

2. New product development

In business and engineering, new product development (NPD) is the complete process of bringing a new product to market. A product is a set of benefits offered for exchange and can be tangible (that is, something physical you can touch) or intangible (like a service, experience, or belief). There are two parallel paths involved in the NPD process: one involves the idea generation, product design and detail engineering; the other involves market research and marketing analysis. Companies typically see new product development as the first stage in generating and commercializing new product within the overall strategic process of product life cycle management used to maintain or grow their market share.

2.1 The eight stages

1. Idea Generation is often called the "NPD" of the NPD process. Ideas for new products can be obtained from basic research using a SWOT analysis (Strengths, Weaknesses, Opportunities & Threats). Market and consumer trends, company's R&D department, competitors, focus groups, employees, salespeople, corporate spies, trade shows, or ethnographic discovery methods (searching for user patterns and habits) may also be used to get an insight into new product lines or product features.

Lots of ideas are generated about the new product. Out of these ideas many are implemented. The ideas are generated in many forms. Many reasons are responsible for generation of an idea.

Idea Generation or Brainstorming of new product, service, or store concepts - idea generation techniques can begin when you have done your OPPORTUNITY ANALYSIS to support your ideas in the Idea Screening Phase (shown in the next development step).

2. Idea Screening The object is to eliminate unsound concepts prior to devoting resources to them.

The screeners should ask several questions: Will the customer in the target market benefit from the product?

What is the size and growth forecasts of the market segment / target market?

What is the current or expected competitive pressure for the product idea?

What are the industry sales and market trends the product idea is based on?

Is it technically feasible to manufacture the product?

Will the product be profitable when manufactured and delivered to the customer at the target price?

3. Concept Development and Testing Develop the marketing and engineering details Investigate intellectual property issues and search patent databases

Who is the target market and who is the decision maker in the purchasing process?

What product features must the product incorporate?

What benefits will the product provide?

How will consumers react to the product?

How will the product be produced most cost effectively?

Prove feasibility through virtual computer aided rendering and rapid prototyping

What will it cost to produce it?

Testing the Concept by asking a number of prospective customers what they think of the idea – usually via Choice Modelling.

4. Business Analysis Estimate likely selling price based upon competition and customer feedback

Estimate sales volume based upon size of market and such tools as the Four-Woodlock equation

Estimate profitability and break-even point

5. Beta Testing and Market Testing Produce a physical prototype or mock-up

Test the product (and its packaging) in typical usage situations

Conduct focus group customer interviews or introduce at trade show

Make adjustments where necessary

Produce an initial run of the product and sell it in a test market area to determine customer acceptance.

6. Technical Implementation New program initiation

Finalize Quality management system

Resource estimation

Requirement publication

Publish technical communications such as data sheets

Engineering operations planning

Department scheduling

Supplier collaboration

Logistics plan

Resource plan publication

Program review and monitoring

Contingencies - what-if planning

7. Commercialization (often considered post-NPD) Launch the product

Produce and place advertisements and other promotions

Fill the distribution pipeline with product

Critical path analysis is most useful at this stage

8. New Product Pricing Impact of new product on the entire product portfolio

Value Analysis (internal & external)

Competition and alternative competitive technologies

Differing value segments (price, value and need)

Product Costs (fixed & variable)

Forecast of unit volumes, revenue, and profit

These steps may be iterated as needed. Some steps may be eliminated. To reduce the time that the NPD process takes, many companies are completing several steps at the same time (referred to as concurrent engineering or time to market). Most industry leaders see new product development as a proactive process where resources are allocated to identify market changes and seize upon new product opportunities before they occur (in contrast to a reactive strategy in which nothing is done until problems occur or the competitor introduces an innovation). Many industry leaders see new product development as an ongoing process (referred to as continuous development) in which the entire organization is always looking for opportunities.

For the more innovative products indicated on the diagram above, great amounts of uncertainty and change may exist which makes it difficult or impossible to plan the complete project before starting it. In this case, a more flexible approach may be advisable.

Because the NPD process typically requires both engineering and marketing expertise, cross-functional teams are a common way of organizing projects. The team is responsible for all aspects of the project, from initial idea generation to final commercialization, and they usually report to senior management (often to a vice president or Program Manager). In those industries where products are technically complex, development research is typically expensive and product life cycles are relatively short, strategic alliances among several organizations helps to spread the costs, provide access to a wider skill set and speeds up the overall process.

Also, notice that because both engineering and marketing expertise are usually critical to the process, choosing an appropriate blend of the two is important. Observe (for example, by looking at the See also or References sections below) that this article is slanted more toward the marketing side. For more of an engineering slant, see the Ulrich and Eppinger, Ullman references below.

People respond to new products in different ways. The adoption of a new technology can be analyzed using a variety of diffusion theories such as the Diffusion of Innovations theory.

A new product pricing process is important to reduce risk and increase confidence in the pricing and marketing decisions to be made. Bernstein and Macias describe an integrated process that breaks down the complex task of new product pricing into manageable elements.

The Path to Developing Successful New Products points out three key processes that can play critical role in product development: Talk to the customer; Nurture a project culture; Keep it focused.

2.2 Fuzzy Front End

The Fuzzy Front End is the messy "getting ended" period of new product engineering development processes. It is in the front end where the organization formulates a concept of the product to be developed and decides whether or not to invest resources in the further development of an idea. It is the phase between first consideration of an opportunity and when it is judged ready to enter the structured development process (Kim and Wilemon, 2007; Koen et al., 2001). It includes all activities from the search for new opportunities through the formation of a germ of an idea to the development of a precise concept. The Fuzzy Front End ends when an organization approves and begins formal development of the concept.

Although the Fuzzy Front End may not be an expensive part of product development, it can consume 50% of development time (see Chapter 3 of the Smith and Reinertsen reference below), and it is where major commitments are typically made involving time, money, and the product's nature, thus setting the course for the entire project and final end product. Consequently, this phase should be considered as an essential part of development rather than something that happens "before development," and its cycle time should be included in the total development cycle time.

Koen et al. (2001, pp. 47–51) distinguish five different front-end elements (not necessarily in a particular order):

1. Opportunity Identification

2.Opportunity Analysis

3.Idea Genesis

4.Idea Selection

5.Concept and Technology Development

The first element is the opportunity identification. In this element, large or incremental business and technological chances are identified in a more or less structured way. Using the guidelines established here, resources will eventually be allocated to new projects.... which then lead to a structured NPPD (New Product & Process Development) strategy.

The second element is the opportunity analysis. It is done to translate the identified opportunities into implications for the business and technology specific context of the company. Here extensive efforts may be made to align ideas to target customer groups and do market studies and/or technical trials and research.

The third element is the idea genesis, which is described as evolutionary and iterative process progressing from birth to maturation of the opportunity into a tangible idea. The process of the idea genesis can be made internally or come from outside inputs, e.g. a supplier offering a new material/technology or from a customer with an unusual request.

The fourth element is the idea selection. Its purpose is to choose whether to pursue an idea by analyzing its potential business value.

The fifth element is the concept and technology development. During this part of the front-end, the business case is developed based on estimates of the total available market, customer needs, investment requirements, competition analysis and project uncertainty. Some organizations consider this to be the first stage of the NPPD process (i.e., Stage 0).

The Fuzzy Front End is also described in literature as "Front End of Innovation", "Phase 0", "Stage 0" or "Pre-Project-Activities".

A universally acceptable definition for Fuzzy Front End or a dominant framework has not been developed so far. In a glossary of PDMA, it is mentioned that the

Fuzzy Front End generally consists of three tasks: strategic planning, concept generation, and, especially, pre-technical evaluation. These activities are often chaotic, unpredictable, and unstructured. In comparison, the subsequent new product development process is typically structured, predictable, and formal. The term Fuzzy Front End was first popularized by Smith and Reinertsen (1991). R.G. Cooper (1988) describes the early stages of NPPD as a four step process in which ideas are generated (I), subjected to a preliminary technical and market assessment (II) and merged to coherent product concepts (III) which are finally judged for their fit with existing product strategies and portfolios (IV). In a more recent paper, Cooper and Edgett (2008) affirm that vital predevelopment activities include:

1. Preliminary market assessment
2. Technical assessment
3. Source-of-supply-assessment: suppliers and partners or alliances
4. Market research: market size and segmentation analysis, VoC (voice of the customer) research
5. Product concept testing
6. Value-to-the customer assessment
7. Product definition
8. Business and financial analysis

These activities yield vital information to make a Go/No-Go to Development decision.

In one of the most earliest studies using the case study method, Khurana and Rosenthal defined the front-end to include the interrelated activities of:

- product strategy formulation and communication
- opportunity identification and assessment
- idea generation

-product definition

-project planning

-executive reviews

Economical analysis, benchmarking of competitive products and modeling and prototyping are also important activities during the front-end activities.

-The outcomes of FFE are the

-mission statement

-customer needs

-details of the selected concept

product definition and specifications

-economic analysis of the product

-the development schedule

-project staffing and the budget

-a business plan aligned with corporate strategy

In a paper by Husig, Kohn and Huskela (2005) a conceptual model of Front-End Process was proposed which includes early Phases of Innovation Process. This model is structured in three phases and three gates:

Phase 1: Environmental screening or opportunity identification stage in which external changes will be analysed and translated into potential business opportunities.

Phase 2: Preliminary definition of an idea or concept.

Phase 3: Detailed product, project or concept definition, and Business planning.

The gates are:

-Opportunity screening

-Idea evaluation

-Go/No-Go for development

The final gate leads to a dedicated new product development project. Many professionals and academics consider that the general features of Fuzzy Front End (fuzziness, ambiguity, and uncertainty) make it difficult to see the FFE as a structured process, but rather as a set of interdependent activities (e.g. Kim and Wilemon, 2002). However, Husig et al., 2005 argue that front-end not need to be fuzzy, but can be handled in a structured manner. In fact Carbone showed that when using the front end success factors in an integrated process, product success is increased. Peter Koen argues that in the FFE for incremental, platform and radical projects, three separate strategies and processes are typically involved. The traditional Stage Gate (TM) process was designed for incremental product development, namely for a single product. The FFE for developing a new platform must start out with a strategic vision of where the company wants to develop products and this will lead to a family of products. Projects for breakthrough products start out with a similar strategic vision, but are associated with technologies which require new discoveries.

It is worth mentioning what incremental, platform and breakthrough products are.

Incremental products are considered to be cost reductions, improvements to existing product lines, additions to existing platforms and repositioning of existing products introduced in markets.

Breakthrough products are new to the company or new to the world and offer a 5-10 times or greater improvement in performance combined with a 30-50% or greater reduction in costs.

Platform products establish a basic architecture for a next generation product or process and are substantially larger in scope and resources than incremental projects.

2.3 NPD organizations

-Product Development and Management Association (PDMA)

-Association of International Product Marketing & Management

-ISPIM (The International Society for Professional Innovation Management)

-Society of Concurrent Product Development (SCPD)

2.4 NPD strategies

-Design for six sigma

-Flexible product development

-Quality function deployment

-Phase-gate model

-User-centered design