with no specific deadline as to when they will no longer be needed. However, again, individual brands, of these generic products may not remain successful for life, hence the need for the proper management of product life cycle. It is also assumed that the needs of a product will vary in terms of marketing and development needs as it passes through the product life cycle. This will not

always be the case with some products having the same marketing needs, regardless of where they are perceived to be in the product life cycle.

With specific reference to capital goods, they can be described as a manufactured means of production. Capital goods are acquired by firms, Government and the society by saving wealth which can be invested in the means of production. Bearden, Ingram, and LaForge (2004), defines capital products/goods as expensive items used in business operations but do not become part of any type of finished product. Because they are used over long periods of time, their cost is normally depreciated or spread over some useful life rather than expensed completely in the year of purchase. Capital products range from physical facilities such as manufacturing plants, to accessory equipment such as desks, copy machines, fax machines, or forklifts.

The purchasing process for capital goods may be long and involve many individuals. Marketers of capital goods emphasize personal selling as the major communication tool. Prices are often negotiated, and sometimes businesses decide to rent, or lease capital products rather than buy them outright. Individuals, organizations and governments use capital goods in the production of other goods or commodities. Capital goods include factories, machinery, tools, equipment, and various buildings which are used to produce other products for consumption.

Kotler and Armstrong (2006), define Capital items/goods as industrial products that aid the buyers' production or operations, including installations and accessory equipments. Installations consist of major purchases such as buildings (factories and offices) and fixed equipment (generators, drill presses, large computer systems, and elevators). Accessory equipment includes portable factory equipment and tools (hand tools, lift trucks) and office equipment (computers, fax machines, desks). Most manufacturing companies use capital goods. Capital goods help companies to make functional goods which are sold to individuals or used in providing valuable services. As a result, capital goods are sometimes referred to as producers' goods or means of production. An important distinction should also be made between capital goods and consumer goods, which are products directly purchased by consumers for personal or household use.

For example, motor vehicles are generally considered consumer goods because they are usually bought by an individual for personal use, but where it is used as a means of production, it becomes a capital good. Dump trucks, Forklifts, Cranes etc, however, are usually considered capital goods, because they are used by construction and manufacturing companies to haul various materials in order to make other products such as roads, bridges, dams, and buildings. Similarly, a chocolate candy bar is a consumer good but the machines used to produce the chocolate candy bar are considered capital goods. The economic term 'capital goods' is not to be confused with the financial or accounting usage of 'capital', which may mean simply wealth or financial capital.

The classic product life cycle according to Hamper (1998) has four stages: introduction; growth, maturity and decline. Prior studies on Product Life Cycle focused mainly on Fast Moving Consumer Goods (FMCGs). Lilien, Rangaswamy, and DeBruyn (2007) opine that the life cycle concept emerges out of many sources. Biological life forms are born, grow, mature, and die. Many

human enterprises (like the Roman Empire) experience a beginning, a heyday, and a decline or death. For products, the length of the life cycle varies from one to another.

Czinkota, Kotabe, and Mercer (1997), made an intuitive appeal of an analogy of product life cycle (PLC) with human life – consisting of introduction, growth, maturity, and decline. The concept of PLC thus suggests that any good or service moves through identifiable stages, each of which is related to the passage of time and has different characteristics. Associated with each stage is a profit level. They opined that profits are likely to be negative at the beginning, when there is high initial investment and hopefully they will be positive by the maturity stage and more than recoup investment.

The existing literature prior to this study, so far, provided a robust knowledge on the subject matter, however, most studies are directed at the FMCG segment, and so far, non on the Capital/Hi-tech goods in Nigeria. This was investigated by this study, taken into consideration other factors that could affect a product's (capital) longevity in the market place which include Effective Pre and After sales services, Marketing Communications campaign(Personal selling), Spares availability, New features, Product Design and Prototyping, and Foreign Innovations. Despite abundance of literature existing in marketing and marketing education on the theme of this study, some writers, researcher and authors have over the years doubted, with good reason, the concept of the Product Life Cycle. Some posited that Product Life Cycle cannot be compared with human life, others claim that it is difficult to tell at which stage a product is in its life cycle, and also that PLC is a result of marketing action, rather than a course of action that sales must follow. This brings to fore the empirical and practical nature of marketing, as an emerging field of science.

First, that Product Life Cycle cannot be compared with human life is synonymous with saying that products are angels or celestial beings that are quite immortal. Critics are quick to point to brands that have stayed in the market for centuries such as coca cola and caterpillar, but the researchers asks, will these products remain if the stages of the life cycle are not monitored and managed? Products/Brands abound in these same categories that have declined in markets they once held, in some cases experienced an outright death, In the Nigerian market for example Dr. Pepper (Africa), Motorola, Trium amongst others.

Second, that PLC is a result of marketing action cannot be tenable. This the researcher refutes because PLC naturally starts even before the product is introduced to the market. This is corroborated by an outcome of this study which posits that PLC should be taken into consideration in product design and prototyping, especially in the case of capital goods. However, this is not to say that the PLC should be a course of action that sales must follow, but a model that guide marketers, especially in this era of Marketing and Societal Marketing Philosophy, in making product related decisions. This is in respect to the findings of Nariman and Yuspeh (1976), Marrik and Hassaan (1995), and Arndt (2001). Most products and services go through many innovation or imitation lifecycles, therefore, only fad products have a single life cycle.

Third, the alleged difficulty in the determination of the stage a product is in its life cycle is not enough reason to discard the model. The assertion that a product might appear to have matured

while it has only reached the plateau prior to another upsurge might be tenable, however, the upsurge, whether upwards or downwards, we argue, can also be traceable to other factors which includes failing competitors, favourable government policies, improved technology, amongst others.

Dickson (2002) stated that each new, clever innovation in product design or distribution has its own path of introduction, acceptance and imitation. Bingham (1998), suggests that the dominant PLC, especially that of the brand leaders which almost monopolize many markets in some industries, does not defy the product life cycle concept but describes efficient and effective product life cycle management, and also strong consumer loyalty, especially where the product is the pioneer in the industry, e.g. Despite the limitations of the concept, it remains an inevitable tool for marketing management to continually watch and monitor the progress of products in their life cycle and to decide which strategy to use at the right time.

From the foregoing, it is established that Management of Product Life Cycle, in any organization that is marketing oriented and knows its onions, is a sine qua non for success. The conceptual and Empirical works reviewed further provided a balanced, up to date, research submission on the topic. From the humble beginnings of an ordinary marketing concept that was used to predict sales, the product life cycle model has evolved into a model for determining Price Elasticity and Cash flow, Product Engineering, Product Distribution, Market Cannibalization, and Entropy. The concept of entropy, which is widely used in Physical Science and Thermodynamics, was applied to explain the phenomenon of Product life cycle using marketing mix activities as the agents to change the quantity of entropy. This provides information for marketing decision markers to take advantage of the availability or otherwise of time within the Life Cycle.

#### **Summary of Empirical Framework**

<b>Author(s)</b>	<b>Title of Research</b>	<b>PLC Content</b>	<b>Results</b>	<b>Nature of Product/ Industry</b>
Hermann Simon (1978)	Dynamics of Price Elasticity and the Product Life Cycle	Time-varying price responses	It reveals typical changes in price elasticity over the life cycle and gives support to the conclusion that the magnitude of price elasticity decreases over the introduction and growth stage, reaches its minimum at the maturity stage, and again increases during the decline stage.	FMCG

Thietart R.A and Vivas .R (1984)	An Empirical Investigation of Success Strategies for Businesses along the Product Life Cycle	Life Cycle and Market Share Life Cycle and Cash flow	The results provide guidance to decision makers as they realize that effective strategic actions is a function of the life stage and the business characteristics, by identifying the stage, the decision-maker can select the appropriate strategic actions and evaluate their impact on performance	FMCG and Industrial Goods
Ioannis Komninos (2002)	An analysis of the Product Life Cycle Model	Cannibalization	In the early days of a new technology, early adopters and technology enthusiasts drive a market since they demand just technology. This drive and demand is translated as the introduction phase of a new product by many companies. As technology grows old, customers become more conservative and demand quick solutions and convenience. In this case a product usually enters in the realm of its growth and as time passes its maturity.	FMCG
Narayanan Machanda and Chintagunta (2005)	Temporal Differences in the role of marketing communication in new product categories	Communication	There are differences in the role of marketing communication in different stages of the life cycle of a product.	FMCG
Wann-Yih Wu, Yu-Chen Hsiao, and Chen-Su Fu (2010)	An Analytical model of the Product Life Cycle-	Entropy/ Simulation	Through analytical hierarchy process and simulation process, the simulated graph represents	FMCG

	An application of thermodynamic		that while putting more marketing mix activities, the life span of the product would be longer and the volume of the product sales would be larger.	
Ilesanmi .O. A (2011)	The Significance of Distribution Channel and PLC in the Management of an Organization.	Product Life Cycle and Distribution	PLC in spite of their varying time frames, helps managers at all levels to think strategically. The great value of the PLC concept is that management, knowing what typically happens at different stages in a product's life, should be able to improve its forward planning.	FMCG

## METHOD OF DATA ANALYSIS

The resulting data from the survey was analysed using both descriptive statistics and inferential statistics. The descriptive statistics employed the use of frequency distribution and simple percentage to describe the collected data and was also used to give answers to the stated research questions, while the inferential statistics employed the use of Ordinary Least Square (OLS) regression analysis. The justification for this is that it is best applied to determine the nature and strength of the variables and test the stated hypotheses. The identified variables of this study are described thus:

### Dependent Variables for the two hypotheses are as follows:

- Sales ( $Y_1$ ) for hypothesis one and Consumer Loyalty ( $Y_2$ ) for hypothesis two
- While the independent variables are as follows:
- Marketing Strategies ( $X_1$ ) for hypothesis one
  - Competition ( $X_2$ ) for hypothesis one
  - Profit ( $X_3$ ) for hypothesis one
  - Product Life Cycle ( $X_4$ ) for hypothesis one
  - Market size ( $X_1$ ) for hypothesis two
  - Effective pre and after sales services ( $X_2$ ) for hypothesis two
  - Product modifications and Redesign ( $X_3$ ) for hypothesis two

### Model Specification

#### The regression equation for hypothesis one is as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \mu$$

Where  $\beta_1, \beta_2, \beta_3, \beta_4$  = co-efficient of independent variables

Y = Sales (dependent variable)

$X_1$ = Marketing Strategies (independent variable)

$X_2$ = Competition, (independent variable)

$X_3$ = Profit, (independent variable)

$X_4$ =Product Life Cycle (independent variable)

$\beta_0$ =constant

$\beta_1, \beta_2, \beta_3, \beta_4$ = co-efficient of independent variable

$\mu$  = Stochastic variable (representing other variables that could bring about changes in the dependent variable that are not stated in the model)

**The regression equation for hypothesis two is as follows:**

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \mu$$

Y= Consumer loyalty (dependent variable)

$X_1$  = Effective pre and after sales services (independent)

$X_2$ = Market size. (Independent)

$X_3$  =Product modifications and Redesign (independent)

$\beta_0$ =constant

$\mu$  = Stochastic variable (representing other variables that could bring about changes in the dependent variable that are not stated in the model)

$\beta_1, \beta_2, \beta_3, \beta_4$  = co-efficient of independent variables

**Test of Hypotheses**

**Hypothesis one:**

$H_0$  – Management of Product Life Cycle does not have significant effect on organizations sales.

$H_1$  – Management of Product Life Cycle has significant effect on organizations sales.

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**Table 1:** Analysis of hypothesis one.

Model		Unstandardized Coefficients		Standardized Coefficients	t	R2	F-Ratio
		B	Std. Error	Beta			
1	(Constant)	4.754	0.750		6.336	0.514	8.45
2	Product Life cycle has been identified as having effects on competitive marketing strategies	0.075	0.105	0.069	8.721		
3	Competitors promotional activities pushes products out of their profitable stages early	0.108	0.102	0.102	9.058		
4	Product Life cycle management has negative effects on company profits	-.098	-.064	-.147	-11.534		
5	Consumer loyalty increases and stabilizes at the growth stage	0.087	0.075	0.110	1.154		

Dependent Variable: Sales increases at the growth stage and stabilize at the maturity stage

**Source: Field Survey, 2014.**

$R^2 = 0.514$

F-test= 8.45

From the SPSS output above the stated model for hypothesis one is therefore fitted as

$Y = 4.754 + 0.075X_1 + 0.108X_2 - 0.098X_3 + 0.087X_4$

$R^2 = 0.514$  (51.4%)

F-test= 8.45

From the result above it is apparent that there is a positive relationship between marketing strategies, competitors' promotional activities (with respect to PLC), consumer loyalty and quantity of sales. This means a better performance in the marketing strategies, response to competitor's promotional activities, consumer loyalty will increase sales. While there exists a negative relationship within statement that Product life cycle management costs has negative effects on company profits. It shows that indeed management of PLC has a positive effect on sales, and consequently, on profit.

The  $R^2$ , which is called the coefficient of determination, tells the strength of the model. The result above shows that 51.4% variation in the dependent variable is explained by the stated independent variable in the model, which invariably means that the model is significant, in terms of goodness of fit and can be accepted.

Comparing F-test calculated ( $F_{cal}$ ) with F-test tabulated ( $F_{tab}$ ) at 5% level of significance with the degree of freedom of (k-1, N-k) (5-1, 110-5) where 4, 105 is the final degree of freedom. From the SPSS result the F calculated value is 8.45 while the F tabulated is 2.53. Since the  $F_{cal} > F_{tab}$  ( $F_{8.45}$ )

>  $F_{2,53}$ ) it shows that the overall parameter is significant at 5% level of significance, hence the  $H_1$  for hypothesis one is accepted, that is, management of Product Life Cycle has significant effect on organizations' sales.

### Hypothesis two

$H_0$  – Management of Product Life Cycle does not have significant effect on consumer loyalty and market share.

$H_1$  – Management of Product Life Cycle has significant effect on consumer loyalty and market share.

**Table 2:** Analysis of Hypothesis two

Model	Unstandardized Coefficients		Standardized Coefficients	T	R2	F-Ratio
	B	Std. Error	Beta			
1 (Constant)	5.322	0.876		6.074	0.224	25.872
2 Effective Pre and After sales service program, and spares availability ensures product availability	0.038	0.121	0.030	8.311		
3 Limited market size significantly affects a products life cycle	0.113	0.108	0.101	9.044		
4 Consumer loyalty increases at a decreasing rate at maturity stage	0.132	0.100	0.126	15.312		

Dependent Variable: Consumer loyalty increases and stabilizes at the growth stage

**Source: Field Survey, 2014.**

$R^2 = 0.224$

F- test= 25.872

From the SPSS output above, the stated model for hypothesis two is therefore fitted as

$Y = 5.322 + 0.038X_1 + 0.113X_2 - 0.132X_3$

$R^2 = 0.224$  (22.4%)

F-test= 25.872

From the result above it is revealed that there is a positive relationship between Effective pre and after sales services, Market size, Product modifications and Redesign, and Consumer loyalty. This Means that an increased performance in the Effective pre and after sales services, Market size, Product modifications and Redesign will bring about a corresponding increase in Consumer loyalty. The  $R^2$ , which is called the coefficient of determination, tells the strength of the model. the result above shows that 22.4% variation in the dependent variable is explained by the stated

independent variable in the model, which invariably means that the model is significant, in terms of goodness of fit and can be accepted.

Comparing F-test calculated ( $F_{cal.}$ ) with F-test tabulated ( $F_{tab}$ ) at 5% level of significance with the degree of freedom of (k-1, N-k) (5-1, 110-5) where 4, 105 is the final degree of freedom. From the SPSS result, the F calculated value is 25.872 while the F tabulated is 2.53. Since the  $F_{cal} > F_{tab}$  ( $F_{25.872} > F_{2.53}$ ) it shows that the overall parameter is significant at 5% level of significance, hence the  $H_1$  for hypothesis two is accepted, that is, Management of Product Life Cycle has significant effect on consumer loyalty.

## DISCUSSION OF FINDINGS

This discussion will be tailored in line with the guiding main objective of this study, which is to analyze and evaluate the effects of management of PLC on the sales of capital goods, which further translates into the following specific objectives;

### 1.) To determine the effects of PLC management on consumer buying behaviour.

The determination of the effects of PLC management on consumer buying behaviour and the third objective of the study, which is the evaluation of the effects of competition on the management of capital goods, shall be considered simultaneously. This is due to the fact that consumer buying behaviour is also affected by competitive theatrics. Most of the respondents (53.6%) strongly agree that a new product requires heavy promotional campaign to entice trial. This is in support of what Kotler (2005) posited. 9.1% are undecided and 1.8% disagree with this statement. In providing solution to the research question regarding the extent that Product Life Cycle dictate marketing strategies adopted, 46.4% of the respondents strongly agree that changes in life cycle affects distributional channel choices, 41.8% agree while 9.1% are undecided. This is in consonance with Perreault, Canon and McCarthy (2002) and Ilesanmi (2011) who agreed with this statement in the affirmative.

Ilesanmi (2011) opined that Product life cycles, in spite of their varying time frames, are a helpful tool for encouraging managers at all levels to think strategically. The great value of the product life cycle concept is that management, knowing what typically happens at different stages in a product's life, should be able to improve its forward planning.

With respect to price determination majority of the respondents agree strongly that cost plus pricing is the best alternative at the introductory stage, 10.9% are undecided and 0.9% strongly disagree. This especially deals with issues relating to price elasticity which Simon (1978) submitted that price elasticity decreases over the introduction and growth stage, reaches its minimum at the maturity stage, and again increases during the decline stage.

Also findings revealed that in introducing capital goods to the market, personal selling is more effective than advertising as 50.9% of the respondents strongly agree to that statement, 35.5% agree, 12.7% are undecided and 0.9% strongly disagree. Further, it was also strongly agreed that

effective pre and after sales services ensures product acceptability, with a correlating affirmation that PLC has been identified as having effects on competitive marketing strategies.

## 2.) To identify the adaptation strategies of firms to the changes in their PLC.

In response to the research question about how companies respond to changes in its product life cycle triggered by competition, 49(44.5%) respondents strongly agree that product strategies such as product modification, redesign and repacking can be applied. 44(40%) strongly agree, 12(10.9%) undecided, 3(2.7%) disagree and 2(1.8%) strongly disagree. This supports Cravens (2000) who considered this aspect relevant in PLC analysis. In this regard, it was also discovered that frequent technological innovations abroad affects life cycle trends locally as 52(47.3%) respondents strongly agree to that assertion, 35.5% agree, 13.6% are undecided and 1.8% disagree, while another 1.8% strongly disagreed.

Judging from responses to the research question “to what extent does a Life Cycle change affect consumer loyalty and market share?” Product life cycle, consumer loyalty, and market share seem to have a lot in common, especially with respect to the submission of Mukerjee (2007) and Thietart and Vivas (1984). They opined that customers would have different requirements at different stages and the manner in which the relationship is managed will determine the customers loyalty and life time value realization, which is also in consonance with Tomoyuki Hata, Satoru Kato, Hirokazu Sakamoto, Fumihiko Kimura and Hiromasa Suzuki (2009), where a simulation was used to help management identify the characteristics of the scenario they construct.

Therefore dynamically changing quality models provide designers with transitions of quality with respect to time, profit and cost, which will help them in planning a better quality management system. The results provide guidance to decision makers as they believe that effective strategic action is a function of the life stage and the business characteristics, by identifying the stage, the decision-maker can select the appropriate strategic actions and evaluate their impact on performance. Further 48(43.6%) respondents agree strongly that consumer loyalty increases and stabilizes at the growth stage, 43 respondents agree, 9(8.2%) are undecided, 4(3.6%) disagree and 6(5.5%) strongly disagree. Again 51.8% of the respondents strongly agree that the market is reduced to only hard core loyalists at decline stage, 30% agree, and 18.2% are undecided.

## 3.) To investigate the effects of Life cycle changes on different product lines.

Findings further revealed that life cycle changes in a particular product line affect the operations of another product line. 45(40.9%) respondents strongly agree to the statement, 51(46.4%) agree, 12(10.9%) are undecided, while 1(0.9%) disagree and strongly disagree.

Muller (2000) emphasized that the life cycle of a product category in the market determines many aspects of the architecting approach, this is in concordance with the submission of Asiedu and Gu (1998), that Life cycle engineering should be adopted as an effective approach to address competitive issues. To corroborate that, 55(50%) respondents agree strongly that PLC should be taken into consideration in product design and prototyping, 37(33.6%) agree, and only 6(5.5%) and 3(2.7%) disagree and strongly disagree respectively.

**4.) To evaluate the effect of cost on the management of the life cycle of capital products.**

Responses to the research question to what extent is PLC maintenance cost affecting company profits? shows that product life cycle do not have a negative effect on company profits, 12(10.9%) strongly agree that PLC has a negative effect on company profit, 8(7.3%) agreed, 32(29.1%) were undecided, 28(25.5%) disagree and 30(27.3%) strongly disagree. It was also discovered that defending market share at maturity stage will ensure profit maximization, in agreement with Smith (2000), as 56(50.9%) respondents strongly agree to this. Further, in agreement with Kotler and Armstrong (2006), that profits increases at a decreasing rate at the maturity stage, 49(44.5%) respondents strongly agree to this assertion. This should provide a warning to marketing management as to the implications of a decline, since 66(60%) respondents strongly agree that it leads to a significant reduction in profit. The construct below was developed in an attempt to depict the links between variables surrounding the success of the Management of Product Life Cycle in the capital goods segment of the Nigerian Manufacturing Industry, taking the traditional marketing mix as given. In the end, both null hypotheses were rejected, which implies that management of PLC has significant effects on sales of capital goods in Nigeria, and also that management of PLC has significant effects on consumer loyalty, in the same segment.

**Economic Implication of the Study and Contribution to Knowledge**

The African economic polity recently witnessed a change in leadership, with Nigeria taking the lead after a rebasing of its economy. This is a welcome development considering the fact that Nigeria not only has the largest economy in the West African sub-region and Nigeria is also the sixth largest producer of oil in the world. Nigeria's economic leap in this regard will no doubt have positive spiral effects on the drive for infrastructural development, which ultimately depends on products from the Original Equipment Manufacturers (OEMs). The capital goods industry in any economy remains the backbone of infrastructural development. The onus is on the players in the industry to apply the Industrial Product Life Cycle construct, as developed, to ensure higher returns and longer life cycles.

The literature review and critique position of this study established a gap in the existing body of knowledge on the topic Product Life Cycle. So far, it has been the exclusive preserve of Theorists, and managers alike, in the Fast Moving Consumer Goods (FMCGs) club. The study, and Construct that emerged, would open a new vista in the Product Life Cycle theory, as regards to its applicability to Capital goods.

Taking the elements in the traditional marketing mix as given, the construct harmonised the classical PLC model into the corresponding characteristic need of industrial goods at each stage of the life cycle. Adding the New Product Development (NPD) to the classical model at the Alpha level, it assumes marketing specialists must take NPD in PLC management as the starting point. While not discarding other elements of the promotion mix at the introductory stage, the model suggests personal selling is still the most effective. At the growth stage, an effective campaign of pre and after sales services must be intensified while assuring spare availability at maturity. The study suggests product modification and addition of new features at decline.

## Conclusion

The conclusion from this study was based on the research questions formulated for the work. This study concluded that: Product Life Cycle significantly dictates marketing strategies adopted, hence management should incorporate PLC management in its strategic marketing planning processes. Further prompt response to life cycle changes triggered by competition will provide an antidote to produce failures especially a forced decline. Consumer loyalty is of importance in any business; hence consumer apathy created by changes in life cycle trends should be met with prompt management actions to correct any anomaly. The effects of life cycle change on different product lines have been established. Thus the need to ensure PLC is adequately monitored, and at best taken into consideration at the design and prototyping stage. Organizations should not be reluctant to spend resources on management of product life cycle, as findings revealed that PLC maintenance cost does not have any negative effect on company profit. This is more so as the cost of product failure is quite unbearable.

In conclusion, above all, Management of Product Life Cycle (PLC) and its strategies should be embraced by all organizations within the capital goods segment of the Nigerian Manufacturing Industry that wish to succeed in the competitive world. Despite the limitations of the concept, it remains an inevitable tool for marketing management to continually watch and monitor the progress of products in their life cycle and to decide which strategy to use at the right time. Products can only survive beyond the life span of its original owners and innovators, if only plans are put in place to monitor its progress from inception.

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