This study examines the challenges of the interface of design, production, marketing and customer satisfaction in relation to product quality. In product development process there is linear function relationship whereby, when one unit completes its assignment, it hands over to another unit until the product is finally launched into the market. In another, there is a simultaneous relationship in which all the units concerned such as design, R&D, production and marketing integrate their responsibilities. The main objective of the study is to determine which of the two approaches is more efficient and effective in relation to product quality and consequently customer satisfaction. Managers from the tyres and roofing sheet Product Company constitute the sample. This study employed descriptive statistics to determine the effects of an interface of design, production and marketing in satisfying customers in relation to product quality and price. The study revealed that an interface between the three mentioned departments from idea generation to product launch leads to high product quality that meets customers requirement when carried out simultaneously.

Key words: Interface, product quality, customer satisfaction, linear function, simultaneous function, interdepartmental conflict.

INTRODUCTION

As competition becomes intensively globalized, understanding and accommodating the needs, wants and aspirations of consumers from different cultural backgrounds have become increasingly important. An examinations and understanding of customer expectations in quality perceptions and in future purchase intentions is of great importance in a competitive marketing environment (Boulding et al., 1993; Kopalle and Lehmann, 2006).

As it is possible to encounter producers or customers from different cultures in any given country, the nationality of employees and firms could significantly change the expectations of both producers and customers and thus, influence their interactive behaviours and satisfaction (Cheryl et al., 2007). In order to be successful, organizations must become customer focused. Customers’ needs and expectations are always changing and this will lead to a situation where customers keep setting ever higher standards.

Therefore, implanting customer satisfaction philosophy...
means identifying customers, their needs and expectation and finally, measuring their perception. Knowing the needs of the customers makes it easier to anticipate the ideal set of products that will satisfy them. The more market oriented firms are the higher their innovation degree. The higher their innovation degree, the higher their innovation performance. The higher their innovation performance, the higher their economic success. Also, the more market oriented firms are the higher their customer loyalty. The customer loyalty is a function of the product acceptability by the customer (Desphande and Farley, 1998).

Customer orientation is the responsibility of the marketing department and whatever products the production department produces that does not conform to customers expectation, is not a quality product and cannot withstand the competitive marketing environment. Garvin (1998) identified eight dimension of product quality as performance, conformance, durability, reliability, serviceability, features, aesthetic, personal perception. He emphasized that quality is customer’s requirement and not goodness i.e. quality is fitness and not goodness. This amount to the fact that whatever the production department produces that are not in accordance to the need and requirement of the consumers as per the survey findings of the marketer is a waste of money and effort on the long run, as there may be no repeat purchase which might lead to product failure.

Lack of cooperation and colaboration of the above mentioned department lead to crisis and low product quality and consequently customers’ dissatisfaction. Based on this premise, interdepartmental dynamics has become indispensable in customer satisfaction. Interdepartmental dynamics are the formal and informal interactions and relationships among an organization’s departments (Kohli and Jaworski, 2008). The critical dynamics are interdepartmental conflict and connectedness. Wang et al. (2007) described the lack of cooperation and coordination between functional units as one of the most common barriers to market orientation. Ruekert (1992) suggested that this lack of cooperation creates frustration among the members of the organization, especially when individuals perceived that the other party is not having a fair manner.

Jaworski and Kohli (2008) suggested that interdepartmental conflict reduces the market orientation of an organization, mainly affecting intelligence dissemination and responsiveness of the organization. Ruekert (1992) also claimed that interdepartmental conflict inhibits communication across the departments of an organization.

Interdepartmental connectedness is the degree of formal and informal direct contact among employees across departments of an organization (Kohli and Jaworski, 2008). The importance of this variable facilitating market orientation is supported by the evaluation literature. This was also documented by Desphande and Farley (1998) who indentified interdepartmental connectedness to be significant and positively related to intelligence dissemination and responsiveness. They also postulated that connectedness enables adequate amounts of intelligence to be generated and at the same time allows its appropriate usage.

This paper beam a search light on Design, production and marketing interface or interdepartmental connectedness as a necessity for customer satisfaction and consequently product quality and survival.

Statement of the problem

Customers’ needs and expectations are always changing, this make customers to keep setting higher standards in terms of product qualities. Knowing the changing needs of customers enables the organization to anticipate and produce the ideal set of products that will satisfy them. Inability to satisfy customers may lead to switching to other competitive products.

The capability and competencies of identifying and producing according to customer requirement has been a challenge to many organization as this has brought conflicts among department as per which department has the sole responsibility of product design and development that meet customer requirement in terms of research, price, quality and distribution (time and place utility). The question that beg for answer is whether product development process be linear or simultaneous among the department involved.

Objectives of the study

1) To determine the effects of design, production and marketing interface on product quality that meet customer satisfaction.
2) To determine the extent to which product design, production and marketing interface, result in organization conflict.

Research questions

1) Does product design, production and marketing interface result in product quality that meet customers satisfaction?
2) Does product design, production and marketing interface result in organization conflict?

REVIEW OF RELATED LITERATURE

Requirement of a good product design

In line with marketing concept philosophy, a reasonable definition of product is that it is the sum of the physical,
psychological and sociological satisfaction the buyer derives from purchase, ownership and consumption (Donnelly, 2004). From this standpoint, products are customers – satisfying objects that include such things as accessories, packaging and service (Donnelly, 2004).

A product is obtained by the transformation of raw materials (Bangar, 2008). What is important in any product to both the marketer and the consumer is the core benefit. The core benefit addressed the question of what the buyer is really buying. The buyer of a roofing sheet is buying protection from rains and heat. In other words, a product is much more than a set of physical attributes. When developing products, marketer must first identify the consumer needs the product will satisfy (Kotler and Keller 2009).

While designing a product, designer must consider the functional requirements and the aesthetic qualities. Designer must also, at the same time keep his eye on the cost of manufacturing the product, how much time it will take for different operations and in complete manufacturing, how much material it will require. For new improved product, ideas are originated by:

i) Customers Suggestion
ii) Suggestions by Production Department
iii) Other Products in the Market or
iv) From R & D Department.

These ideas are given final shape in the form of product design by joint efforts of marketing, R & D, design department and production department (Bangar, 2008).

A good product design must fulfill the following essential requirements:

1. Customers Satisfaction.
2. Earn Adequate Profit.

a) Customers’ satisfaction:- The product should satisfy the customers by fulfilling their need and expectations. In order to achieve this objective, the following points should be kept in view.

i) It should function properly.
ii) It should be of proper quality so as to achieve desired degree of accuracy and reliability.
iii) Easy to use (or operate).
iv) Easy to repair and service.
v) Should be able to withstand rough handling.
vi) Good aesthetic view.
vii) Should have good space utilization.
viii) It should fulfill the ergonomic requirement of the user (Bangar 2008).

b) Adequate profit:- The product when manufactured and sold should give adequate profit. For this purpose, it should fulfill the following requirements:

i) It should be able to be manufactured at a reasonable cost, so that it can compete with other products in the market.
ii) It should adopt latest technology, in order to arrive at a minimum cost per unit of production.
iii) A good design needs minimum number of parts.

Factors considered while designing a product

In designing a product, several factors are considered which include the following:-

i) Materials:- Quality raw materials give quality finished products (Egboro 2004) Materials should be cheap and be able to withstand design requirements. During production, wastage should be minimized.

ii) Manufacturing Facility:- Product design should commensurate with the facilities available in the factory as regards to equipments, labour and layout.

iii) Use of Standardization:- The parts used should be of minimum variety and should either be easily available in the market or can be manufactured easily with the machines available.

iv) Aesthetic:- The product should be good in appearance and should have attractive colours.

v) Functions:- It should be able to perform its desire function with desired accuracy, reliability and strength.

vi) Ergonomics:- It should be easy to use, operate and should cause minimum possible fatigue and provide comfort.

vii) Operating Conditions:- The product (Industrial Product) should operate with minimum of noise, vibration, heat and other hazards.

viii) Economy:- At design stage, it is easy to attach cost than later on when the product is actually being marketed. All possible ways to reduce the cost should be considered at the design stage.

The traditional approach to new product development has been a functional, linear process. Typically, each functional area works on specific stages of a process in isolation (Figure 1). When one step is concluded, the results go to the following functional area of the next step, for example, Research and development might conceive a product idea and give it to the design function, which develops engineering specifications and gives it to
Design, production and marketing interface.

In the product design stage, the new product concept is developed into a physical product. The objective is to use the information obtained from the concept tests to design an actual product that can be further tested. In fact, at this stage the company will determine whether the product idea can be translated into a technically and commercially feasible product (Kotler, 2004).

The job of translating target customer requirements into a working prototype is helped by a set of methods known as quality function development (QFD) (Kotler, 2004).

According to him, the methodology takes the list of desired customer attributes generated by market research and turns them into a list of engineering attributes that the engineers can use. For example, customers of a proposed truck may want a certain acceleration rate. Engineers can turn this into the required horse power and other engineering equivalents. A major contribution of quality function development (QFD) is that it improves communication between marketers, engineers and the manufacturing people (Kotler, 2004).

The R & D develops one or more physical version of the product concepts, its goal is to find a prototype that embodies the key attributes described in the product concept statement, that performs safely under normal use and conditions, and that can be produced within the budgeted manufacturing costs. Developing and manufacturing a successful prototype can take days, weeks, months or even years (Kotler, 2004). According to him, when the prototypes are ready, they must be put through rigorous functional tests and customer tests.

Alpha testing is the name given to testing the product within the firm to see how it performs in different applications. After refining the prototype further, the company moves to beta testing. It enlists a set of customers to use the prototype and give feedback.

Beta testing is most useful when the potential customers are heterogeneous, the potential applications are not fully known, several decision makers are involved in purchasing the product, and opinion leadership from early adopters is sought.

Consumers’ preferences can be measured in several ways. The different ways that the consumer preference might be measured include the following (Kotler, 2004):

The Rank Order Method: The rank order method asks the consumer to rank the three items in order of preference. The consumer might respond with A > B > C. Although this method has the advantage of simplicity, it does not reveal how intensely the consumer feels about each item or whether the consumer likes any item very much. It is also difficult to use this method when there are many objects to be ranked (Kotler, 2004).

The Paired – Comparison Method: The paired comparison method calls for presenting pairs of item and asking the consumer which one is preferred in each pair. Thus the consumer could be presented with pairs AB, AC and BC and say that she prefers A to B, A to C. we could conclude that A > B > C and this method allows the consumer to focus on the two items, noting their differences and similarities.

The Monadic Rating Method: The monadic rating method asks the customer to rate liking of each 4 product on a scale. Suppose a seven – point scale is used, where manufacturing to produce. Manufacturing produces the product and give it to marketing to market and sell.

Although this type of approach has resulted in some successes, the process can be very slow and costly (Jobber, 1998). In contemporary times, many firms have improved the new – product development process by adopting a multi-functional simultaneous approach. This approach requires all relevant functions to work together during all stages, with several steps typically performed simultaneously. Some firms benefit from including suppliers, distributors, customers and other interested groups.

This is referred to customer value-chain involvement for co-creating customer delight (Oswald et al., 2004).
I signifies intense dislike, a difference and 7 intense like.
Suppose that the consumer returns the following rating:

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>=</td>
<td>=</td>
<td>=</td>
</tr>
<tr>
<td>6</td>
<td>5</td>
<td>3</td>
</tr>
</tbody>
</table>

We can derive the individual’s preference order (i.e. A > B > C) and even know the qualitative level of person’s preference.

According to Jobber (1998), the task of product development is not the sole responsibility of R & D and or engineering departments. Multi – disciplinary project teams are established with the task of bringing the product to the market place. The aim is to integrate the skills of designers, engineers, production, finance and marketing specialists so that product development is quicker, less costly and results in high quality product that delight customers.

For example, the practice of simultaneous engineering means that designers work together rather than passing the project from one development to another once the first department work is finished. Costs are controlled by a method called target costing. Target costs are worked out on the basis of target process in the market place and given as engineering design and production targets.

Cutting time to market by reducing the length of product development stage is a key marketing factor in many industries. Allied to simultaneous engineering companies are the use of computer aided design and manufacturing equipment and software to cut time and improve – quality.

There are two main reasons why product development is being accelerated. First, products market such as computers and cars change so fast that to be slow means running the risk of being out of date before the product is launched.

Second, cutting time to market can lead to competitive advantage. Marketing has an important role to play in the product development stage. R & D and engineering may focus on the functional aspects of the product whereas seemingly trivial factors may have an important bearing on customer choice. Marketing usually brief R & D staff on the product concept and the latter is charged with job of turning the concept into reality (Jobber, 1998).

**Total quality management (TQM):- A system approach and customer focused**

The TQM approach depends on understanding the TQM approach depends on understanding organizations as systems. A system is a series of functions or activities within an organization that works together for the aim of the organization (Stoner et al., 2000). Parts of the system must work to support each other. People must cooperate for the good of the whole system or else "Suboptimization" occurs. When parts of an organization do not support other parts, then the organization cannot focus on total quality management.

The quality program’s ultimate objective of an organization is not only to move toward zero manufacturing defects, but also to improve all levels of customer satisfaction.

Total customer satisfaction (TCS) provides for continuous improvement in price delivery, performance, quality and total customer experience.

The Juran trilogy of quality according to (Strickland, 2001) is stated in three perspectives.

**a) Quality Planning.**
1. Set Goals.
2. Identify Customers and their Needs.
3. Develop Products and Processes.

**b) Quality Control**
1. Evaluate Performance
2. Compare to Goals and Adapt

**c) Quality Improvement.**
1. Establish Infrastructure.
2. Identify Projects and Teams.
3. Provide Resources and Training.
4. Establish Controls.

**METHODOLOGY**

The study employed descriptive survey in determining the effects of product design, productions and marketing interface on consumer satisfaction through quality products.

The population of the study consists of managers from design, production and marketing departments of three manufacturing companies in Delta and Edo States of Nigeria. These companies are in Bicycle tyres and roofing sheets product industries. The estimate of the population is 510 managers. The Taro Yemene’s formular for finite population was used to derive a sample size of 255.

The structured questionnaire was developed along a likert scale of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD) to determine the extent to which the interface of product design, production and marketing can result in quality products that meet consumer’s requirement.

The items in the structured questionnaires were weighted 4, 3, 2 and 1 respectively to give them interval value. Data were analyzed using descriptive statistics of Mean and Standard Deviation. Any mean rating which is 2.5 and above is considered significant, indicating that interface between the three departments can results in quality products that satisfy consumers rather than resulting in conflicts between the departments.

The instrument / questionnaire was tested for validity using content validity test. This was determined by experts’ opinion. Three senior lecturers specializing by Marketing and Business Administration validated the research instrument.

Cronbach’s alpha was used to test the internal consistency reliability, which is 0.868.
Table 1. Mean rating on design, productions and marketing interface as it affects quality products that satisfy or meets customers’ requirement.

<table>
<thead>
<tr>
<th>S/N</th>
<th>Items</th>
<th>Mean Rating</th>
<th>Standard Deviation</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Knowing the needs of customers makes it easier to anticipate the ideal set of products that will satisfy them.</td>
<td>6.13</td>
<td>1.48</td>
<td>Significant</td>
</tr>
<tr>
<td>2.</td>
<td>Customer orientation is the responsibility of design, production and marketing departments.</td>
<td>2.99</td>
<td>1.68</td>
<td>Significant</td>
</tr>
<tr>
<td>3.</td>
<td>A good product design must fulfill customer’s satisfaction and earn adequate profit.</td>
<td>7.09</td>
<td>1.42</td>
<td>Significant</td>
</tr>
<tr>
<td>4.</td>
<td>Interface between design, production and marketing department does not result in conflict.</td>
<td>5.58</td>
<td>1.29</td>
<td>Significant</td>
</tr>
<tr>
<td>5.</td>
<td>Interface between design, production and marketing does not bring delay in introducing the product to market on time.</td>
<td>4.40</td>
<td>1.54</td>
<td>Significant</td>
</tr>
<tr>
<td>6.</td>
<td>Interface between design, production and marketing result in quality product that satisfy customer.</td>
<td>7.15</td>
<td>1.18</td>
<td>Significant</td>
</tr>
<tr>
<td>7.</td>
<td>The functional linear process in new product development is more feasible than simultaneous approach.</td>
<td>2.34</td>
<td>1.03</td>
<td>Not Significant</td>
</tr>
<tr>
<td>8.</td>
<td>The simultaneous approach process in New Product development is more feasible than functional linear process.</td>
<td>5.18</td>
<td>1.18</td>
<td>Significant</td>
</tr>
<tr>
<td>9.</td>
<td>In new products development, ideas from suppliers, distributors and customers help in creating customer delight.</td>
<td>7.26</td>
<td>2.22</td>
<td>Significant</td>
</tr>
<tr>
<td>10.</td>
<td>Communication between Marketers, Engineers and Manufacturing people is indispensable in new product survival.</td>
<td>3.87</td>
<td>1.49</td>
<td>Significant</td>
</tr>
<tr>
<td>11.</td>
<td>The integration of the skills of designers, engineers, production, finance and marketing specialists in product development, make it quicker, less costly and result in high quality product that delight customer.</td>
<td>3.84</td>
<td>1.78</td>
<td>Significant</td>
</tr>
<tr>
<td>12.</td>
<td>Total quality management (TQM) is not important to product customer acceptance.</td>
<td>2.34</td>
<td>1.03</td>
<td>Not Significant</td>
</tr>
<tr>
<td>13.</td>
<td>Marketing department alone can meet customer requirement.</td>
<td>2.36</td>
<td>0.83</td>
<td>Not Significant</td>
</tr>
<tr>
<td>14.</td>
<td>Production department alone can meet customer requirement.</td>
<td>2.30</td>
<td>0.67</td>
<td>Not significant</td>
</tr>
<tr>
<td>15.</td>
<td>Total customer satisfaction provides for continuous improvement in prices, delivery, performance, quality and total customer experience.</td>
<td>3.50</td>
<td>1.06</td>
<td>Significant</td>
</tr>
</tbody>
</table>

DISCUSSION OF FINDINGS

The result of the data analyzed revealed the significance of an interface between design, product and marketing in relation to satisfying or meeting customer requirement (Table 1).

Knowing the needs of customers helps to anticipate the right set of products that meet customer requirement of satisfy them (Mean, 6.13); this indicates that customer orientation is an integral part of these three departments (Mean 2.99).

The satisfaction of the customer is not done in isolation of the company’s adequate profit (Mean 7.09).

The interface between these three departments does not result in conflict that may lead to delay in production lunch (Mean, 5.58 and Mean 4.40).

Ideas from suppliers, distributors and customers create customer delight (Mean 7.26). Total customer satisfaction provides for continuous improvement in prices, delivery, performance, quality and total customer experience (Mean 3.50).

The above significant variables are in line with Jobber (1998) which stated that simultaneous product development process among these departments leads to quality product cost cut and early lunch to market to beat competition.

Managerial Implication

The importance of the “customer” to an organization has grown in recent years. Greater emphasis is now on customer satisfaction, and more effort is being expended on brand quality concepts.

This study has highlighted a number of issues that are useful to aiding management in a competitive market where
customers satisfaction and delight is a competitive advantage. It is important for managers to identify the areas of conflicts between department during new product development that might affect product quality. This is so because this study has shown that lack of collaborative and cooperative solutions to customer dissatisfaction can amount to loss of market share and customer retention.

The manager should have at the back of his mind that "a house divided against itself cannot stand". There must be total quality management (TQM) where all departments' focus is on customers' satisfaction.

Summary and Conclusion

In order to be successful, organization must become customer focused, because customers' needs and expectations are always changing, in which there is a continuous setting of higher standards. Knowing the needs of the customers makes it easier to anticipate the idea set of products that will satisfy them.

This task cannot easily be accomplished, by marketing department alone. There must be a synergy between design, production and marketing department. In so doing, there should be a simultaneous effort rather a linear function among the different departments.

A product is the sum of the physical, psychological and sociological attributes of the products. These are some important customers' requirement.

RECOMMENDATIONS

1) Identification of customers need and requirement should be a priority in attempt to satisfy customers (i.e. identification of a market and their needs and requirement.)

2) Product design and development should not be a responsibility of one department rather, there should be a synergy.

3) The effort of product design and development should be simultaneous rather than been a linear effort. Each unit or department involved should bring in their ideas right from the ideas generation and screening, to product development.

4) In the product development and testing stages, managers involved from different units should ensure the product price, functionality quality, easy of operation, repair and service, aesthetic. These are some important customers' requirement.

Conflict of Interests

The authors have not declared any conflict of interests.

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