

# Exploring the Role of NPD for Improving Customer Satisfaction in Deming Awarded Indian Industry

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## Abstract

Deming award is the topmost award conferred to the industries which exhibit excellence in business capabilities in terms of managing quality, cost, and competitiveness. This paper deals with the journey of the Indian industry for achieving the Deming award through the lens of new product development. The study reveals that competitiveness in terms of cost, quality, and innovation are the key drivers of new product development. New product development when integrated with the other cross functions themes of an organization creates a sense of togetherness. The process of NPD synergically vibrates with the other functions of the organization like quality assurance, sales and marketing, cost management, delivery, and HRM. These functions when managed holistically result in both tangible and intangible benefits. The tangible and intangible benefits involve a competitive product profile, improved market share, improved profitability, improved customer satisfaction, and improved sustainability.

## Keywords

NPD, Deming award, customer satisfaction, sustainability

## 1. Introduction

Product development activities are associated with the transformation of new feasible ideas about a product into a profitable product. This transformation requires a detailed analysis of customers' voices, technology requirements, and market competition to reduce the uncertainty about market needs and technological choices. There are complexities involved in translating dynamic customer needs into functional and emotional product attributes that give rise to market uncertainty on the other hand the technical uncertainty can be linked to the degree of novelty in product and manufacturing process design decisions. In designing a product development process, it is important to identify the strategic problem of risk and uncertainty reduction and the organizational issues of cross-functional integration in the formulation of design decisions. The significance of new product development is paramount for an organization as it helps in realizing the market share due to addressing customer expectations on Quality, Cost, Delivery, and Reliability. So, there is a need to develop products with high quality, low cost, meeting various global standards and regulatory requirements, and faster development cycle time. It is important to ensure reliability in the development of products from the prototype stage to the production stage to ensure full functionality of the product before coming to customers.

### Synergies between NPD and customers

The process of NPD is founded on the customer requirements and with this, the organization is intended to achieve a different level of customer satisfaction known as customer delight. This helps in creating a reputation for excellence. The customer requirements comprise availability, delivery, reliability, maintainability, cost-effectiveness, aesthetic appearance, etc. The transformation of customer requirements into product specifications needs special care. It is also very important to involve suppliers of the organization in the transformational process.

### Synergies between NPD and Market

The NPD process begins from the market, and it involves a review of market needs in terms of unclear or unstated expectations or preconceived ideas in the mind of customers. Excellent communication between an organization, customer, and suppliers is the key to total quality management and thus can lead to a better NPD process.

### Synergies between NPD, Technologies, standards, and Innovation

There is a great affinity between product specifications and standardization. It is necessary to build the quality into the design specification. The choice of standards remains with the organization and the market into which the product is being launched. Also, an organization needs to strike out a balance between standardization and innovation.

## 1.1 Objectives

The above brief introduction presents a picture of new product development and its synergies in various scenarios. There are studies about factors responsible for the successful implementation of NPD along with the technologies that can boost the new product development but there is limited information about the NPD journey with the support of TQM or TPM. This paper explores the journey of NPD of an organization under the aegis of TQM and enumerates its impact on customer satisfaction.

## 2. Literature Review

The dynamic global economy is forcing the organizations to compete for their survival and the organizations are also not leaving any stone unturned to capture the needs of customers and turn these needs into a handsome fortune for them. In this way of transformation, many business excellence tools like TQM, TPM, Lean manufacturing, etc. play their vital role. With the opening of the Indian market for the global giants, the pressure on Indian industries to perform as per the desires of the customers has increased significantly. The Indian industry has taken this challenge very seriously and made some proud achievements in the field of achieving prestigious awards like Deming and TPM excellence awards. The profitability of an organization is regarded as one of the crucial parameters of financial performance and according to (Albuhisi & Abdallah, 2018) there exists a direct relationship between customers' requirements and the financial performance of an organization. The organizations capable of capturing the customer needs are found to be more successful in implementing quality initiatives in their market of interest (Uluskan et al., 2018). The market dominance of an organization can be correlated to cost management and it is the mantra for today's modern global economy for getting true gains as well as to sustain. Total Quality Management provides a holistic approach to achieving tangible benefits in the form of Quality, Cost, and Delivery. The competitive balance of quality, cost, and delivery through TQM can be realized with a cross-functional management theme (CFM) called new product development. Cost competitiveness in terms of cost of quality and Unit production cost are some essential performance measures that are greatly influenced by the implementation of a quality management system (Bhatia & Awasthi, 2018). TPM philosophy addresses the new product development through its DM pillar and this contributes towards the overall excellence of the organization (Gupta & Vardhan, 2016). Some Indian industries have tried the combination of TPM and TQM for their business excellence and found that both philosophies significantly influenced the process of new product development in the organization (Sahoo, 2018). For the success of new product development, it is a must to include the inputs about the supply chain at the early stages of product development for the early identification of associated risks (Goswami et al., 2021). The TQM philosophy considers the NPD as the subset of innovation and promotes its digitization (Marion & Fixson, 2021). The contribution of innovation and continuous improvement approach in an organization can be seen as a catalyst for the successful implementation of TQM and help in harnessing significant improvements in quality, productivity, cost, safety, and delivery (Sraun & Singh, 2017). It is must for an organization to address the uncertainty about the market and technological choices for success of new product development (Biazzo & Filippini, 2021). There is also a case study by authors (Silva & Moreira, 2021) on the involvement of suppliers in the process of new product development and it has been found that large scale industries do this to differentiate their products while the SMEs do to increase their efficiency.

It is a must for an organization to integrate the policies on Technology up-gradation and cost management with the organization's vision/mission for a competitive edge over its competitors (Kumar & Gupta, 2020, 2021). Industry 4.0 technologies provide greater integration of customer participation in the development of product design rather than the development of new processes (Naeem & Di Maria, 2021). Setting up aftermarket logistics is an important aspect of new product development and is a must for the avoidance of customer loss (Teresa & Chacko, 2021). In a study conducted on the steel industry, the authors (Dashtianeh et al., 2021) found that customer role is a top-ranked critical factor for new product development. In contrast to the idea of customer's voice behind the new product development, the authors (Barak & Bedianashvili, 2021) argues that the main motive forces behind the development of the new product are knowledge and creativity of the scientist and then the authors propose a methodology of systematic inventive thinking to develop new products. The role of environmental sustainability in the development of new products in the construction industry has increased to a greater extent for reducing the environmental impact of older and newly developed products (Bigolin et al., 2021). Entrepreneurial orientation and customer relationship management are found to have a direct impact on new product development through customer participation (Zonoozi & Ghahremanpour, 2021). Also, it has been found that open innovation practices and new product development directly influence the business performance of automotive organizations (Pinzón-Castro et al., 2021). The relationship between customer involvement and new product performance is found to be affected by technological newness and market newness (Chen et al., 2021). The contribution of TPM and TQM can be seen in terms of benefits to the operational performance of the plant, thus reducing the cost of quality in terms of reduced scrap and reduced defective products (Ahuja & Khamba, 2008; Kaur et al., 2012; Modgil & Sharma, 2016; Singh & Ahuja, 2015).

## About the organization

The organization is the subsidiary of a multinational company operating in key areas crucial to the development of India's infrastructure and economy. Its business includes manufacturing of engineering products, construction, Infrastructure Projects as well as Technology and Financial Services. This Indian Multinational organization posted INR 1200 billion in revenue in FY 2018. The current subsidiary is a pioneer in electrical & automation. It operates in the switchgear industry. The organization maintained a commendable position in the market due to its strong customer value propositions including an in-depth understanding of specific needs of Indian customers, wide reach and strong channel network, and strong service support.

## Challenges

Indian government's decision of opening market for overseas organizations posed a competitive business environment. The organization adopted the TQM framework for getting it prepared to face stiff competition. It followed an organization-wide transformation on the foundation of total employee participation, structured problem-solving techniques, and waste elimination. The organization has formulated its management strategies and objectives as per the dynamic needs of the environment.

## Need of New product development

With changing business scenario and increasing competition from the world's leading brand entering the Indian market since 81% of organization business comes from products manufactured, manufacturing excellence was the only tool for being competitive in terms of cost, delivery, and operational efficiency. Since most of the products were designed in-house by the NPD team, there was a demand for the new product development on lines of competitive quality levels. So, the organization decided to embrace the TQM approach for handling its new product development issues. The strategic objective of NPD is to develop and maintain a portfolio of products and solutions that enable the business to grow its share in the identified markets. The mentioned strategic objective helps the organization to excel in the following areas

- i. Long-term sustainability in business by planning the future technologies and products.
- ii. Customer-centric designing and development of products and solutions with competitive quality, cost, and at right time.
- iii. Development of environment-friendly products and solutions.

## New Product Development: a TQM way of excellence

Cross-functional management (CFM) being an integral aspect of TQM is mainly responsible for organization-wide quality control. The organization considered NPD as a cross-functional management theme that will develop the products based on the customer needs. The NPD team works in conjunction with the other departments of the organization like Marketing & Sales, Design, Engineering, Sourcing, Quality, and Tooling. It was desired that it will cater to business, contributing to revenue growth and profitability along with long-term business sustenance.

### 1.2 NPD Process

The NPD process flow is shown in Figure 1, the NPD process begins with the product planning phase beginning with the market and technical analysis.

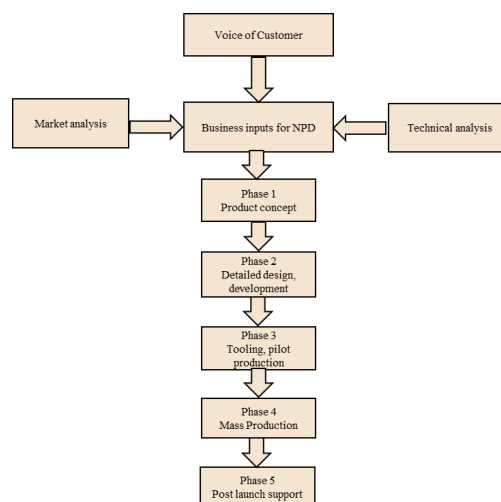


Figure 1: NPD process flow

Based on previous analysis and the voice of the customer draft specification of the product is prepared. After favorable evaluation of the technical feasibility, strategic alignment with business, and financial benefits for the development, the product gets into the development phase. The product development is carried out in 5 phases and these development phases are reviewed after each stage using six gates. Any new project needs to be approved at check 1. Once approved the project is adapted for further development.

### 1.2.1 Market analysis

The organization planned to take inputs from the market to drive out information competitor study, gap analysis for the products offered by the competitor. The organization also interacted with the suppliers for gap analysis. The organization also planned to take an initial snapshot in terms of customer response about its new product ideas by launching exhibitions and fairs.

### 1.2.2 Technology analysis

The organization planned the technological analysis by conducting technological benchmarking, standardizing, and IPR tracking. This analysis helped utilize the latest technologies and can prevent getting future lawsuits due to IPR infringement. This analysis also provides a way forward for the organization to either develop a new technology or borrow it from others.

### 1.2.3 Voice of Customer

The organization considered the voice of the customer as a major input component for the process of NPD. This involves a survey from the current customers and suppliers of the organization for new features, present issues. As an example, the following Table 1 presents various challenges in the process of new product development and the initiatives taken along the lines of TQM.

Table 1: List of initiatives on the lines of TQM carried out for NPD

Key Challenges in NPD	Initiatives
Cost competitive and technology competitive product	<ol style="list-style-type: none"> <li>1. Use of computer-based simulation to reduce the cost of actual testing, prototype building.</li> <li>2. Identification of areas of cost reduction, performance improvement.</li> <li>3. Benchmarking and testing of products.</li> <li>4. Improvement/development of process to meet the standards.</li> </ol>
Integration of customer needs with organizational policy	<ol style="list-style-type: none"> <li>1. Customer-centered product management</li> <li>2. QFD for benchmarking the needs of the customer</li> <li>3. Gathering of input from end-users</li> </ol>
To improve NPD effectiveness in terms of product success in the market.	<ol style="list-style-type: none"> <li>1. Measuring the NPD performance using KPIs</li> <li>2. Validation of product</li> <li>3. Product design verification</li> <li>4. Pre-release design validation</li> <li>5. Redefining the process FMEA process</li> </ol>
Use of IT in NPD	<ol style="list-style-type: none"> <li>1. Implementation of SAP for paperless job</li> <li>2. Creation of knowledge base</li> </ol>
Policy Management	<ol style="list-style-type: none"> <li>1. Use of balanced scorecard for policymaking</li> <li>2. Use of Daily work management</li> </ol>

### Benefits of carrying out NPD

The NPD process thrives on the relationship of the organization, suppliers, and customers. Being a cross-functional management (CFM) activity is centered around the customers. This CFM theme involves the members from the quality assurance (QA), cost management (CM), supply chain (SC), Marketing and Sales, etc. All these members work together for the attainment of customer satisfaction. Carrying out the NPD along the lines of TQM offers certain benefits to the customers which are then translated back as the organization's achievements. The following points enumerate the benefits of NPD.

### 1.3 Improved Know your customer policy

A well-established NPD process involves multidirectional communications with its old as well as new probable customers. Such communications are the key success factors for products development projects. These interactions help in the early encapsulation of product configuration at the initial stages of the NPD process. The know your customer policy becomes the foundation of customer-oriented marketing.

### 1.4 Improved customer-oriented marketing

The value of customer-oriented product configuration can be seen in the marketing strategy of the firm. Being a committed process binds together both customers and suppliers. NPD's value creation strategy promotes the organization to invest its assets to build the relationship characterized by commitment and a long-term perspective. The level of customer involvement will help in improvising the firm's marketing strategy.

### 1.5 Product differentiation for a varied customer base

NPD offers a holistic way of creating product differentiation. The objective of having product differentiation is to gain a better financial position in the market. Differentiation refers to offering something different to the customers as compared to what the competitors are offering. The information for creating differentiation can be gathered from market research and customer interaction. Customer interaction offers more flexibility when compared with the traditional market research approach in accessing the customer requirements. This fine-grained information and knowledge from customers are very valuable for NPD processes for developing products as per customer preferences.

### 1.6 Improved brand image for establishing customer loyalty

Involving customers in the NPD process helps in creating a sense of belongingness in the customers which not only improves the brand image but also generates loyal customers. This sets highly desired and valuable market positions, resulting in a profitable situation.

## Results

The organization's new product development process shown in Figure 1 shows that it is centered around the customers' requirements, market analysis, and technical analysis. For a customer, product quality, cost, and delivery are the indices that measure the market performance of a new product of an organization. The implementation of TQM in the organization in 2011 is supported by strategically restructuring the new product development process of the organization. These changes resulted in the following improvements in the organization.

### 1.7 New product intensity is improved by 14.3%

With the help of structured NPD, the organization has registered a growth of 14.3% in launching new products in the markets. The organization conducted surveys with the customers to capture their requirements and with suppliers to forecast technical capabilities.

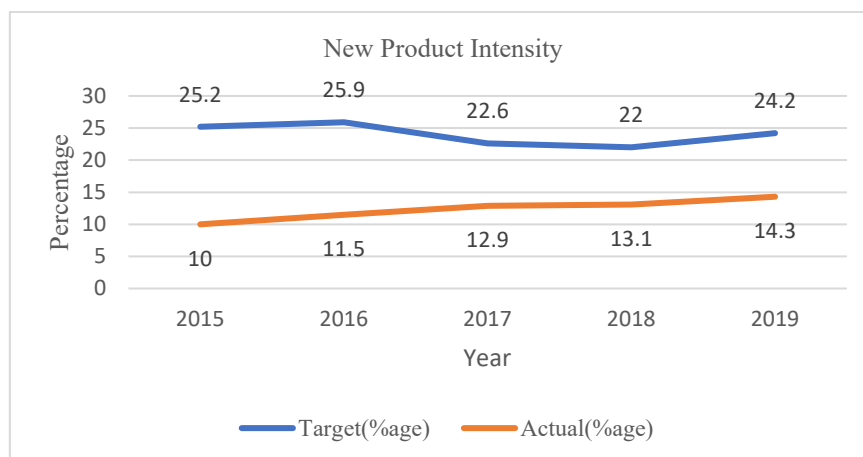


Figure 2: New Product Intensity

**1.8 Customer satisfaction score is increased to 86%**

The organization started the process of gathering the information about the issues/problems that customers were facing in their already launched products and they addressed those issues by launching a new version of the same product and by giving technical support to resolve issues in the older version. This helped the organization in improving the customer satisfaction score to 86% as shown in Figure 3.

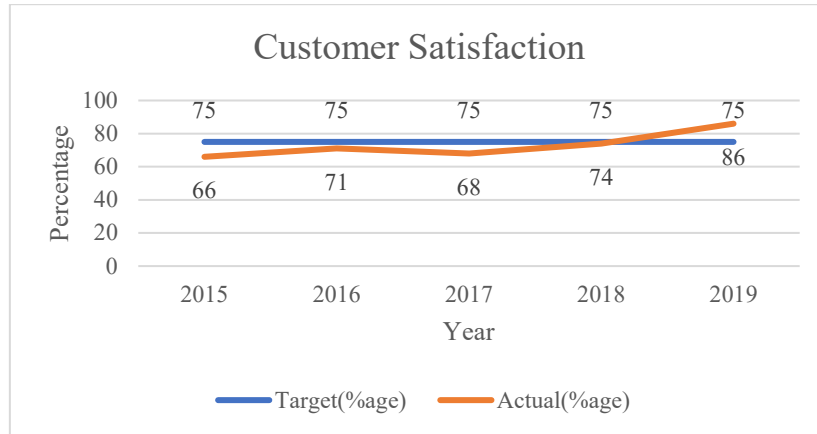


Figure 3: Customer Satisfaction

**1.9 Implementation of QC stories is improved by 155%**

The information on issues/problems and future requirements opened a way for making the improvements. The organization handled these issues using quality circle stories. This resulted in an incredible increase of 155% in the implementation of QC stories in the organization as shown in Figure 4.

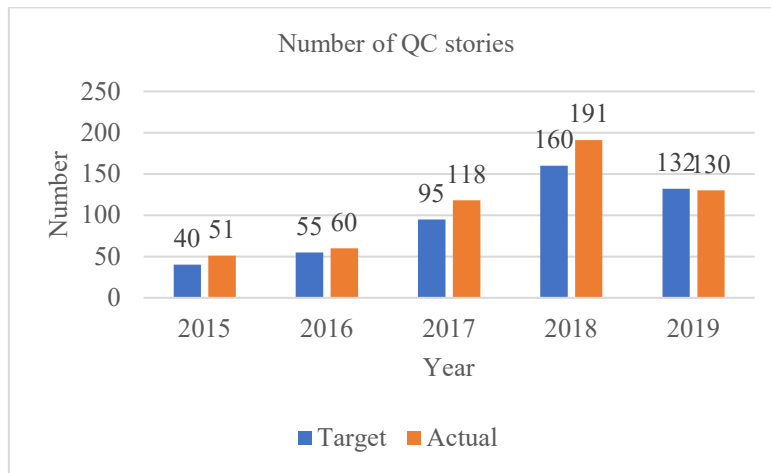


Figure 4: QC stories

**1.10 Employee participation has been increased to 99%**

The TQM being founded on total employee involvement created a participative culture in the organization. The increase in the number of QC stories done by the employees is one of the indicators of employee participation. Figure 5 shows the improvements in the employee participation as a result of NPD and TQM.

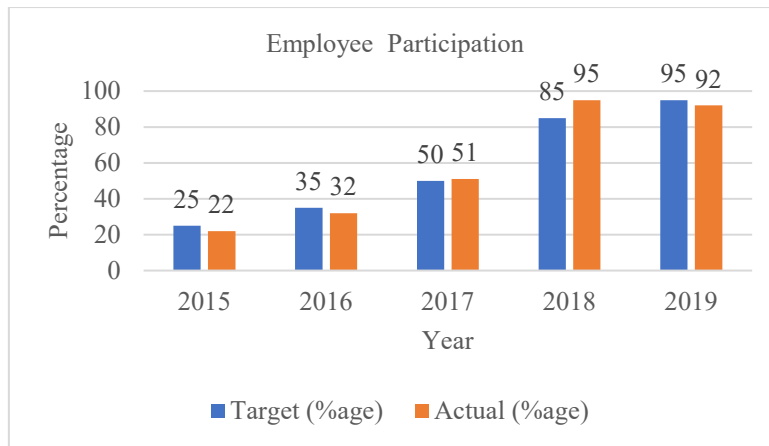


Figure 5: Employee Participation

### 1.11 Market share has been increased to 22% from 10%

The NPD resulted in the launching of products having USPs like reliability in performance, safety in operation, user friendly, and ease of maintenance. These USPs helped in the increase in the market share of the organization from 10% to 22% as shown in Figure 6.

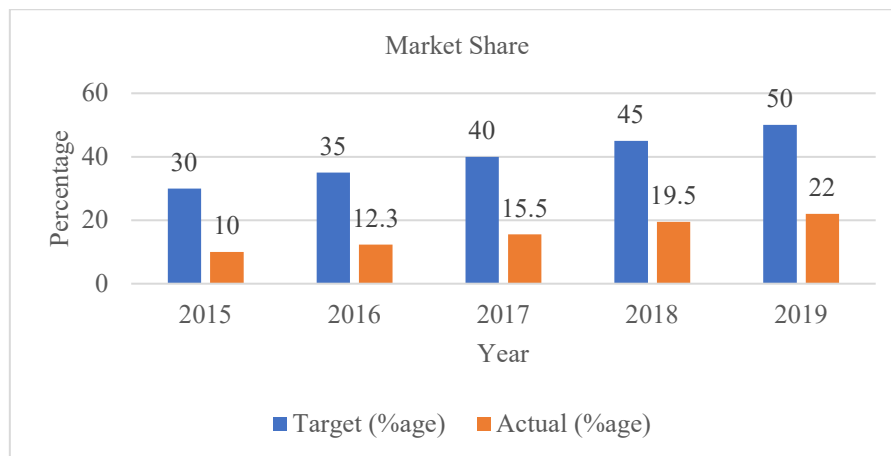


Figure 6: Market Share

## Conclusion

This paper presents a case study on the role played by New Product Development which is one of the most important elements of TQM for improving organizational performance in a Deming awarded Indian industry. The major contributors in NPD were the customer requirement, suppliers' capabilities, market analysis, and technical analysis. Both suppliers and customers helped in the generation of initial product configuration. The NPD was focused on developing products that are reliable in performance, safety in operation, user-friendly, and ease of maintenance. So, a 5-stage new product development process accompanied by six check gates was adopted. These gates were designed to address every possible issue after every stage that can delay or fail the product. The study also reveals that the NPD increased the new product intensity, customer satisfaction, and market share of the organization which is tangible benefits to the organization. The study also reports that the interacting factors as reported by various researchers in the literature review are consistent with this study.

### Limitations of case study

This case study is conducted on a single organization so the results may not be generic so for the generalization more organizations should be considered. Also, the NPD maybe not be as structured as this in small, medium enterprises.

### Future scope

This case study pertains to an organization that has adopted TQM as its business excellence tool but some organizations are smaller in size and cannot afford the implementation of TQM and the supporting factors of the NPD may behave differently or they might be altogether different. So for getting a real picture more such industries should be taken for preparing the case study.

### Conflict of interest

The authors declare that there is no conflict of interest.

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