The Importance of a New Product Development (NPD) process: Getting Started.

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Abstract

In order to achieve a successful new product, and certainly the successful implementation of a new product into a company, it is necessary to have a structured and documented approach to New Product Development (NPD), therefore providing a clear roadmap for the development of new products. This review highlights the NPD process, from concept to consumer, and what the key success drivers are, such as; the quest for real product superiority and success, and the need for cross-functional teams; in order for a company to succeed and use new products as a source for competitive advantage.

1. Introduction

Intense global competition, rapid technology change and shifting patterns of world market opportunities compel companies to continually invest in NPD; if not for profit, then for survival, and this is considered to be the key to success (Cooper & Kleinschmidt, 1988, 1991, 1995a; Schmidt, 1995). The advance of New products and their development is widely recognised as an important source of competitive advantage (Thomas, 1995). However, despite the importance of NPD, for both the present and future prosperity of companies, a high percentage of new products fail when released into the market. Research (Liberatore & Stylianou, 1995; Twigg, 1998) demonstrates that most new idea concepts fail to become commercial successes, without the aid of a structured process.

Subsequently, formal NPD processes have had a positive impact on the way that some companies' new product programmes are managed and controlled (Cooper, 1999). Therefore, new products, if properly managed, can offer a substantial injection in growth that cannot usually be managed by existing products.

2. Risk of failure

As the risks of failure inherent in every new product situation vary, so too do the returns. The balance of investments, risk and returns is a major criterion in deciding whether or not to proceed with a new product (Kuczmarski, 1992). As new product forecasting techniques (e.g. M^{c}Kinsey Seven S Framework, Balanced Scorecard) can be expensive, both in time and money, careful consideration needs to be assigned before taking them on board (Whitworth, 1998).

Gruenwald (1995) demonstrates numerically in table 1 how the consequence of success and failure, affects new products over a five-year period (1988-1993). It can be seen that half of the companies surveyed had achieved success, with at least two-thirds of the major new

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products marketed over the last five years. However, the other half reported such success with less than two thirds of their new products. As a result these median values for new product success were the same for manufacturers selling to either industrial or consumer markets. Therefore the success rate reported by each company represents the percentage of all major new products introduced to

Successful New Products	Percentage of Companies Selling primarily to Industrial Markets	Percentage of Companies Selling Primarily to Consumer Markets
100%	9	18
90 to 99%	7	4
80 to 89%	16	9
70 to 70%	11	11
60 to 69%	16	12
50 to 59%	15	15
40 to 49%	4	2
30 to 39%	9	9
1 to 29 %	5	4
0%	8	16
Total	**100**	**100**

Table 1. Success rates for major new products over a five year period (Gruenwald, 1995).

the market by the company during the previous five years. Complete success or complete failure is more common among manufacturers catering to consumer markets than amongst those servicing industrial markets (Gruenwald, 1995). Companies situated at either end of these extremes, which will include, to an above average extent a number that launched only relatively few major new products (Gruenwald, 1995). Subsequently, it can be understood, that a company which sends to market only one or two major new items over a period of time is perhaps either exceptionally cautious or exceptionally short in new product innovation experience. Moreover, the low number of products at risk increases the chances of total success and/or failure. This study covers new products that companies have actually introduced into the market.

Acknowledging that virtually every new product will inevitably carry some sort of risk does not, however, prevent attempts to reduce such a risk to a minimum. Experience gained from past NPD failures can lead the NPD team into hurrying the process, and as a result does not allow the team to perform as one (Rosenthal & Tatikonda, 1993). This is understandable as NPD does absorb both financial and human resources from a company, with no real guarantee of clear cut winners (Cooper, 1999).

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3. The Need for Structured NPD Processes

With shorter life cycles and the demand for greater product variety, continual pressure is put on NPD teams to produce a wider and varying portfolio of new product opportunities and to manage the risks associated with progressing these through from initial development to eventual launch. Subsequently in simple terms to minimise the risk of failure. In order to deal with this both effectively and efficiently attention has been focussed on systematic screening, monitoring and progression frameworks such as Cooper's stage gate approach (Cooper, 1988, 1994). Most of these ideas are not in themselves new; for example, Lawrence and Lorsch (1967) drew attention to cross-functional team working and co-ordination mechanisms back in the 1960s, and Cooper (1994) has reported on NASA's 'phased review process' as a stage gate model also dating back to the same period.

However, despite the importance of NPD, for both present and future prosperity of companies, a high percentage of new products fail when released into the market. Research (Liberatore & Stylianou, 1995) demonstrates that most of the concepts that enter the NPD process fail to become commercial successes; in fact only fourteen percent (14%) succeed. As new product failure rates are so high, and because the costs associated with NPD are usually high, companies have been hesitant to provide the resources to advance the NPD process (Cooper, 1998). Conversely, it can be argued that there is now a growing consensus about integrating the varying tools and techniques available in the 'new model of good practice'. Table 2 lists some of the key features of the emergent model.

Subject	**Characteristics**
Systematic process for progressing new products.	Stage-Gate Model. Close monitoring & Evaluation at each stage.
Early involvement of all relevant functions.	Bring key perspectives into the process early enough to influence design and prepare for downstream problems. Early detection of problems leads to less rework.
Overlapping/Parallel Working.	Concurrent or simultaneous engineering to aid faster development whilst retaining cross-functional involvement.
Appropriate project management structures.	Choice of structure – e.g. matrix/line/project/heavyweight project management – to suit conditions and task.
Cross-Functional team working	Involvement of different perspectives, use of team-building approaches to ensure effective team working and develop capabilities in flexible problem solving.
Advanced support tools	Use of tools – such as CAD, rapid prototyping, computer-supported co-operative work aids (e.g. Lotus Notes) – to assist with quality and speed of development.
Learning and Continuous Improvement.	Carrying forward lessons learned, via post-project audits etc. Development of continuous improvement culture.

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Table 2*. Key Features of the 'new model of good practice' model in NPD.

{*Table based on Cooper, 1994; Crawford, 1991; Johne & Snelson, 1988; Lilien & Yoon, 1989; Mahajan & Wind, 1992; Maidique & Zirger, 1985; Rothwell, 1992; Smith & Reinertsen, 1991; Thomas, 1993; Wheelwright & Clark, 1992.}

Therefore, if properly managed new products can offer a substantial injection in growth which cannot usually be matched by existing products (Griffin, 1997). As a result it is important that companies do not adopt a 'Not Invented Here' (NIH) syndrome.

4. Measuring the Success

It is understood that new product success cannot be measured in absolute terms. It should be defined and interpreted according to realistic goals and objectives that reflect the specific new product situation. The study of new product success (and failure) has been a preoccupation of academic researchers for several years. The various studies have used different measures to report back from a wide range of industrial and market segments, subsequently drawing valid comparisons and conclusions is difficult. As a result, it is difficult to decide on common factors which lead to new product success, but it is possible to draw two fundamental points from the various studies undertaken, these being:

1. New Product Success is highly situational
2. No one factor can be clearly defined for New Product Success.

NPD success is highly situational and there are few actions that can be taken in order to assure NPD success. Therefore, companies developing new products must carefully analyse their own situation, and recognise the multiple factors that may determine success.

4.1 Cornerstones of Success

Identifying new product success factors has become an extremely topical area of discussion for both academics and industrialists alike. Questioning what discriminates between success and failure and the reasoning behind the factors has become important, and in some cases vital, in order to grasp a better understanding of the development of new products (Twigg, 1998).

Research by Cooper and Kleinschmidt, (1995b) illustrated in figure 1, demonstrates the three cornerstones of NPD success; Process, Strategy and Resources.

The three critical success factors were found to be the drivers of new product performance at the business unit level. This research study considered ten different performance measures (Cooper & Kleinschmidt, 1995b) and they have been summarised into the following points:

- Having a product innovation strategy for the business that ties product development to the company strategy, that identifies areas of focus for product development, that has a longer term drive, and finally that is clearly enunciated to all in the company, is likely to lead the company towards success.

- Adequate spending and resources is another factor that can contribute to company NPD success, by having the necessary people and R&D spending in place.
- Finally, possibly the most important of the three is having a high quality new product process to guide product innovations from idea to launch. Of the three it is the least appreciated, but can have the biggest impact on the company's NPD performance.

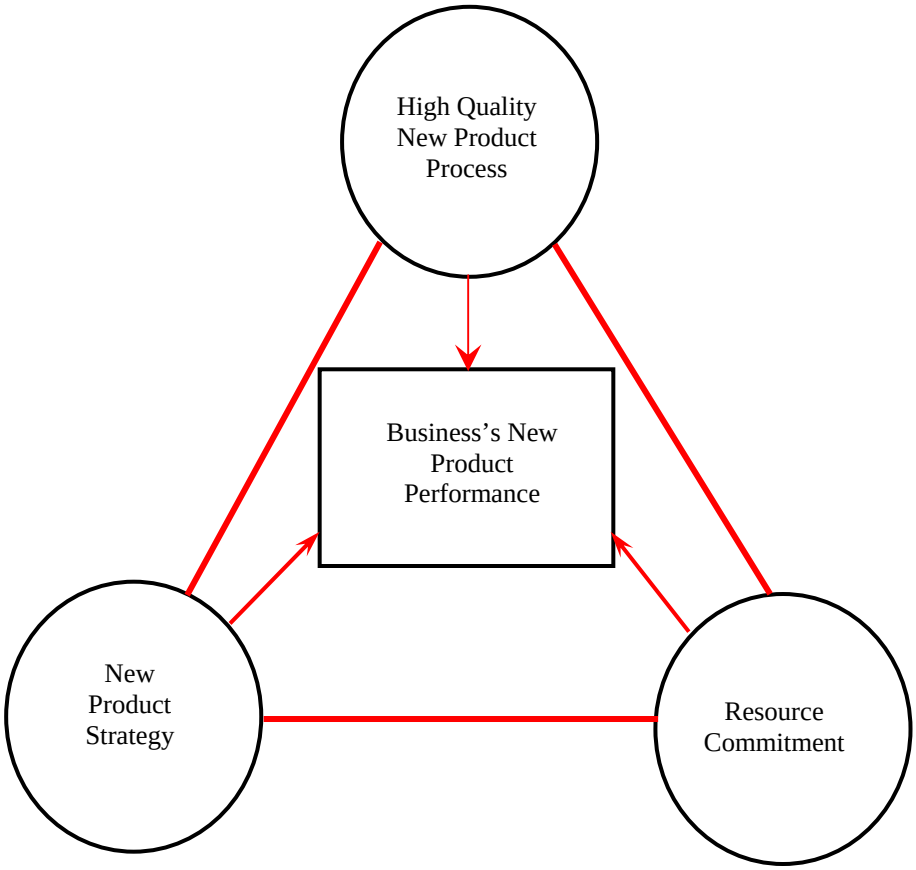

Figure 1. The New Product performance triangle and the three cornerstones of performance (Cooper & Kleinschmidt 1995b).

There are no hard and fast rules to defining the contents of a critical list of factors which might aid NPD success, only an integration and balance of best practices and tools which are essential ingredients of the process (Cooper et al, 1998).

5. Time Management of the NPD Process

What are the best drivers of time efficiency? There are many drivers that can be considered which can consist of attributes such as the forming of cross-functional teams and having that team working both effectively and efficiently, doing the homework upfront and determining what the customer really does want and the quality of execution of the new product process. In a study carried out by Cooper & Kleinschmidt, (1994), ten drivers of time efficiency of the NPD process were considered to be of importance and were found to reduce the overall introduction time of a new product across the varying case studies undertaken. These drivers with a summarised view of their description are given in table 2.

Driver.	Description.
Project Organisation.	Projects organised as a cross-function, dedicated, accountable project team, with a strong empowered leader and with senior/top management support are more time efficient.
Early, sharp product definition.	Projects where the project was clearly defined and agreed to prior to the development phase are found to move to market more quickly.
Up-front homework.	Projects where solid, thorough and reliable research was done, are found to give fewer problems down the NPD process.
Strong market orientation.	Projects that are market-orientated and customer focused, and build the customer into the process from start to finish, have been found to progress more quickly.
A strong launch.	Good advertising and promotion with product availability are key ways in moving the product to the market more quickly.
Technical Proficiency.	The undertaking of technological/technical activities in a quality fashion leads to cycle time reduction.
Synergy.	This is the ability to leverage the company's in house or existing technology, production, and marketing skills and resources to advantage, with regard to improving timeliness.
Familiarity.	Projects that are more familiar to the company in respect of product type, markets and technologies also means improved timeliness.
Market attractiveness.	Products aimed at attractive markets with fast growing and economic climates will feature a better cycle time.
Market Competitiveness.	Markets characterised by many competitors, intense aggressive competition and easily switched customers will see more rapid product developments.

Table 2. Ten drivers of time efficiency of the NPD process (Cooper & Kleinschmidt, 1994).

6. Assembling a NPD Team

Assembling the appropriate team and having that team working effectively together is essential (Urban et al, 1987). Depending upon the experience of the individual company this may be an easy, or conversely, complex situation to implement (Olthuis, 1997). Procedures need to be introduced which will encourage team participation throughout the NPD process. Rapid prototyping, incremental NPD, process modelling, electronic mail (E-mail) and video presentations are a few techniques that can be used to enhance both product and process

visibility. Hence, using these tools greatly simplifies the challenge of maintaining effective communications within the whole work environment. Therefore, keeping commodities in view ensures that information about the NPD effort is constantly under observation (Bessant & Caffyn, 1997). Likewise, making effective decisions quickly is vital to the success of the NPD process. It is also important that just about everyone contributing to the process knows how to make a swift, accurate decision or knows how to get them made. Technique and the adaptation of technique within a particular environment is the base for decision making success (Edstrom, 1998).

Attempting to create a new product with a pool of talent that is inadequately prepared, or lacks the skills needed to apply the knowledge they possess effectively, is an exercise in futility (Cooper, 1999). In summary, the authors believe that within an NPD team the following need to exist; adaptability, creativity motivation, competitiveness and initiative.

7. Developing a NPD Process

The sequential NPD process as shown in figure 2 is the most basic and traditional approach to NPD. In this process, once each stage has been completed the information gained is passed onto the next function in the process. However, the fundamental problem with the traditional approach to NPD is that the information flows sequentially from department to department, and forms a problematic 'over the wall'

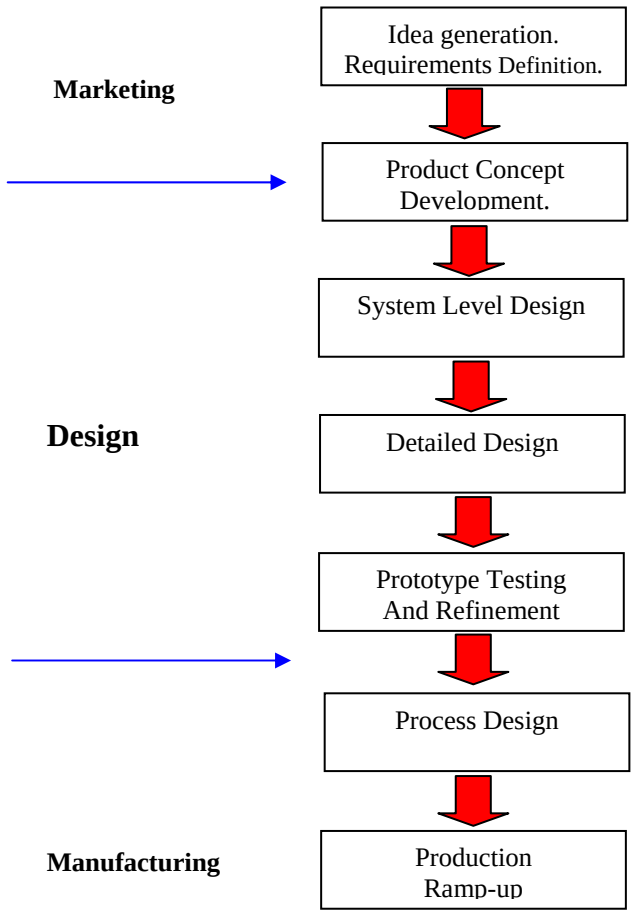

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Figure 2. Sequential NPD process. (Ulrich & Eppinger, 1995; Russell & Taylor, 1995)

style development, as demonstrated in figure 3. This both increased the time from product concept to product launch and increased the number of formally documented engineering changes late in the process. Both these problems delay the time to break-even and the start of making profit. Also implicit in the term 'over the wall' engineering is a complete lack of team working and understanding of other department's problems, which can result in late, over-expensive and poor quality products.

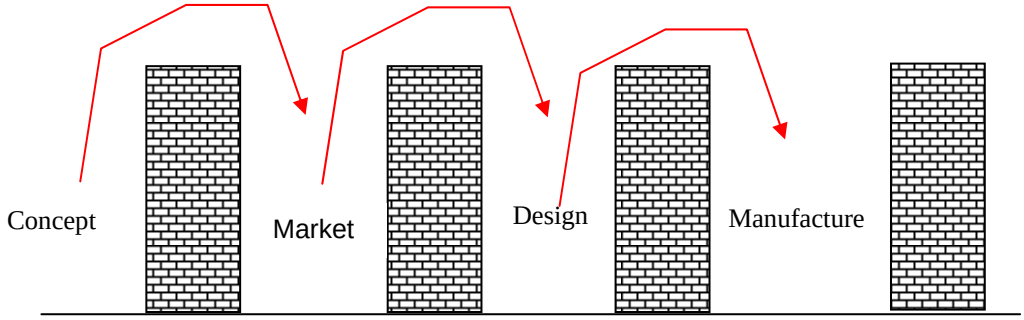

Figure 3. Typical 'Over-the-Wall' engineering approach.

The effect of these late changes to the product is compounded, as it takes longer to evaluate each change the further down the development process it is (Rush & Hansen, 1998). Consequently, it is often too late to action a large proportion of the proposed changes due to the excessive costs of these late changes. Quite often and where appropriate these changes are designed out on a next generation new model (Cooper et al, 1998). Table 3 demonstrates how the cost of change increases as the design progresses. The example used is the electronics industry, but the increase of cost will follow a similar pattern for other high tech industries.

Stage	Relative Cost (£)
Concept.	1
Detail design.	10
Tooling.	100
Testing.	1000
Post-release.	10000

Table 3. The increasing cost of design changes in the electronics industry (Olthuis, 1997).

The predictable result of a sequential NPD process with a large number of late changes is that the development budget is exceeded and the product cost is too expensive to make an acceptable profit (Cooper, 1993). As a result, most cost reductions are often too late to be

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cost effectively implemented at this stage as most of the product's budgets have already been consumed.

One such method and a significant improvement on the traditional NPD approach is the stage-gate approach (Cooper, 1993). Figure 4 demonstrates a conceptual and operational model for moving a NPD project from idea to launch.

The stage-gate system breaks the NPD project into discrete identifiable stages, five such stages being illustrated. This number can be increased or decreased to suit the NPD team, it can be seen that there are no individual R&D or Marketing stages, instead these are incorporated into stages 1,2 and 3. Each stage is designed to gather the information required to progress the project to the next gate. Each stage consists of a set of parallel activities undertaken by personnel from different functional areas within a company, but working together as a team. In order to manage risk via a stage-gate scheme, the parallel activities within a stage must be designed to gather vital information, so as to drive out technical and business uncertainties (Cooper, 1998).

It can be perceived that each stage costs more than the preceding one, so that the fundamental plan is an incremental commitment to the project. In order to speed products to market, stages can overlap each other. Long lead- time activities can be brought forward from one stage to an earlier one; projects can proceed into the next stage, even though the previous stage has not been totally completed; and the stages can be collapsed and combined to suit each individual project.

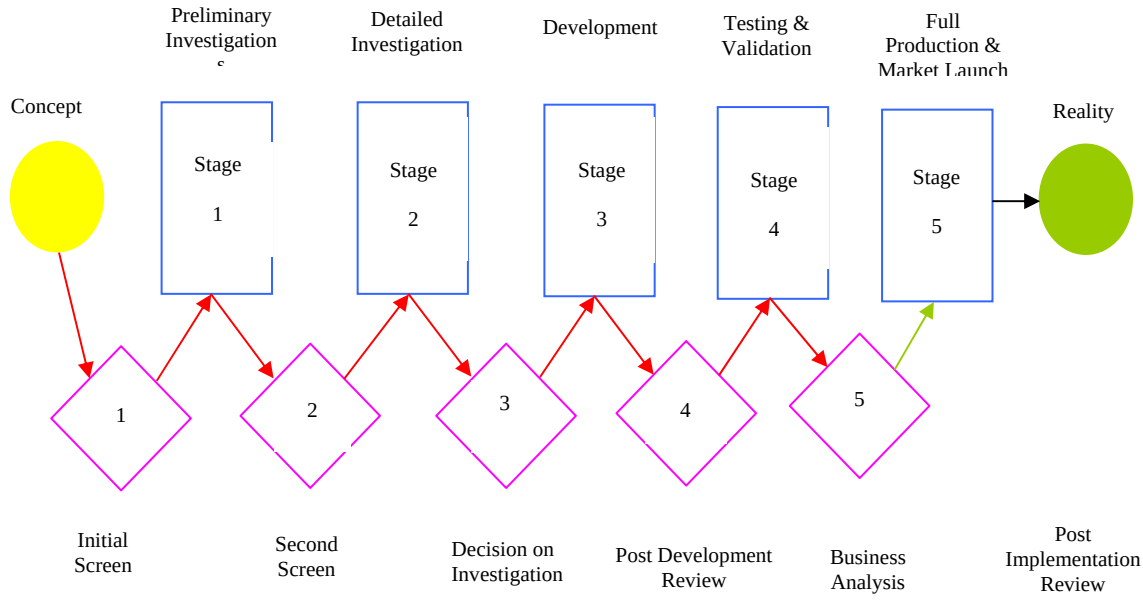

Figure 4. Overview of a typical Stage-Gate NPD process. (Cooper, 1993)

8. Discussion

The long-term survival of a business hinges upon its ability to successfully introduce new products into the market place. These new products and their successful development can be

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the lifeblood of a company. These new products provide the ability for the company to grow and produce profitable returns. Also new products can gain new markets and market shares and subsequently help to defend against competitive pressures. Regularly establishing new products can potentially provide satisfaction to the continually changing customer needs and requirements.

However, the question that is still being asked by many companies who are already on, or want to join the NPD train, is what makes a new product successful? Much research has been done in attempting to answer this question. One of the earlier studies in this area established that most new products are market driven. Hence this is one trend that has remained the same over the years, i.e. it is vital to really 'listen to the customer' giving them something that they really want.

Subsequently, more and more companies are looking into how to drive their new product from concept to consumer, both quickly and with fewer mistakes. This will prove critical, especially in the latter stages of development. As there is no one easy answer on how to do this, it is therefore necessary for them to establish what is required in order to get started. This paper has discussed the importance of having a structured NPD process, this in effect can be termed as a roadmap which can aid towards achieving new product success. Also it highlights the significance of success and failure, establishing what they both are and how they can be measured in terms of NPD.

In conclusion, we discuss the basic, but vitally important issues that a company should adhere to when in their infancy of NPD. The quest for successful innovation is continuous. The implementation of a NPD process however, will not solve every problem in the development process, but it will go a long way to introducing a commonsense structure that will assist somewhat in establishing success. Companies that fail to adopt these basic concepts could soon find themselves in decline facing survival pressures rather than the demands of growth.

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