ABSTRACT

New product development is a very challenging task in today’s competitive business world. Due to the different demographic group of customers and their varying demands, it’s not an easy task for an organization to develop a new product by considering the customer's needs. Due to the competitive environment in market; ‘Customer Satisfaction’ becomes the major responsible factor for the sustainability of the product throughout its entire life cycle. Hence now the organizations are defining new techniques, new strategies for product development, from the point of view of ‘Customer Satisfaction’. Other major factors that decide the sustainability of the product are ‘Cost’ and ‘Quality’. The emerging trend is to provide better quality product in affordable cost from organizational survival point of view. Hence to meet the demand of a changing time, various organizations as well as research scholars have been busy in the development of new tools, techniques for the product development process. Hence the traditional product development cycle is changing rapidly with profound changes. This paper will discuss the various traditional processes of product development as well as emerging trends in the field of New Product Development.

Keywords: Apqp, Lean Product Development, New Product Development, Qfd, Six Sigma, Value Engineering.

1) NEW PRODUCT DEVELOPMENT

New product development is a challenging task for any organization. While developing any new product organizations has to think about various factors. The significant factors to be considered from product development point of view are shown in figure. It needs effort and involvement of experts from various fields from marketing up to legal section of organization.
Thus new product development is completely a creative multidisciplinary process. All the departments in the organizations should work effectively and consistently while developing any new product. Apart from that the organizations have to work within a framework by considering legal aspects, budget restrictions, dynamic market, ever-changing customers, technological advances, available resources etc. Translating Customer’s needs into a physical product is very interesting as well as complex process. This complex process is called as Product Development Cycle, which is discussed in details as under.

2) PRODUCT DEVELOPMENT CYCLE

![Product Development Cycle Diagram](image-url)

**Figure 1:** Factors affecting product development

**Figure 2:** Product Development Cycle
The traditional product development cycle starts from idea generation and ends at product commercialization and pricing. The effectiveness and outcome of the cycle depends on creativity and innovation. The seven stages in the product development are shown in the figure. Idea screening-Technical implementation and launching of the product are the crucial stages in the process of product development. Just review first the product development cycle.

i) Idea generation:- Various ideas about a new product are generated in sessions like brainstorming by considering customer needs which is based on market surveys

ii) Idea screening: - It is carried out to check the feasibility of the generated ideas and to eliminate the over and out concepts. The genuine and feasible ideas are considered for further process.

iii) Idea Development and Testing:- This stage is carried out to develop the screened ideas in the point of the view of target market and their requirements

iv) Market Testing:- It includes development of prototype, introduction of the product in trade fairs and testing it for customer acceptance

v) Technical implementation:- It includes all preparations required for manufacturing of the new product.

vi) Product Launching:- It includes all the activities like advertising & promotion, which is required for launching of a new product.

vii) Pricing:- To decide the cost of product by considering the circumstances.

The above discussion highlights the procedure of product development cycle. However as discussed in earlier paragraphs it is necessary to develop the product development strategies & techniques by maintaining the basic theme to meet the demands of changing market. There are various product development strategies evolved depending on different strategies adopted by the organizations.

3) DIFFERENT STRATEGIES TO PRODUCT DEVELOPMENT

In the past or at the start of industrialization there was supplier oriented product development approach. Then it is shifted to Consumer oriented product development. And now it has been changing to Service oriented product development to accommodate the dynamic demands of the customers. The last approach is the most sensible approach; because supplier shoulders the responsibility of product even after the sale of the product. Here we will discuss all the three approaches in brief.

3.1) Supplier oriented product development
Here the functions, specifications, price of the product are decided by the manufacturer or supplier only. There no voice to customer in entire product development process as all the strategic decisions is taken by supplier. The role of Customer is limited up to the purchase of the product irrespective of his satisfaction. In between 1900 to 1970 the entire industry was under the influence of this approach. It was not necessary for the suppliers to understand the Customer’s needs and their satisfaction. Because very few options were available for Customers due to limited number of suppliers. But it has been changing now, and today this approach is becoming outdated.
3.2) Consumer oriented product development

End customer is more important for any supplier or manufacturer. Hence to build strong relationship with the end customer is the challenging task for supplier. Customer’s demands are becoming sophisticated and specially defined in current market. Junichi Tomita [1] has discussed various issues regarding customer oriented product development. Today it is important for any organization to develop the effective customer system to understand their needs. Junichi Tomita [1] also concluded that the supplier has to think more about the end user of the product rather than the intermediate users.

The consumer oriented product development always talks about the customers. Helle Alsted Søndergaard[2] has discussed about the Means End Chain Theory. He discussed in his study about the effectiveness and limitations of MEC theory. However there are limitations for this strategy. Because sometimes the Customer’s demands are diversified and too much sophisticated. Hence it is critical to analyze the data collected from the market survey and translate it into technical specifications. Due to different segments of market; organization cannot rely fully on the market or customer survey. But they have to analyze carefully the data generated from the market surveys. The effectiveness and reliability of the market survey depends on the various factors. Some factors are out of control while some factors can be easily analyzed. Various new techniques are developed to carry out the market survey by considering all these things. The flow of any product is generally as shown in the figure. Though the end customer is at the last place in the flowchart; it is the only significant factor in consumer or customer oriented product development process.

![Figure 3: Product flow](image)

3.3) Service oriented product development.

It is totally new approach in product development process. In this companies shoulders more responsibility about their products. It is totally different approach than the other strategies of product development. Adrian R. Tan[3] has discussed various factors regarding service oriented product development. In this process, the approach of business is integrated. It do not focuses on only product but the product & service. He has concluded that the integrated product service approach helps to generate more business for any organization. He also talks about development of product service system in the organization. Now we can see here the entire field of product development has been developing very rapidly by adopting the changes. New strategies to full fill the demands of different market segments. Hence to tackle with demand of the changing time its now necessary for
any organization to define and develop effective strategies of product development for the sustainability of product in volatile and competitive market. Its necessary to discuss about various product development strategies. The market success of the developed product largely depends on the adopted product development strategy.

4) CONVENTIONAL APPROACHES

The organizations are now adopting the development approach as per their requirement, applications of product and economical position of organizations. After taking the review, it can be said that some approaches of product development are conventional. Because these approaches are now fully established, well developed and implemented successfully by various organizations. And some approaches are unconventional, because still these approaches are under development stage. And some organizations are trying to implement it. Lean product development, QFD and six sigma may be called as conventional processes while Advanced Product Quality Planning(APQP) can be called as unconventional approach for new product development. Both the conventional and unconventional approaches of product development are discussed below in detail. All the approaches are evolved either by efforts of some established giants in the industrial field or prominent researchers. Especially the people from Japan, USA. Then after they were established successfully in various organizations. It is worthy for an organization to study these approaches and try to implement a suitable one for the reputation and value of organization in market.

4.1) Lean Product Development

The lean product development is based on the two statements.

1) Do the thing right
2) Do the right things

The major things emphasized in the Lean product development are value and wastage.

Marcus Vinicius Pereira Pessôa[4] defines the value in a totally different context. As per his conclusion the value of a product should be observed for the entire life cycle. For stake holders, the concept of value is different than that of the customer. Hence the while following the strategy of lean product development ‘value’ should be considered an important factor. The second most important thing is any type of ‘waste’. Total seven types of wastes are defined by a Automotive giant Toyota.[4]Another major target of Lean product development process is to reduce any kind of waste in considerable proportion.

John Teresko [5] stated the thirteen principles of Lean product development. Every concept is explained by him from establishment of customer defined product value to various tools in new product development.

Marcus Vinicius Pereira Pessôa[4] has discussed steps of lean product development process in a nutshell.

However there are certain issues that should be taken in to account before application of the said process.

1) Complexity of product
2) Complexity of process
3) Uncertainty in market environment
4) Market demography
The Automotive giant Toyota has developed and applied the Lean product development process successfully. However to cope up with dynamic customer needs there is another one strategy of product development i.e. called as the flexible product development process. Due to the uncertain environment and volatile market conditions it is necessary to modify the product as per changing demand.

4.2) Quality Function Deployment

The another tool used for new product development process is Quality Function Deployment (QFD). As per Jaiswal[6] it is a tool that translate the Voice of the Customer in to new products that truly satisfies their needs. Hence there is more focus on customer’s needs, wants or demands in this method. The term Quality Function Deployment is derived from six Chinese characters with Japanese Pronunciation.[7] It was first introduced in Japan by Yoji Akao.[6] Toyota and its suppliers further developed it. As per Jaiswal[6] there are standard four stages of Quality Function Deployment.

i) Product planning:-This is carried out by Marketing department of organizations. All the requirements of targets customer should be listed. Similarly competitors and specifications of their product should be studied carefully.

ii) Product Design:-This stage is to be carried out by the Design department. All the Customer’s needs obtained in first stage should be translated in to product design.

iii) Process Planning:-This is to be carried out by Manufacturing department. All the processes and there parameters are to be documented.

iv) Process Control:-It is the monitoring of the manufacturing processes. There are following benefits of QFD

a) Major reduction in development cost.
b) Leads to Customer satisfaction.
c) Increases Market share.
d) Simplifies product planning.

There are also certain issues regarding QFD,

a) It takes a long duration for application.
b) It is a quantitative method including various matrices. Hence more complex.
c) Some times you are not able to transfer the customer demands in to technical specifications.
d) Process may vary from application to application.

General motors, Kodak, NASA are some organizations who have implemented the QFD in their systems.

4.3) Six-Sigma

Another approach of product development is Six sigma. Six sigma approach is also based on Quality Management. The emphasis of Six sigma is on continuous improvement in Quality. According to M.Sokovic[8] objective of Six sigma approach is to aggressively attack costs of quality. Six sigma methodology includes following stages.

i) Define:- Define the problem; as well as prepare solution matrices.

ii) Measure:- Apply Pareto analysis and measure various factors like reduction in cycle time, reduction in tool cost etc.

iii) Analyze:- The critical operations in the production process should be analyzed in this step.

iv) Improve:- The results from analysis phase are studied and improvement should be made accordingly.

v) Control Phase:- To develop the Control plans.
Six sigma is developed by General Electric and always speaks in the language of ppm. If the organization has rejection rate of 3-4 ppm; it can be said that Six sigma processes is implemented successfully.

4.4) Value Engineering

It can be said that value Engineering is one of the conventional strategy of product development. In now days it is important for any organization to improve the performance continuously and grow successfully. Value analysis is a frame work within which proven methods are systematically employed to identify better values for product and services. Don J. Gerhardt\[9\] has explained the significance of value analysis in new product development. He has explained various tools of Value analysis in the different stages of new product development process. Don J. Gerhardt\[9\] also concluded that the application of Value analysis in new product development process provides the high value to the customers and excellent return to company. As per P.M.Charantimath\[10\] there are following two functions in Value Engineering. The basic function is regarding to fulfill the mentioned requirements of user, and secondary function talks about offering something extra to the customer. Value Engineering strategy helps the organization to increase the profitability.

4.5) Modularity in product development\[11\]

To divide the large system in to small modular subsystems is called as modularity. In product development process modularity reduces the complexity of entire process, because instead of building a large structure directly we are going to create small modules of the system. It also minimizes the cost reduction and interchanging of the modules. Hence it is more beneficial to customer also, he can purchase the different module according to his requirement though the system is same. Desktop computer is the best example of modularization in product development.

5) NON-CONVENTIONAL APPROACHES

After reviewing all the processes, each and every process have its advantages as well as the limitations. Also specific objective of each process is different; that we have seen in previous paragraphs. Value and wastage are the crucial factors in Lean product development process. QFD concentrates on Customer needs. The emphasis of Six sigma is on Continuous improvement in quality. Value engineering talks about value of the product only. So there is no uniqueness in all these processes. If two organizations having similar product are using two different processes, the it is possible that quality of their product, cost of the product, and demand of the product may vary according to that process. In today’s competitive environment and era of standardization it is necessary there should be an unique product development process which considers all the factors from customer demand to maintenance. APQP (Advanced Product Quality Planning) is the only methodology for development of a new product that incorporates and synchronizes all the factors related to the product. Basically it is tool for the improvement of quality, which was invented by three Automotive giants Ford, GM, and Chrysler (Integration of these giants is well known as Automotive Industry Action Group). Today instead of quality tool APQP is rapidly transforming in to product-development process. Kapil Mittal\[12\] has stated that using APQP we can improve quality standards as well as productivity. He has also concluded that it can be implemented in any sort of industry. M. Bobrek\[13\] talks about APQP as a basic for standardization of management system design procedure. Yulia Surinova\[14\] has concluded that APQP not only satisfies the Customer needs but also offers the extraordinary to the Customer. Further she has also concluded that it is the
globalization of quality management technique. The flowchart shows various stages of Advanced Product Quality Planning activities.

![Flowchart of APQP Methodology](image)

**Figure 4: APQP Methodology**

i) Plan and Define:- The needs of target customers are identified in this phase by conducting market surveys. And inputs and outputs are defined clearly. According to that inputs and outputs the entire planning is decided.

ii) Product Design & Development:- DFMEA and PFMEA of the product is to be carried out as well as other designs and technical specifications are decided.

iii) Process Design and Development:- Develop the most suitable manufacturing processes for the product.

iv) Product and Process Validation:- Validation of selected manufacturing process and control mechanism is developed.

v) Feedback Assessment:- Outputs of the applied process are identified and compared with defined outputs in phase one.

6) CONCLUSION

As we have reviewed the standard product development strategies in today’s environment, It can be concluded that APQP (Advanced Product Quality Planning) is the only methodology that incorporates all the significant factors related to product. In first phase the inputs as well as the outputs also decided. While in last phase the actual outcome is compared with decided output. And if the results are not satisfactory then there is the scope for corrective measures also.

QFD concentrates on customer need while six sigma concentrates on wastage reduction. Lean product development also concentrates on value of product. **But APQP optimizes all these factors, and hence it is most suitable product development process, in today’s competitive market the organizations has to implement the strategies like APQP to retain their customer.**
7) REFERENCES


