Product Development Management and Funding

Source Book

Ahmad Gaber

Professor of Chemical Engineering
Faculty of Engineering, Cairo University
& President, Chemonics Egypt
Consulting Group

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Annex 1: Glossary

Acronyms:

APD   **Accelerated Product Development**

BU   **Business Unit**

COPC   **Customer Oriented Product Conceptualization**

HRM   **Human Resource Management**

NPD   **New Product Development**

NPM   **New Product Management**

PD   **Product Development**

PDM   **Product Development Management**

QFD   **Quality Function Deployment**

R&D   **Research and Development**

ROI   **Return on Investment**

1. Introduction

The key to development within organizations lies in obtaining a clear understanding of global industrial development. Faced with increasing competition, intense diversification, improved technology, growing labour competence, and expanding markets worldwide, it is imperative that organizations remain determined to sustain their competitive advantage.

In the past, it was proven that mass production provided exceptional effectiveness within organizations activities. It initiated high growth rates and expansion throughout global economies. However, the structure of demand began to change, while labour forces were rebelling within social markets. As a consequence, organizations concluded that although the objective of flexible production was an appropriate response to the challenge of new competition this could not be achieved through the current form of production. Instead, a new transition to industrial organization was required. This transition termed mass customization provides for large-scale production while satisfying customer requirements for increased product quality and diversity. Mass customization is characterized by: [1]

- Product heterogeneity, innovation and enhanced levels of product quality without sacrificing price competitiveness.
- The use of flexible machinery involving automation technologies.
- The introduction of new forms of work organization involving team working, delayering of managerial hierarchies.
- The search for economies of scope rather than economies of scale.
- The pursuit of systemic optimization in efficiency, involving teams of workers, inter-linked plants and collaboration between firms in the same sector.

This new era hence resulted in the growing need for organizations to re-coordinate the managerial activities already existent. Attention was concentrated on the new field of improving new product development. Sustaining a stable and predictable PD environment requires adoption of a revitalized product development management (PDM) methodology. PDM is an innovative and straightforward approach that instills an integrated and disciplined methodology to facilitate the implementation of the new product development paradigm.

New product management (NPM) has thus become an increasingly important matter in the field of product development. Organizations are beginning to focus on addressing management awareness along with increasing the involvement of employees throughout the PD process. This new field involves integrating factors such as creating and sustaining core multifunctional teams, selecting appropriate project leaders, developing and applying tools and methods to the new PD process, as well as educating and improving the organization's innovation capabilities. These responsibilities all fall under the scope of the new product manager.

Through indicating the magnitude and vitality of NPM to project success hence organizational development, we present this thorough source book effectively composed to highlight the various views presented in the field of PD.

Section 2 discusses the reasons as well as the benefits achieved resulting from the growing need for NPM throughout organizations.

This is followed by section 3 which entails the scope of new PD management as well as the key issues and management tasks that have arisen in this field.

Section 4 addresses the important issue of the PD management team. This is a critical element dictating the success of new PD, thus the section covers all aspects from the team to the leader to their approach to their implementation.

In section 5, we address the approaches and tools utilized by new PD managers in implementing the product development process. It is imperative to understand the importance and magnitude of this section, in order to portray that NPM is not a haphazard, unsystematic process but a detailed, organized procedure.

Section 6 discusses the process of managing the funding for new product development projects. This section addresses several aspects including the proper methods for implementing a successful funding system, selecting proper projects for funding, delegating funding authority to experienced and reliable sources as well as managing the amounts required for funding.

Finally, section 7 introduces the art of innovation to NPM. It is essential to present the impact of innovation on the success of new products, processes and overall organizational efficiency. The data provided throughout this source book was carefully selected and compiled from numerous, reliable sources.

2. The Need for New Product Management

Products are the key elements in which organizations focus and revolve all their activities around. Often, they are considered as the core of organizational development and progress. In order to appreciate the totalitarian impact of products on organizations, it is imperative that we present their essence through the two separate aspects; external and internal factors. The reason behind this being that any organization, striving for success, needs to thoroughly understand and regard these elements as influential factors affecting organizational progress and development.

The most effective procedure for organizations to view the magnitude of this issue is to present the position of products through two distinct avenues. The first is to consider the product as an external element to be introduced to markets through the organization's activities. This enables us to perceive the product as simply one necessary component among several influencing the overall performance of the organization.

These components such as competition, environment, markets, profit potential and prospects each reflect an impact on the overall success of organizations, hence must be taken into consideration. Figure 2-1a illustrates these strategic aspects that are taken from an organization's overall external perspective. (2)
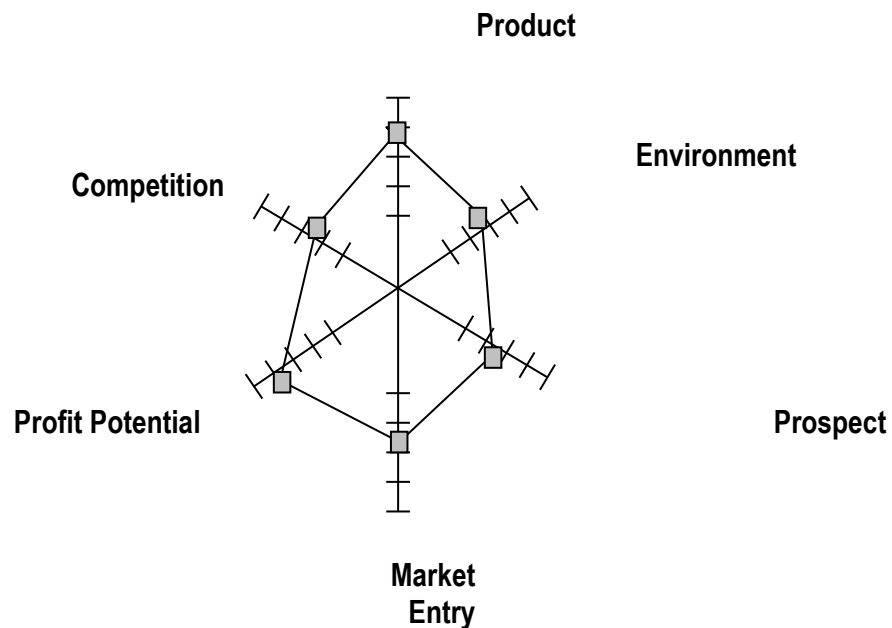

Figure 2-1a: Strategic Factors,
External Perspective of Organizations

Table 2.1a. further defines these factors and reflects their importance towards product development.

Table (2.1a): Description of the Six External Strategic Factors

Strategic factor 1: Product	Description
a- Product differentiation	Analysis of product differentiation in the market-place.
b- Product benefits	Analysis of the benefits provided.
c- Product complexity	Analysis of the complexities that will be involved when using or selling product.
d- Product obsolescence	Analysis of the likelihood of technological obsolescence of the product.
e- Implementation problems	Analysis of the degree of problems faced to the introduction of a new product.
Strategic factor 2: Environment	**Description**
a- Demographics	Analyzes market, geographic location, income and education.
b- Cultural changes	Analyzes extent to which culture supports penetration of the market.
c- Government actions	Analyzes extent to which government supports plans.
d- Technological change	Measures affect of technology on actions.
Strategic factor 3: Prospect	**Description**
a- Decision time	Analyzes the length of the typical prospect decision cycle.
b- Product acceptance	Analyzes the probability that the market-place favors the acquisition in substantial volume.
c- Price vs. benefits	Analyzes the probability that a prospect will pay a higher price if more benefits are offered.
d- Pricing sensitivity	Price is the major deciding factor in the decision to purchase product.
e- Shopping characteristics	Analyzes the propensity of the buyer to exert energy prior to making the decision.
f- Market penetration potential	Analyzes the potential for rapid penetration of the primary market served.
Strategic factor 4: Market entry	**Description**
a- Development team	Analysis of the strength and viability of the PD team.
b- Operating costs	Analysis of engineering designs, materials, facility and manufacturing personnel.
c- Distribution methods	Analysis of methods to distribute product.
d- Marketing and sales	These are analyzed for strengths and current activities.
e- Experience factors	Analysis of experience vs. competition
f- Start up problems	Analysis of problems while penetrating the market.
g- Infrastructure	Analysis of potential difficulties to insufficient infrastructure.
Strategic factor 5: Profit potential	**Description**
a- Competitive retaliation	Analysis of whether competitors will retaliate when product is introduced.
b- Competitive opposition	Analysis of degree of competition.
c- Substitute products	Analysis of the probability the product will encounter alternative products in market.
d- Buyer's bargaining power	Analysis of the position of the prospect in the buying negotiation process.
e- Supplier's bargaining power	Analysis of ability to establish reasonable purchase prices with suppliers.
f- Staying power	Analysis of ability to sustain competitive advantage.
g- Freedom of action	Analysis of degree of independent control available.
Strategic factor 6: Competition	**Description**
a- Strength of competitors	Analyses indicate the degree of competitors have considerable experience and are in a strong position to market the products.

The second avenue for organizations to view the product is internally. This means to study the product as one of the several internal components present within the interior context of the organization. This presents organizations with the realization that the product and its development are indeed essential elements, yet they are not the only components contributing to overall success. Other components including the enterprise itself, marketing/sales, customer services, and production all play extensive roles in attaining organizational development. Figure 2-1b. presents these internal factors with Table 2.1b further describing each component in detail.
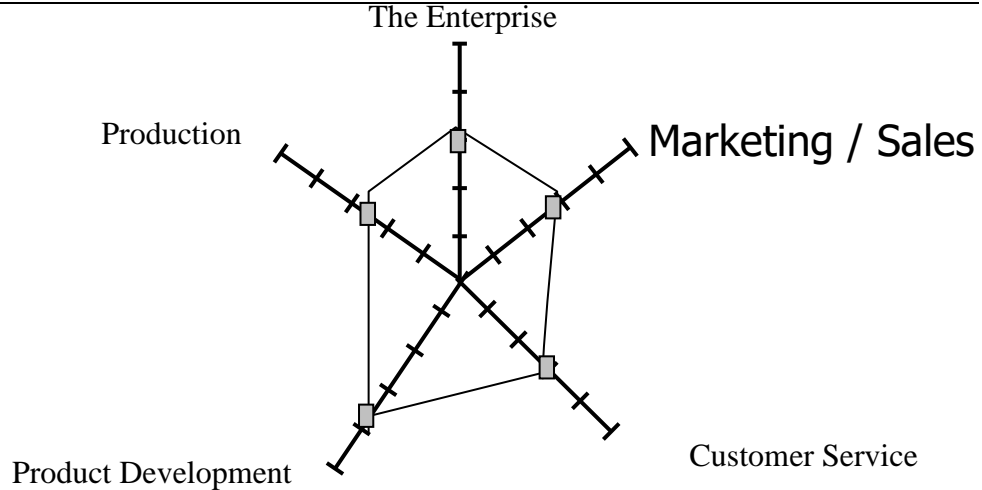
Figure 2-1b: Internal Factors

Table 2.1b. presents the internal factors discussed above and presents the analyses of each component in detail.

Table 2.1b: Description of the Internal Factors

Internal Factor 1: Enterprise		Description
a-	Management team	Analysis of management teams experience and compatibility with the tasks at hand.
b-	Enterprise image	Analysis of market image of the company.
c-	Cost competitive product	Analysis of company's ability to achieve a competitive advantage based on cost leadership.
d-	Industry leader potential	Analyzes the company's ability to become an industry leader by creating the best product in the market.
e-	Staying power	Analysis of company's ability to sustain its competitive advantage.
f-	Infrastructure	Analysis of potential difficulties that may arise due to insufficient infrastructure.
g-	Competitive market entry	Analysis of company's ability to construct barriers to prevent entry of competitors.
h-	Legal considerations	Analysis of legal factors that must be considered, including patents, trademarks.
Internal Factor 2: Marketing/Sales		**Description**
a-	Distribution	Analysis of the strength of the distribution capability.
b-	Pricing	Analysis of product pricing logic.
c-	Advertising	Analysis of viability of your advertising efforts, considering experience, budget etc.
d-	Sales promotion	Analysis of the effectiveness of your sales promotion efforts.
Internal Factor 3: Customer Service		**Description**
a-	Service manager	Analysis of the experience and suitability for the job of customer service manager.
b-	Current customer service	Estimate of the extent to which needed service facilities are established for the product.
c-	Service uniqueness	Estimate of the view of the product service organization from the prospect traits.
Internal Factor 4: Product Development		**Description**
a-	Development manager	Analysis of the experience and suitability for the task of development manager.
b-	Product specifications	Analysis of whether specifications can satisfy market demand and allow cost effective manufacturing.
c-	Resources	Analysis of the development programs are needed for equipment and financing.
d-	Personnel	Analysis of whether the PD personnel have the necessary skills to do quality work and are motivated to achieve objectives.
Internal Factor 5: Production		**Description**
a-	Production manager	Analysis of the experience and suitability for the job of production manager.
b-	Material/production facilities	Analysis of the engineering design for use of materials, and adequacy of facilities.
c-	Quality control	Analysis of ability to ensure high quality of produced products.
d-	Production experience	Analysis of experience vs. competitors plus the ability to differentiate product.
e-	Experience benefits	Analysis of ability to benefit from your knowledge to apply technology in the production process.

2.1. The Need for NPM:

The starting point in addressing the need for new product management is the realization that the process of new product development is exceedingly difficult. Most of the decisions are made with far less information than desired. Hundreds of individuals are involved in the creation of a single product. Almost all are from individual departments (sales, engineering, manufacturing) where they each may have their own agenda. The complexity of multifunctional operations and decisions is a characteristic of new product development. New product managers must comprehend the complexity and become increasingly knowledgeable in order to sustain successful PD projects.

An additional factor reflecting the urgent need for new product management is that companies need to introduce more new products, react faster to market and technology changes and develop superior products in order be competitive. The changes taking place in product development are significant enough to achieve a real competitive advantage and is sustainable through continual improvement. These opportunities stem from redefining the underlying process using new management concepts.

2.2 The Outcome of Applying Effective NPM:

For most companies, improving the new product management will strengthen the PD processes within the organization and will have a greater strategic impact than any other improvement they can achieve. They will grow at a quicker rate, react to opportunities and threats faster than their competitors, improve productivity and increase efficiencies in other operational areas as well. Faster time to market is the most visible improvement and is a result of the improved PD process. These benefits can be viewed as strategically significant and include the following:

2.2.1 Increased Revenue:

In most companies, significant improvements in new product management can fuel revenue growth, at least until competitors catch up by improving their own PD processes. Alternatively, if competitors are able to improve their PD processes first, the company may see a decline in revenue. Higher new product revenue comes from
- increased product life cycle revenue
- increased market penetration
- success in time sensitive markets
- producing more successful products

2.2.2 Improved PD productivity:

PD productivity is not attained by working staff harder. Motivating developers to work excessively only temporarily increases capacity and can reduce overall effectiveness. Rather, increased PD productivity is derived from
- shorter development cycle times
- less development waste
- better resource utilization
- ability to attract and retain skillful technical staff.
- improvements in manufacturing

2.2.3 Operational efficiencies:

Improving new product management can achieve operational benefits, especially in manufacturing and service, by designing a product to make operations easier or more efficient. More predictable product completion dates also improve the efficiency and effectiveness of the product launch. Increased operational efficiency can also be derived from
- Design for manufacturability, service ability etc.…
- Higher quality products
- Lower engineering change order costs
- Improved predictability of launch

2.3 Reasons why Companies Haven't Already Achieved these Benefits:

Despite the significant benefits that arise, some companies have not yet made measurable improvements to their new product management procedures. This is for several reasons:
1. PD has not been viewed, managed or taught as a process.
2. The necessary concepts and techniques have only recently been developed.
3. The improvement usually requires a cultural change.
4. Cross-functional changes are difficult to make from within.
5. Changes are too extensive.
6. Some companies mistakenly perceive they have it already accomplished.

2.4 Summary:

Dramatic progressions are required in new product management hence altering the competitive balance of industries for the following reasons:
- An improved PD can increase revenue by increasing product life cycle revenues, improving market penetration, enabling success in time sensitive markets and creating more successful products.
- An improved NPM can increase productivity by shortening development cycle times, reducing wasted development, improving resource utilization and attracting technical talent.
- Improves other operational efficiencies by incorporating the design for manufaturability, encouraging higher quality products and improving the predictability of release.
- Achieved together, the benefits of an improved PD can establish a significant competitive advantage.

3. The Scope of New Product Management

New product management is a combination of art and science. It is regarded partly as an art because art is essentially based on boundless intuition, experience or premonition. Therefore, when managers lack the experience or information to make a reasoned decision, they must go with what they feel is right. New PD is regarded as a science as a result of the several new techniques and approaches applied and implemented within all aspects of the field, including the team selection, process implementation, funding issues and so on. Tools such as conjoint analysis, financial sensitivity testing, activity planning are all methodologies that have been studied and successfully addressed within this field hence emphasizing the scientific oriented element of PD.

When attempting to determine the scope of the new product project, PD managers apply three main tests that are critical in new PD:
- The concept test - to determine if the intended user really needs the proposed item.
- The product use test - to see if the item developed actually meets that need.
- The market test - to see if an effective market plan was established**.**

3.1 Definition of a New Product:

In order to establish a clear comprehension of the scope of new product management, it is imperative to first define what it is we are trying to manage. Several definitions of new products are listed below:
a) New to the world products: these are products that are inventions.
b) New category entries: these are products that take a firm into a sector new to it, yet not new to the world.
c) Additions to product lines: these are products that are line extensions in the firm's current markets.
d) Product improvements: these are current products made better.
e) Re-positionings: these are products that are re-targeted for a new use or application.

Variations not commonly accepted as new products include those items that are new to a country, a new channel of distribution, packaging improvements, and different resources or methods of manufacture.

3.2 The Key Issues for Managing a New Product Program:

There are several issues that should be considered and emphasized by managers of new PD projects. They include the following:
- Strategies approved by top management
- Specific capabilities required for organizing PD
- Opportunity identification and mission statement
- Continuous stakeholder involvement

- Active corporate support
- Project management by leader, core team and overall company support
- Level of commitment to unique, superior products
- The acceptance of the triple stream process
- Pre-technical product definition
- Marketing requirements
- Tracking launch through to success
- Continuous new product process evolution

3.3 The conflicting matters of NPM:

Today, new product management should be essentially addressed as a result of the increasing demands made by customers. Currently managers are ordered to serve up products that have:
- Valuable attributes to meet the end user's needs.
- High manufacturing and design quality.
- Low competitive costs.
- Introduced to the market in a short time.

NPM are responsible for allocating resources as efficiently as possible amongst four main aspects, as illustrated below in figure 3-1. (3)
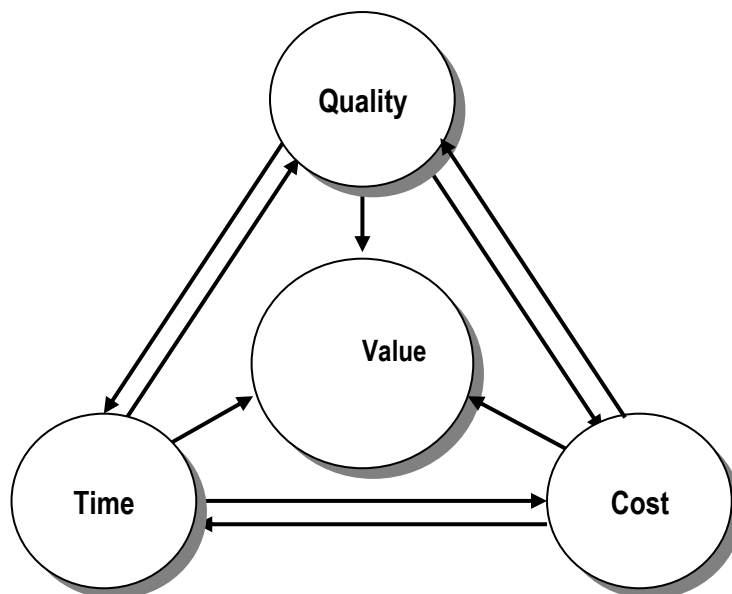
Figure 3-1: The Conflicting Matters of

- The new PD must respond to the three unique inputs - the right quality product, at the right time and at the right cost.
- The three inputs tend to conflict with each other although they are associated.
- The three inputs contribute to the value of new products, but in different ways and in different amounts from project to project.

- The goal of new product managers is mainly to discover a technique in which it is possible to optimize the set of relationships in each new product situation.

The expanding scope of NPM within organizations has resulted in the increasing importance of diversifying and developing the responsibilities of management tasks. This multi-task approach has resulted from the growing awareness that has occurred amongst organizations in defining the scope of NPM. Figure 3-2 represents these tasks and annex 1 presents the term definitions. (4)

Process

Problem – based ideation

Cross – functional teams

Reengineering

Information technology Networking

Metrics
Kaizen

Colocation

Empowerment

Stage gates

Concept assurance

Product requirements QFD

Activity-based accounting

Concurrent Simultaneous Parallel

Conflicting functions
Productivity of the process

Continuous customer Improvement

Success as a goal

Launch control

Design

Focus

Alliances
Fuzzy front end

Benchmarking

Facilitator

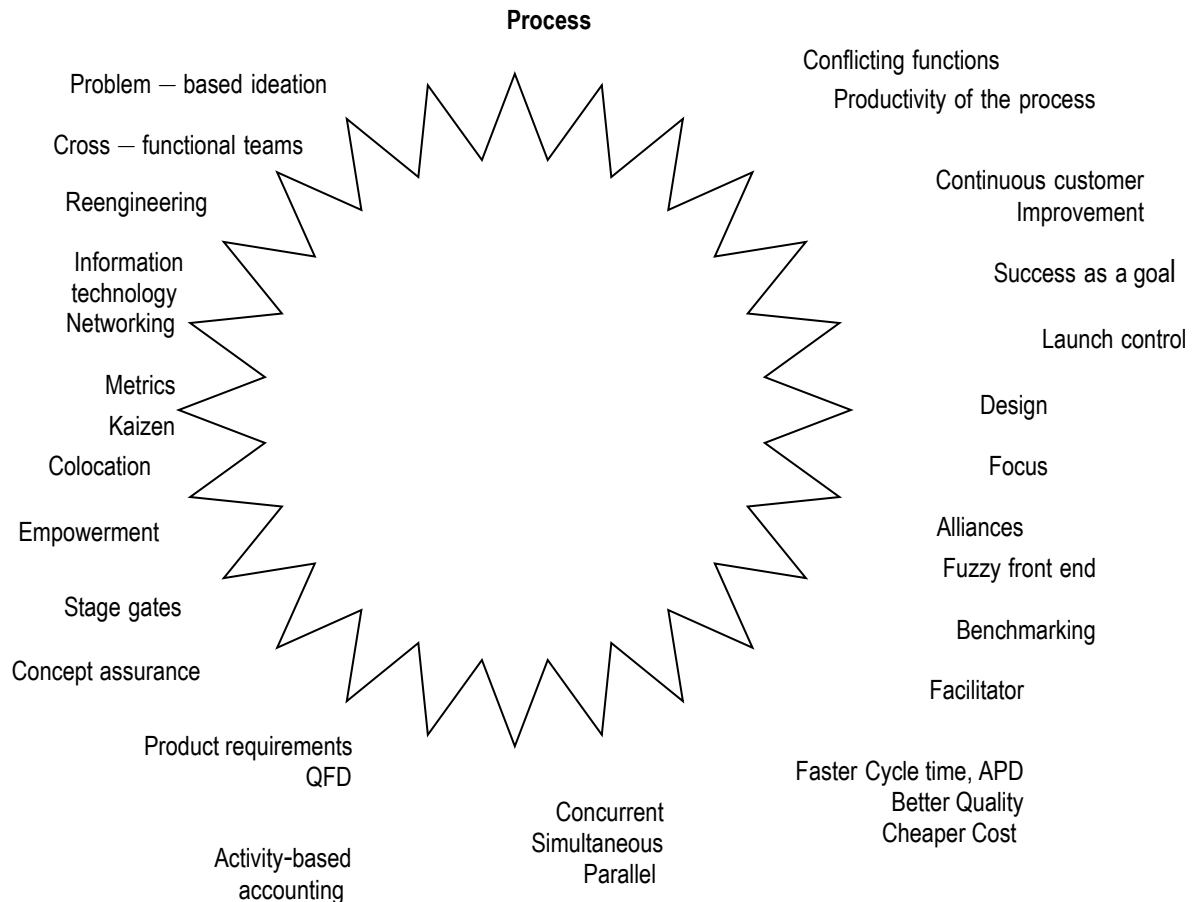Faster Cycle time, APD
Better Quality
Cheaper Cost

Figure 3-2: Common PD Terminology for NPM Tasks

3.4 Summary

New product management is an expanding field in the realm of business and must be regarded with sincere consideration and dedication by organizations. This ongoing growth has diversified as well as extended the tasks and responsibilities of management hence, it is imperative to increase the awareness of managers to this new scope in order for them to effectively address and implement its processes.

4. The New Product Management Team

New products are developed through the coordination efforts of many individuals who apply different skills and work together on the thousands of tasks needed to create a new product. To cooperate successfully, it is imperative to coordinate activities, communicate what they are doing, and collectively make decisions. These are the primary characteristics of successful teams. An effective project team organization is necessary to make this happen. Although project organization is one of the most essential elements of PD, few companies have implemented a consistently effective approach to it.

4.1 Functional Organization Approach:

Under this approach, each department within the company contributes to the PD process in a serial fashion. The development cycle starts with marketing's requirements for the product. These requirements are then handed to engineering to prepare specifications and begin designing the product. Manufacturing then builds prototypes and pilot units, and sales next fills up the distribution pipeline. Finally, customer service gets involved to support initial sales and handle customer applications.
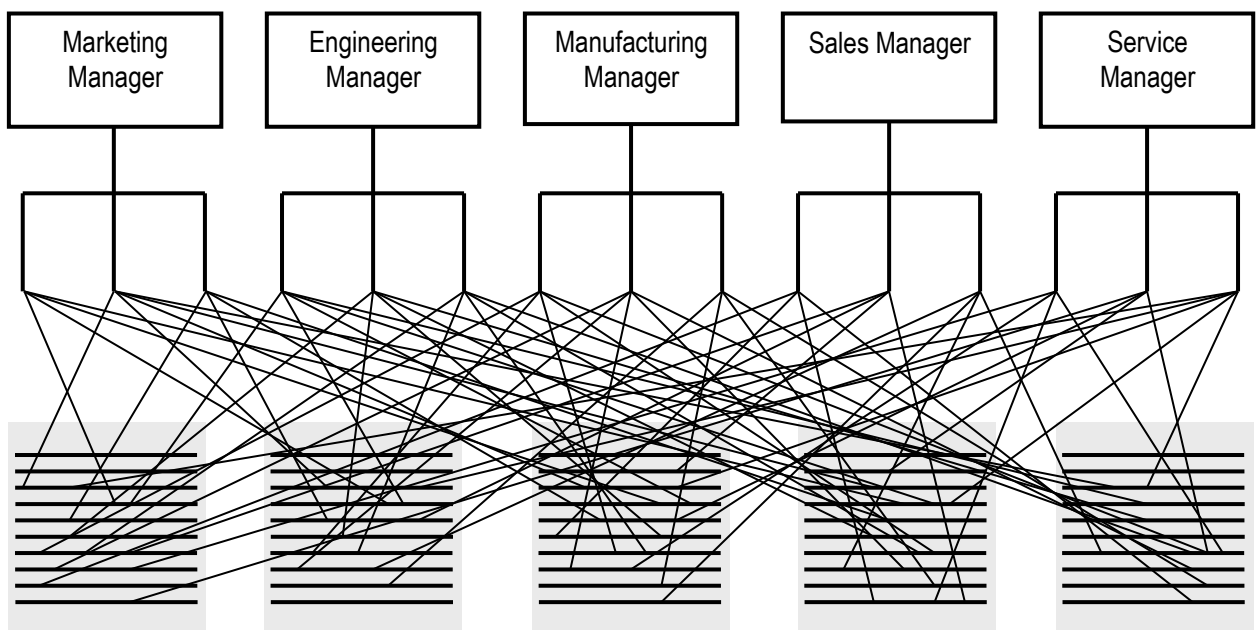

**Figure 4-1: Functional organization, showing
the interfunctional communication tangle.**

Figure (4-1) illustrates the confusing communication tangle of the functional organizational approach.(5) This approach has evidently been proven ineffective, complex and time consuming as information must move horizontally across the various functions as well as vertically through many levels in the organization. The number of communication paths quickly increases thus adding to total cycle time.

4.2 Core Team Approach:

This is regarded as a superior method of organizing, directing and managing project teams. It is believed to be the best form of project organization for new PD. The team generally consists of individuals with different skills and a leader. It does not use the classical hierarchical approach to organization. All PD responsibilities are divided among the team members according to their skills. However, all team members are equal and no single function has more status than another, as depicted in figure (4-2). (6)
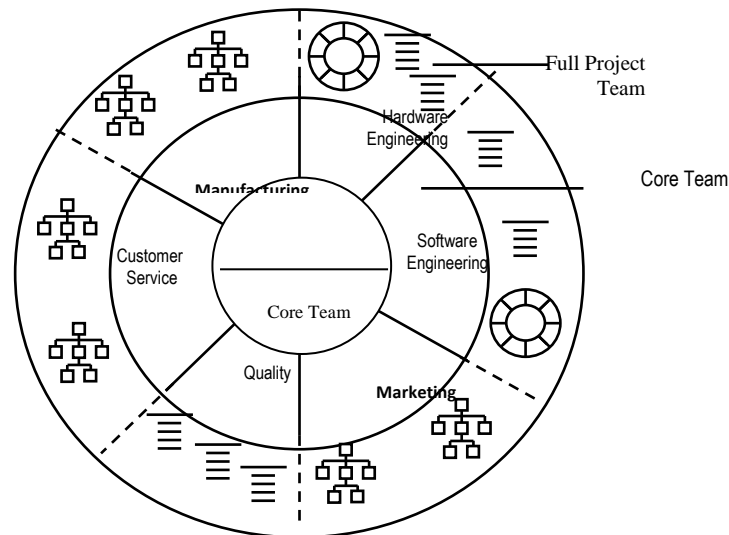
Figure 4-2 Basic Core Team

The circular illustration suggests that everyone is faced with the same challenge: ***to do whatever it takes to get the right product out to the customer quickly***. This implies completing tasks that may be outside team members' strict functional area or below what would normally be considered their stature. Individual team members focus less on representing a function and more on carrying out the tasks that contribute to the ultimate success of the project. They are more flexible and work as a team to do what needs to be done.

4.2.1 The Role of Project Teams:

Projects are managed through teams whose members bring in several perspectives, a multitude of skills and areas of expertise and who, together, can channel their individual efforts towards successful project outcomes. The following points explain the merits of a core team-based approach:
- Project leaders are an integral part of the core team concept.
- The core team leader accepts responsibilities for managing budgets, resources and schedules.
- The leader leaves it up to the core team members to coordinate their own functional activities.

The core team concept is a very powerful approach to project management. In order for teams to meet required goals and objectives, they should be given the authority and power to make decisions on the project implementation and thus be more accountable for its success or failure.

Project teams play an essential role in the evolution of organizations towards their improved performance and structured growth. A good description of the evolutionary process experienced by organizations in their new PD projects, starts by assuming a troubled, primal stage which graduates to a functional phase, followed by the attainment of the integrated period, to finally pass on to the world class level. In order to achieve successful development throughout this process, it is imperative for managers to concentrate team activities on an internal, developmental focus that addresses the issues relating to the success or failure of projects. In this context, it is essential for project managers to build on enhancing team cultures within the organization. This aspect should be emphasized as the key to success for organizations, as it is through these teams that activities and projects are implemented. Hence, as efficient team management improves, this enables organizations to confidently promote their status from the troubled stage to the world class stage. Table 4-1 illustrates the team functions and performance during the four stages of organizational development.

Table (4.1) Team Functions and Performance During the Four Stages of Organizational Development

	Stage 0 Troubled	Stage 1 Functional	Stage 2 Integrated	Stage 3 World class
Product development process	• Informal • Formal process not practiced.	• A process for each function with disparate steps etc. Varying definitions abound	• One Integrated process known to all and followed consistently	• Process among the best in the world and continuously improving • High rate of successful innovation or new product
Project organization	• 'Missiles and grenades over walls' • 'Free for all'	• Strong functional walls/boundaries • Internal 'politics' are strong	• Dedicated cross-functional core teams • Good functional integration • Strong project management	• Experienced core teams • Capable of multilocation development
Management review process	• Focus is on release problems	• Monthly project reviews	• Event-based throughout the process	• Internalized as part of the culture
Strategic role	• Process failure threaten survival	• Process is detrimental to competitiveness	• Process permits parity with industry leaders	• Process as a source of competitive superiority • Strategies exploit process
Project Management	• No project planning or schedules done once then shelved	• Schedules exist in abundance, but are not integrated	• Teams use schedules & tools as keys for project success	• Scheduling linked to process improvement
Design tools	• None	• Some, but not integrated	• Integrated tools	• Completed and linked to factory vendors
Design standard and techniques	• We never do the same thing twice	• Partial unrelated standards exist within areas of specialization	• In place & training available	• Continuously updated • Used as performance indicators
Product cost	• Not predictable	• Different estimate	• Product cost highly predictable	• Uses life-cycle cost models
Target setting	• Wishful thinking or non at all	• By edict (you will complete this by..)	• Based on process norms (e.g. cycle-time guidelines)	• Based on world-class benchmarks
Product planning	• Not done or done opportunistically	• Done periodically • Often disconnected	• A cross-functional responsibility • Focuses on product line strategy	• Highly integrated • Common vision

Table (4.1) Team Functions and Performance During the Four Stages of Organizational Development (Continued)

Technology planning	• None	• R&D responsibility • Distinction between technology and product development not well maintained	• Long range • Distinction between technology and product development	• Long range and integrated • Product strategy • Strategic options identified
People management	• Random	• Functional kingdoms	• Teaming skills highly valued	• Everyone wants to work here
Customer involvement (QFD)	• None	• Marketing seen as surrogate for customer	• QFD and related techniques in some use	• Customer effectively integrated into process
Strategic vendor alliances	• Non. Hostile relationship	• Critical components only, one-way street	• Seen as strengthening the process	• Integrated into process
Performance measurement	• None quantified. Information disguised	• Functional only • No process metrics	• Metrics used as management tool	• Consistent metrics • Regular external benchmarking
Time-to-market performance	• May be infinite	• Inconsistent and unpredictable	• 40-60% of Stage 1	• Best in industry and declining

4.2.2 Selecting the Core Team Leader:

Given the overall strategy and the decision on just how much team the firm needs for the job at hand, it is time to select the leader. Leaders must be general managers. They lead without direct authority to win support. Most managers prefer to select the leader, and then let the leader identify the team players. This increases the likelihood of good team chemistry, and commitment, but also reassures that a capable leader is in charge.

The leader has the responsibility and accountability for ensuring that the product meets its goals for time to market, quality, development expense and product cost. He/she is also responsible for managing the project budget, resources and schedule, while working to resolve conflicts among members.

4.2.3 Key Attributes of Core Team Leaders:

• Analytical, patient, persuasive, honest, decisive, motivated, committed, open-minded, flexible, creative and friendly.
• Good communication and interpersonal skills.
• Good negotiating power.

4.2.4 The Key Tasks of Core Team Leaders:

The best way to understand project leaders and ensure success of the project is to establish what they are expected to do, what roles they are supposed to assume and what personal attributes they are expected to possess. The following list describes these roles:
• Proper briefing on the project and its outcomes. There has to be an overall agreement on the goal of the project.
• Communicating requirements to various individuals/sections needed to contribute towards the project as early as possible. This is essential if support is to be obtained and the project is allowed to proceed on time.
• Securing adequate resources for the project.

- Getting the team members together. Communication between various members should be encouraged as early as possible to ensure cooperation and commitment.
- Role definition and clarification of team members.
- Ability to move the project forward and achieve progress.
- Communicating to the various sponsors. This ensures continuous awareness on progress and support is gained for difficult decisions to be made.
- Acquire the new knowledge and learning from every project.
- Managing beyond the project brief. There should be a thorough understanding of process implications.
- Keep purpose and goals meaningful.
- Build team commitment and confidence.
- Apply disciplined project management.
- Guide the team in managing breakdowns.
- Manage team interfaces, leading the integration of various project teams.
- Strengthen the skill mix and level.
- Provide opportunities for personal growth and development for team members.
- Be competent working member of the project team.
- Lead the team in measuring their progress.

4.2.5 Core Team Members:

When selecting the team members of a new product project, it is important to remember that each individual is a representative of the department they are from. Hence, seeking people who are knowledgeable in their respective areas, have attained the respect of their departments, and desire to participate on the team.

The core team usually consists of people from marketing, engineering, design, finance, manufacturing, customer service and management. The members coordinate project activities for their particular functions. This multifunctional coordination ensures a product that is manufacturable, serviceable and meets customer requirements.

Project teams must include members with skills in all the following areas:
- Customer knowledge
- Marketing
- Business
- Systems engineering
- Various technical areas, and experimentation
- Various aspects of manufacturing
- Highly developed problem-solving capabilities
- Good interpersonal communication abilities for working in a team structure.

4.3 Different Types of PD Teams:

Since projects vary from organization to organization, there is no single, fixed team for each project. Team members, functions and sizes are dynamic in the field of PD hence there are more than one type of project team. Figure (4-3) presents the distinction between the core team, the ad hoc team and the extended team. (7)

4.3.1   **The Core Team:** Is composed of those people who are involved directly in managing functional clusters. Members remain active throughout the entire project life cycle.

4.3.2   **The Ad Hoc Team:** They support the core team. Although members are from important departments, their presence is brief throughout the project and thus not needed on the core team.

4.3.3   **The Extended Team:** Members are less critical. They may belong to some other division of the firm, work as corporate staff or with another organization. Sometimes they are referred to as a resource group.
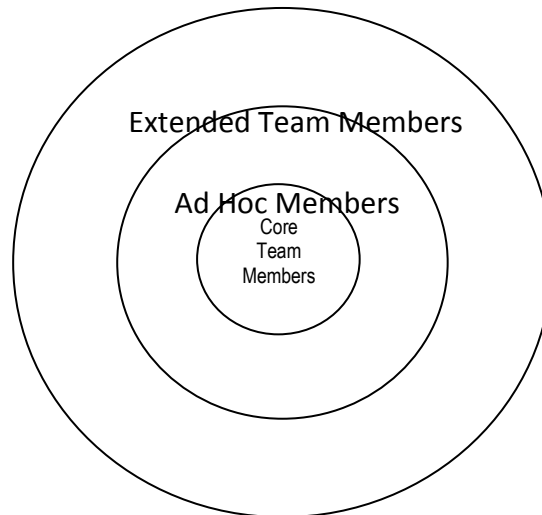
**Figure 4-3: The Team: Core, Ad Hoc, Extended**

4.4 Network Building:

So far, all our focus has been concentrated on the team leader and members, however there are times when actually there is no team. In fact, since most new products are improvements or extensions, they are developed in the functional mode, without a special team. The participants actually implementing the work, thus constitute a network, and a simplified version is shown in figure (4-4). (8)

The network consists of nodes, links and operating relationships. Nodes are people important to the project in some way. Links are how they are reached and what important relations they have with others in the network. Operating relationships are how these people are contacted and motivated to cooperate in the project.

4.5 Managing the Team:

One of the most discussed management aspects is speed, or better known as Accelerated Product Development (APD). The firm that gets to the market first has a major short-term advantage and may sustain that advantage for many years if its follow up development practice is sharp. In effect, teams must be managed to be continuously active and participating efficiently in the process. However, the most pressing problem faced by managers involves maintaining the motivation and drive to work within the members.
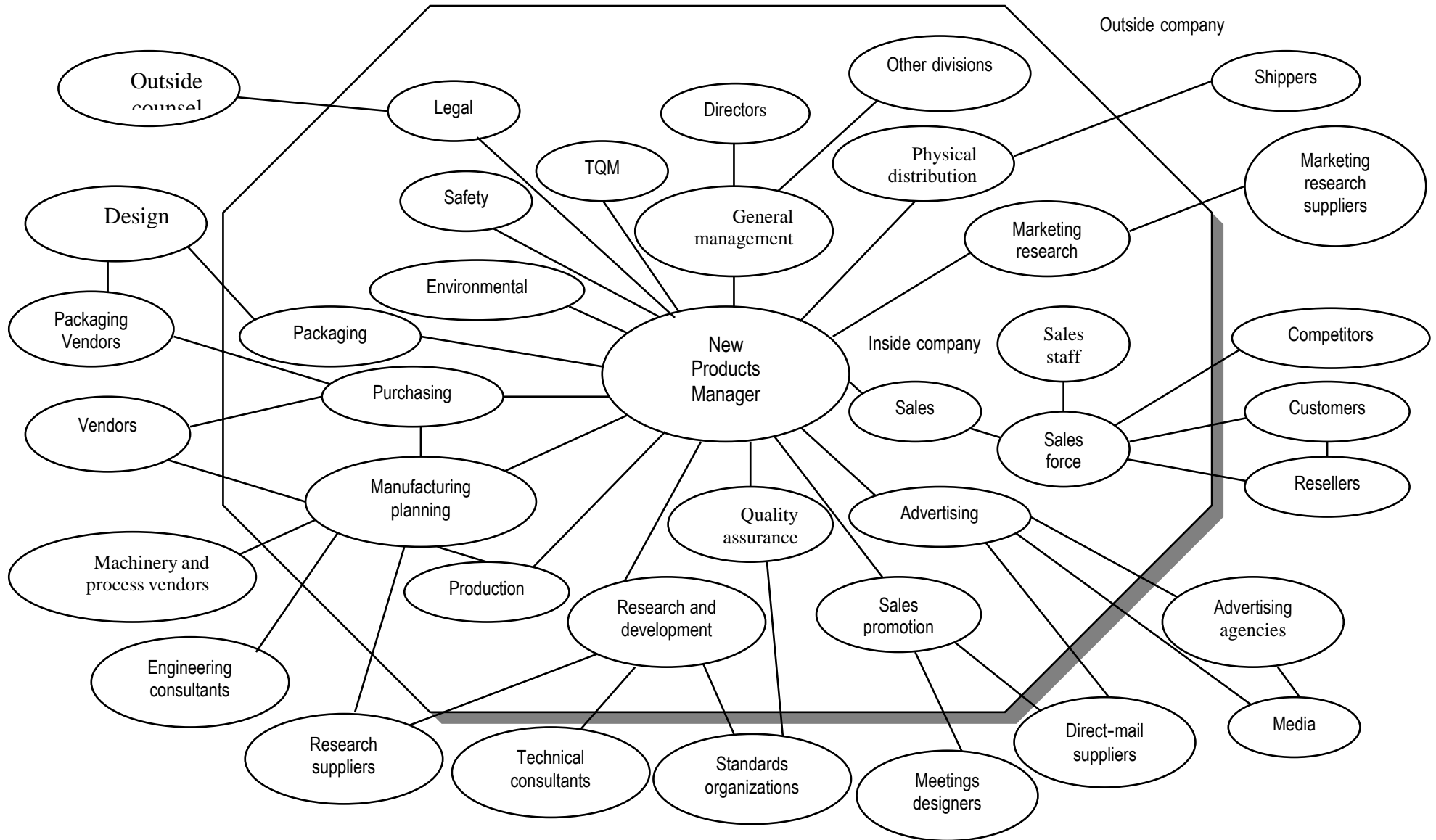
Figure 4-4: Network Building

Another aspect of team management problems is the ability to run effective meetings. New product people seem to be in meetings continuously. Fortunately, managers have realized this inefficiency and remedial methods are now being studied to shorten the time span, yet increase efficiency and decisions taken throughout the meetings.

4.6 Best Practice Project Management:

Through examining four world class organizations; it was revealed that effective project management comes from the following factors.
- Ensuring successful project management is driven by teams of various types.
- Teams have control of resources and the process is supported in all aspects.
- Project leader is fully in charge of budget authority and team selection.
- Full use of innovation processes.
- Periodic reviews involving senior management.
- Emphasis on measurement, using resource utilization, technical advancement, risk management, system solution, speed and technical performance.
- Managing projects through total flexibility, problem solving and creativity.

4.7 Summary:

The key concept here is that new product projects should be performed by an experienced leader, a core-multifunctional team and sometimes a resource group, pending on the size of the project. Refer to figure (4-5).[9] Most managers and researchers have concluded that new product teams must be created to fit their situations. A clear understanding by everyone involved as to what the team is for, its mission and its strategy are critical factors determining the success of the project.
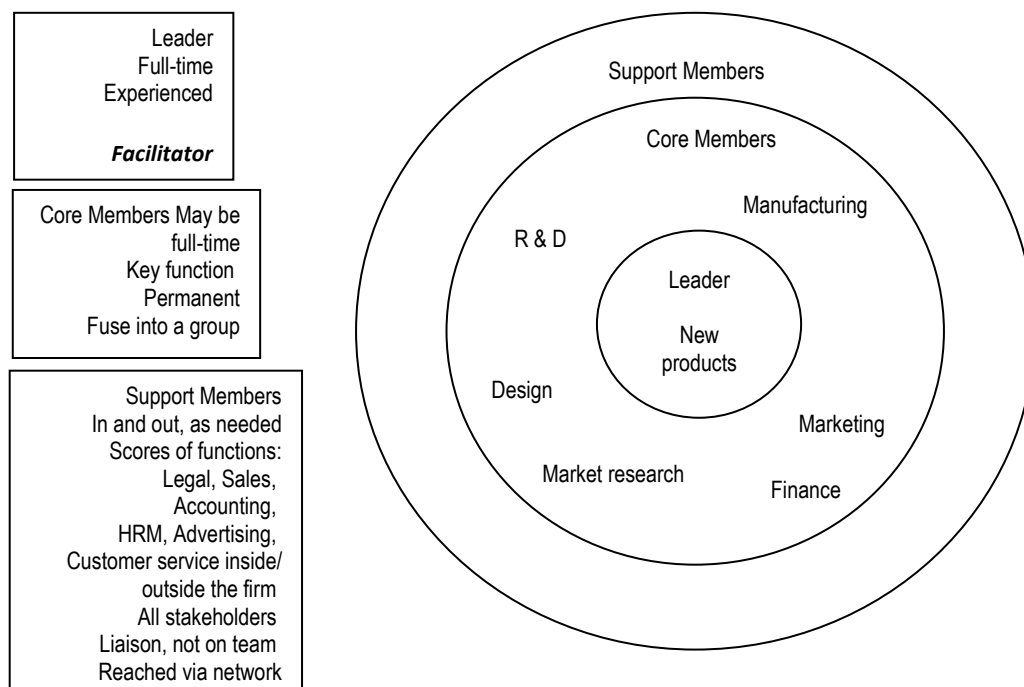

Figure 4-5: The Team: Leader, Core, Support

5. The Approaches and Tools Utilized by New PD Managers

Now that we have discussed the need, scope, and team of new PD management, it is time to address how exactly management should be integrated in the process in order to ensure the successful implementation of PD. However, firstly, we shall begin by briefly reviewing the PD process.

5.1 New PD Management Integrated in the PD process

It is essential when assigning a new project to a manager that their involvement is embedded from the very beginning of the project, to the very end. This key factor is vital in determining the success of the project. The following brief below presents the PD process and reflects the participation of NPM. Figure 5-1 portrays this process. (10)

Phase 0 – Concept Evaluation:
The objectives of Phase 0 are to enable NPM to rapidly evaluate product opportunities and start the product development process as quickly as possible. The result of Phase 0 is an evaluation of the concept and opportunity for the product. The primary focus of Phase 0 is to analyze the market opportunity and strategic fit, as well as evaluate opportunities, using assumptions clearly identified and reviewed for validity. This enables new product managers to take action before a significant investment is made. Only the new product manager and a few people work on the project during Phase 0.

Phase I – Planning and Specification:
Phase I is the fundamental building block of the product development effort. The objectives of this phase are for NPM to:
- clearly define the product
- identify competitive advantages
- clarify functionality
- determine the feasibility of development
- verify to a greater degree of accuracy the estimates made in Phase 0
- plan the development effort for Phase II and the rest of the project.

The Phase I review enables senior management to resolve any remaining issues necessary to make the product development effort successful, as well as establish priorities among projects and allocate resources accordingly. During Phase I more people are involved in the project effort, and at this point the project takes on a formal core team structure. Additional resource groups will also become involved in supporting the efforts. At the end of Phase I, it should be decided to either cancel the project or fund the Phase II effort, but it is also possible that the project team will be directed to resolve a specific issue before approval.

Phase II – Development
The objective of Phase II is to develop the product based on the development program approved at the Phase I review. During this phase the primary emphasis is on execution rather than analysis of the product opportunity or its feasibility. Approval at the end of Phase II is the judgment that the product is ready for test and evaluation and that the plan for doing this is appropriate.

Phase III – Test and Evaluation

The objective of Phase III is to complete acceptance testing and prepare for volume production and product launch. Completion of this phase is marked by a successfully tested product, approved manufacturing and support processes, and a product launch plan.

Phase IV – Product Release

Phase IV typically includes volume production, product launch marketing, initial distribution, and early support of the product. It also serves as an assessment of early product performance and customer acceptance. During Phase IV, the product is released to the market. At the end of this phase, responsibility is passed from the project team to the functional departments to manage the product on an ongoing basis. The project team, however, is responsible for resolving any product problems that occur before the Phase IV review.
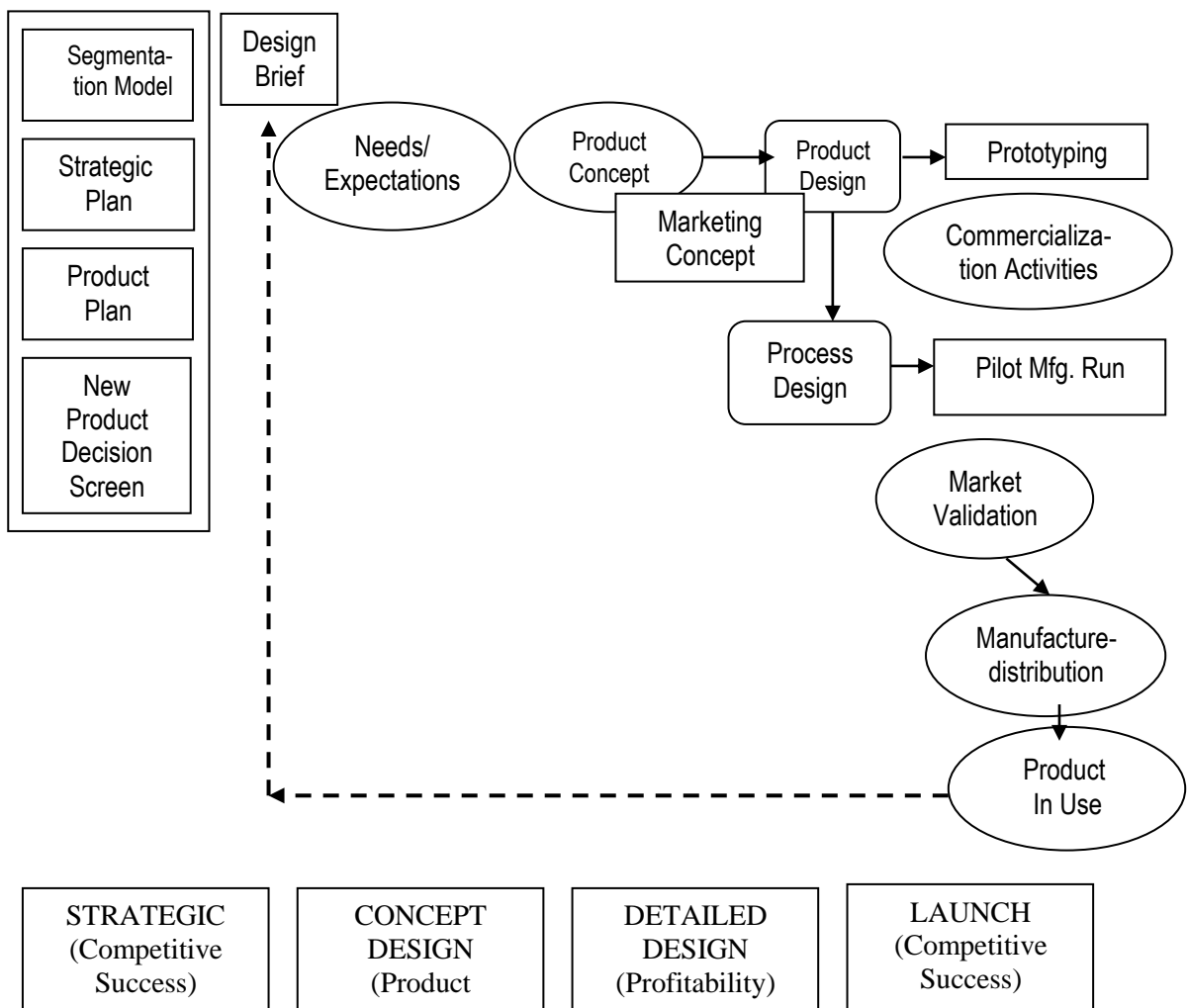
Figure 5-1: The Proactive product development system

5.2 Triple Stream Process

Although the process above is a thorough procedure reflecting the PD process, it is not enough, because we actually are developing three things, not just the new product itself. Figure 5-2. (11) depicts the three parallel streams, simultaneously with the product's creation, there is the creation of a marketing plan and an acceptable evaluation plan.

Throughout the implementation of the PD process, it is important for new product managers to maintain stability in running the project through the careful implementation of the proper method to carry out a project. One of their objectives is to try to optimize the product's outcome subject to these goals and constraints, while simultaneously attempting to satisfy the customers' needs and to ensure that the company makes a profit as quickly as possible.

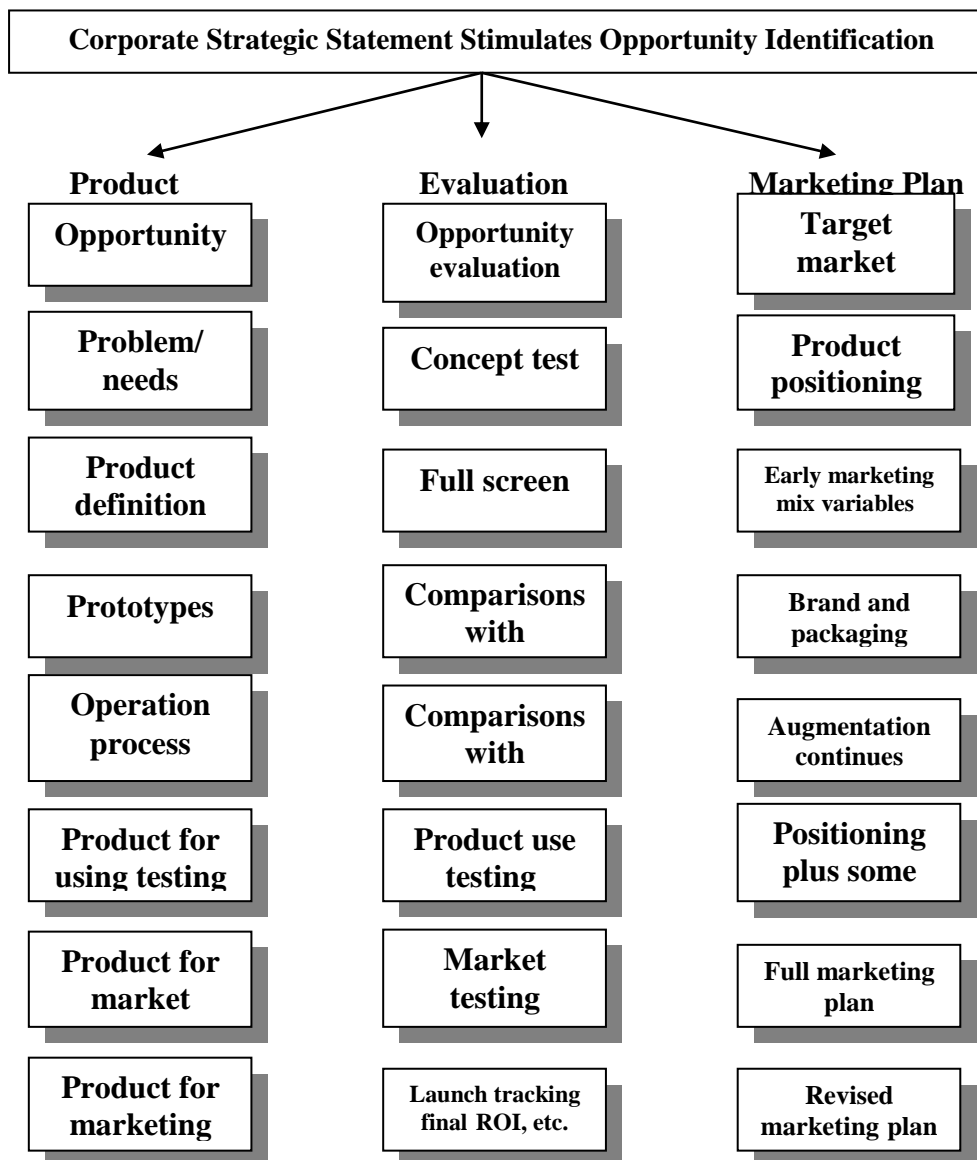| Corporate Strategic Statement Stimulates Opportunity Identification		
Product	**Evaluation**	**Marketing Plan**
Opportunity	Opportunity evaluation	Target market
Problem/ needs	Concept test	Product positioning
Product definition	Full screen	Early marketing mix variables
Prototypes	Comparisons with	Brand and packaging
Operation process	Comparisons with	Augmentation continues
Product for using testing	Product use testing	Positioning plus some
Product for market	Market testing	Full marketing plan
Product for marketing	Launch tracking final ROI, etc.	Revised marketing plan

Figure 5-2: The Triple Stream Process

5.3 The Tools for Effective NPM

It is imperative to understand that new product management is not an underdeveloped field of study existent within organizations. On the contrary, there is a disciplined approach to project management, with particular reference to the following:
- The development of specific project performance goals
- The ability to link project plans
- Project scheduling
- Task-specific activities
- Responsibilities.

Baring these in mind, the variety of tools that can be used for new PD management can now be addressed and explained.

5.3.1 Technology assessment and market assessment tools:

These tools are used to develop innovation goals and objectives, often using matrix analysis. A new product development strategy can be developed from this, which will enable the organization concerned to decide how to achieve its innovation target, what project types are going to be sponsored, what is the most desirable mix, resource requirement issues and so on.

5.3.2 An aggregate project plan tool:

The aggregate project plan is intended to help the organization decide the right number and mix of projects, the best scenarios for delivering strategic goals, the best approach for using existing resources and the optimum involvement of people with expertise in managing the various projects.

5.3.3 Activity Planning tool:

Activity planning is a micro level, detailed tool to be used so that projects are managed effectively. Essentially, the following are the stages involved in activity planning:
- Identifying key activities required at each stage of the project and milestones to be reached
- Identifying all the key people to be involved for each activity
- Clearly identify roles and responsibilities for each task/activity
- Producing an estimate of resources required for each activity
- Producing a schedule for all the key activities.

5.3.4 Analytical Attribute Tools:

Analytical attribute techniques capitalize on the concept that any future change in a product must involve one or more of its current attributes. Attributes are of three types: features, functions and benefits. Theoretically, the three basic types of attributes occur in sequence. A feature permits a certain function, which in turn leads to a benefit. The analytical attribute tools covered are:
- Dimensional analysis
- Checklists
- Gap analysis
- Trade-off analysis

- Relationship analysis

5.3.5 The New Product Decision Screen tool:

The decision screen idea is founded on the premise that new product development is much better, cheaper and faster when management focuses on spending quality time developing specific criteria for selecting new product development projects. This requires the executive management to understand precisely what drives product success and then to provide this input to each product team in the form of a decision screen. These criteria should remain constant so long as the current corporate strategy remains in effect. The best screens cover several key decision areas:

- Target markets to be served
- Profit (margin) requirements
- Desired volume minimums
- Technologies to be optimized if appropriate
- Core competencies to exploit
- Favored competitive situations
- Weaknesses to avoid

Decision screens offer several persuasive advantages:

- Improved quality of key product decisions
- Fewer problems for management to decide
- Better understanding of the outset of staffing and funding requirements
- Vastly improved speed due to the absence of "restarts" and criteria changes
- Clear goals for each team

5.3.6 Other tools:

There are countless numbers of tools and techniques that can be used for project management. Typical examples listed from literature include:

- Quality function deployment (QFD)
- Customer oriented product conceptualization (COPC)
- Concept generation and selection process
- Decision and risk analysis
- Problem solving tools
- Planning tools
- Target costing
- Value analysis
- Benchmarking
- Process flowchart developed and modified

5.4 Stages in the Evolution of New PD Management

Every company that really improves the new PD management goes through evolutionary stages. There are four stages in the evolution of new product development:

- **Stage 0 -** Necessary elements of a product development process are either missing or extremely weak. The approach is informal and ad hoc and the failure of product development threatens the survival of the business or company.

- **Stage 1 –** This is the classic stage during which project management responsibilities are distributed across functional organizations, and coordination is often difficult and time-consuming.
- **Stage 2 –** This stage is characterized by the cross-functional integration of project management at many levels. The result is short cycle times and little wasted development. The principal challenge to master in this stage is implementing effective cross-functional project management structures and skills.
- **Stage 3 –** This stage integrates planning at the enterprise or cross-project level with the excellent execution achieved. Product strategy and technology planning are linked to the project management. The entire product development pipeline is managed to optimize strategic benefit. The principal challenge to master in this stage is implementation of cross-project management processes.

World class companies regularly assess their stage of advancement. Moving from one stage to the next is very difficult. A summary of the main characteristics of each stage in the evolution toward product and cycle time excellence is shown in Table 5.1.

Table (5.1) Stages in the Evolution of New PD Management

	Stage 0	Stage 1	Stage 2	Stage 3
Product development process (Structure & Definition)	• None • Concern about just getting the product out overwhelms any consideration of process • Weak project management discipline	• Distinct functional processes • Hard to coordinate • Adherence to process varies widely	• The process is structured & clearly but simple defined • A single overall process integrates all functions • Use on all projects	• Process is ingrained in the culture • Product development process is formally linked to product strategy and technology processes
Project Team Organiza-tion	• Ad hoc • Firefighters often more highly regarded than project managers	• Inconsistent team membership • Functional politics strong • Leadership shifts or is indeterminate	• Small dedicated cross-functional teams similar to Core Team model • Strong project management	• Experienced Core Teams often develop multiple generations of products • Core Teams are used for platform and technology development
Management Decision Process	• Informal and highly reactive • Resources flow to whatever catches management's attention	• Priorities are set through annual budgeting • Project status reporting is initiated but is time consuming • Functional managers set de facto, often conflicting, priorities • Resource allocation is very difficult	• Efficient, event-based phase review process is used by a decisive cross-functional management team to set priorities • Priorities are accompanied by resources	• Decisions are based on fully developed product and technology strategies • Priorities set within context of overall pipeline and skill mix plans • Product platform decisions get an increased focus of attention
Continuous Improvement	• Individual learning takes place, but is not captured in a process	• Process elements are owned by individual functions; key skills often known only to certain individuals • It's hard to learn from failed projects because of fear of being blamed	• Full-time process owner in place • Process is evaluated regularly and updated • Opportunities to advance to next stage identified	• Process is "owned" by all who use it • There is a history of process upgrades and extensions • Opportunities to advance the state of the art regularly identified
Target Setting/Metrics	• No process targets • Focus is often on survival or financial turnaround	• Overall process targets not set or set by management fiat • Current performance is hard to measure	• Process targets are routinely set and measured against • These include cycle time and quality measures	• Process targets are set based on quantitative bench-marking of world-class companies • Annual improvements of 5%-15% in all major metrics routinely planned

Table (5.1) Stages in the Evolution of New PD Management (Continued)

	Stage 0	Stage 1	Stage 2	Stage 3
Product Strategy Process	• No process in place, only the de facto implications of past decisions • Tendency to follow inconsistent strategies	• Strategic visions inconsistent and not linked with product strategy • Tendency to attempt too much or be all things to all customers	• Focus is on individual products, not platforms • Product strategy is done in annual planning, if at all • Product strategy issues raised in phase reviews tend to be dealt with informally	• Focus is on product platforms, current and new • Product strategy is a formal process • It is linked to technology planning and executed through efficient product development process
Technology Management Process	• No distinction between technology and product development	• This is a functional responsibility • Finger pointing between marketing and technical functions is common • Large resource swings year to year are common	• Typically no formal process for technology planning • Distinction between technology and product development becomes clearer, but not managed	• Technology strategy is linked to product strategy • Technology development is more deliberately managed • Technology transfer to product development process is well defined
Pipeline Management	• Pipeline not managed or balanced • Fire fighting gets disproportionate share of resources	• Project proliferation is common • Chronic bottlenecks occur in certain functions	• Distribution of projects by phase is known • Fewer projects staffed • Skill mix problems still common	• The strategic distribution of projects is known and managed • Skill mix management is long term
Time to Market Performance	• Not measured or managed • May be infinite	• Inconsistent and unpredictable • Very hard to measure • Tendency to bring many products to market before they are fully debugged, so manufacturing problems or high levels of engineering changes are common	• 40-60% of Stage 1 • Cycle times are based on completing development of a quality product which is manufacturable in volume and at acceptable yields	• Best in industry and declining • Combined with product strategy advantages which focus effort on right products, the advantage is very hard for competitors to overcome
Development Productivity	• Not measured or managed • Typically ver low	• Many projects are cancelled late or never brought to market • Slow time to market limits productivity • Revenues from new products lag industry leaders	• Reduced time to market greatly increases productivity • Greatly reduced wasted R&D since phase reviews lead to earlier cancellation • Revenues from new products increasing	• Little wasted R&D • All efforts highly focused by platform, technology, and product • High percentage of sales generated by new products and new platforms

5.5 Summary

Product development evolves through well-defined stages at all companies, and understanding this evolution helps a company see where it is and where it wants to go.
- In Stage 0, product development is an informal process, and certain functional and project management skills are lacking.
- In Stage 1, product development responsibilities are distributed across strong functional organizations.
- In Stage 2, there is cross-functional integration at the project level. This is the first true step toward Product And Cycle-time Excellence.
- In Stage 3, the most successful product development organizations achieve cross-functional integration at the enterprise level.

New PD management must be recognized as a field of study complemented with several tools, techniques and approaches that must be addressed to employees at all levels within the organization. This awareness shall undoubtedly improve the effectiveness and efficiency of new product development, hence the overall improvement of the organization.

6. **Managing New PD Funding:**

Funding decisions are extremely important and hold a significant role in determining the success or failure of new product projects. It is imperative for NPM to totally understand and appreciate the magnitude and vitality of making the right funding decisions for the right project proposals. They must take into consideration several factors, including the size, and expected time length of the project, its overall estimated cost, the product's necessity to markets, the funding amount required, associated risks, and whether it is in correlation with the organization's overall strategic mission and objectives.

6.1 Types of funding systems:

New PD managers in both focused and diversifying companies are mainly concerned with two key dimensions of funding systems. First the ability to make appropriate funding decisions in selecting projects that fit customer needs, while minimizing waste. Second, the ability to make funding decisions quickly. Focused companies were primarily concerned with making the right decisions, while diversifying companies emphasized speed in decision making.

The key differences between funding systems are summarized in Figure (6-1). (12) The four zones in this figure represent four types of funding systems. The "Fs" represents funding sources, the "Ps" potential projects needing money, and the "Hs" hierarchical levels not authorized to make funding decisions. The solid lines are normal hierarchical links, while the dotted ones link projects with funding sources.

6.2 Dimensions of a funding system:

At its core, a funding system consists of people within an organization that develop ideas, people in control of the funding resources, and communication links between them. There are several key dimensions of this constellation presented in Table 6.1.

Table 6.1: Dimensions of a funding system

| Dimension	Impact
• Distance between people with ideas and people with resources	• Affects speed of communication, distortion and communication, and level of knowledge of those making decisions
• Time to make decisions and obtain funding	• Affects overall speed of innovation process and response time
• Distortion of information communicated between people with ideas and people with resources	• Affects appropriateness (correctness) of decisions taken
• Level of knowledge of those making decisions	• Affects appropriateness of decisions taken
• Number of possible funding sources available	• Likelihood of diversification; likelihood of an unusual idea getting funding
• Type and quantity of information demanded by funding sources	• Affects appropriateness of decisions taken; may force teams to think about things they would not otherwise consider; can also slow decision
• Incentives of those making decisions	• Affects their willingness to support innovation
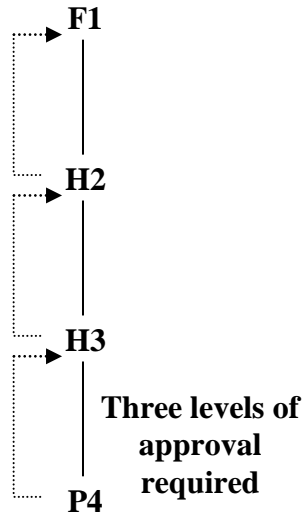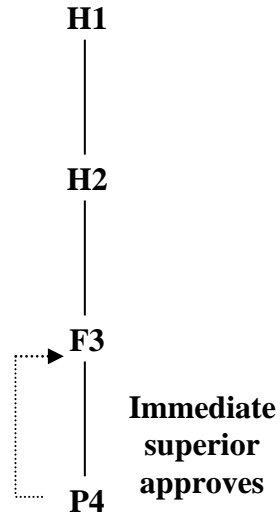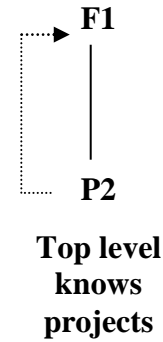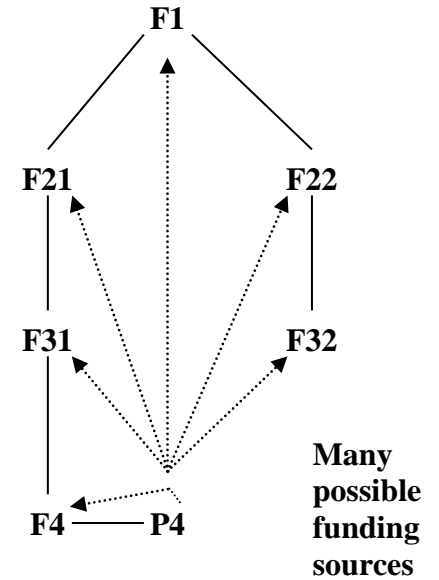
Figure 6-1   Types of Funding Systems

Key
F# = Funding Source X
H# = Hierarchical Level X (without funding power)
P# = Project Idea X

⟶ = Hierarchical Link
········▶ = Possible Funding Link

6.2.1 Distance between people with ideas and people with funds

The term distance refers to the number of people of intervening hierarchical layers between the person with the idea and the funding source. Figure 6-2 reflects the distance between ideas and funding sources. (13) It is important to note that distance has several key effects.

a) Long chains of communication or approval mean that decisions will be slowly taken. If these chains are short, decisions may be made much more quickly (speed of decision making).

b) The contents of an innovative project proposal must be communicated through a number of people, there is likely to be some distortion of the information presented. This will lead to lower decision quality.

c) If the funding source is distant from the source of the idea, the people making the funding decision are likely to have little knowledge of the technology, the market, and other key issues involved. This will also lead to poor quality decision-making. If the funding source is close to the source of the idea, those making the decision are most likely to be more knowledgeable and the decision quality is likely to be higher.

d) Number of funding sources available. One person or position may have a monopoly of innovation project funding. Or the idea generator may have many potential sources of funding, in both his business unit and elsewhere. Increasing the number of funding sources will increase the innovation performance of a company.

6.2.2 Type and quantity of information

Another key dimension is the type and quantity of information demanded by funding sources before they give resources to a project. This can range from minimal information about the goals of the project to detailed information on the technology involved, key marketing issues, and other relevant aspects. In addition, there may be formal requirements for what information will be given. Alternatively, the system may be informal, the funding source asking for whatever it wants. In this latter case, some project teams may be required to provide extensive and detailed information, while others are not required to provide anything more than the minimal amount of information.

6.2.3 Type of documentation required for a funding request

This dimension controls the amount and type of information that will be exchanged between people deciding whether the project will be funded.

6.2.4 Incentives of those who make funding decisions

Those who control resources are rewarded, and what they see as the strategy and goals of the company, will have a great influence on how many resources they dedicate to innovation and what they decide to fund. This will be affected by a number of aspects of the company's management systems. Obviously, the explicit incentives, such as compensation and promotions, have an impact. If those supporting innovation receive large bonuses and promotions, this is a strong signal that managers should support innovation. However, if non-innovators, those who focus on the short term and invest nothing in the long term are promoted, a strong signal is emitted that one should not invest in innovation.

4. Corporate funding board must approve → **Corporate**

□ **Much time lost pursuing funding request through three levels**

3. Group head must approve → **Group head**

□ **Much information distorted as request rewitten at each level**

2. Business unit head must approve → **BU head**

□ **Final decision makers know little about the business**

1. Functional staff see need/opportunity → **Marketing and technical staff**

Key:

———————→ = Hierarchical Link

········→ = Funding request

Figure 6-2: Distance between ideas and funding sources

6.2.5 Number of possible funding sources available

The importance of the number of funding sources available to the person who has generated the idea can vary from none in companies to many in companies where anyone can go anywhere in search for funds.

The effect of having only one source of funds is either positive or negative, depending on the company's strategy and situation. If the company is practicing a focus strategy, having only one source of funds will help to maintain this focus. As long as the funding board understands the technologies and markets involved, the system will work. If a large number of projects are involved, or if the technologies involved are more than one person, the task will be difficult.

6.3 Outcomes of a funding system:

A number of outcomes are driven by the structure of the funding system. These outcomes include repetitive factors such as the number of funding sources, the number of projects funded and the breadth or variation of projects funded. Breadth in turn has two key sub-dimensions, the product market and competence. More global outcomes include the overall risk profile and the outcomes of the projects themselves. These outcomes are presented in table 6.2.

Table 6.2: Outcomes of the Funding System

Outcome	Impacted by	Importance
Time needed to make funding decisions	• Distance between idea source and funding source (for example, number of levels of decision needed) • Funding system procedures (for example, frequency of meetings)	• Affects overall speed of innovation system
Accuracy/appropriateness of funding decisions	• Amount and quality of information about project available to decision makers • Amount of knowledge decision makers have about technologies and markets involved	• Inappropriate decisions may result in missed opportunities or wasted money
Number of projects funded	• Funds available • Incentives of decision makers • Average project budget	• Affects number of new products company will have downstream • But funding too many projects may slow them all
Breadth of projects funded: product markets	• Company strategy • Number of different, independent funding sources	• Affects range of potential diversification and expansion
Breadth of projects funded competences	• Company strategy • Number of different, independent funding sources • Existence of competence management program	• Affects company's competitive position in the long run • Affects ability to develop new activities
Risk profile	• Company strategy • Incentives of decision makers	• Affects risk/payoff profile of project portfolio
Project outcomes	• All of the above	• Drive company's future competitive position and learning

6.3.1 Time needed to make a funding decision

The time needed for funding decisions is an important competitive variable because the longer it takes to make a decision, the longer the time to market will be. The time required is mostly affected by the number of levels of decisions needed, as well as the distance between the source of the idea and the funding source.

6.3.2 Accuracy of decision making

The accuracy of decisions is driven by two factors:

a) The amount and quality of information about the project available to decision-makers. This is determined by how distant they are from the project and by the type and amount of information demanded as part of a funding request.

b) The amount of knowledge that the decision-makers possess concerning the technologies and markets involved in the project.

6.3.3 The number of projects funded

All things being equal, the greater the number of projects funded the more new products the company will have a few years down the road. This dimension is influenced by the money available, the average project budget, and the incentives facing those who make funding decisions.

6.3.4 Breadth of projects funded

The breadth of the project mix is influenced by the number of different and independent funding sources available. The more funding sources there are, the broader the project mix. The breadth of the product market mix is affected by the company's strategy and goals, as well as by the location of funding sources.

6.3.5 Breadth Competence

The other aspect of breadth is in effect, the mirror image of product markets: it is the range of competence being developed through innovation product funding. Product markets are the external side of the projects, competence the internal side. The breadth in terms of competence is partly the result of the company's strategy and goals and partly result of the location of funding sources.

6.3.6 Risk profile

Companies usually want a mix of low-risk and high-risk projects. The low-risk projects can be counted on to advance the company's technologies and improve its product mix. High-risk projects should also be high pay-off projects, offering the potential for a significant improvement in process technology and or significant new market positions.

6.4 Tools used to Improve Funding Systems:

Managers can use five types of intervention in order to improve the performance of their funding systems. They can

**One Funding
Source**

→ **F1**

P2
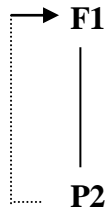
Method:
1. **Shorten communications paths; eliminate levels**
2. **Change who makes funding decisions (more expertise)**
3. **Change the types of information used in the funding decision**
4. **Increase (or decrease) the number of funding sources**
5. **Change the incentives of the decision makers**

**Many Possible
Funding Soucres**
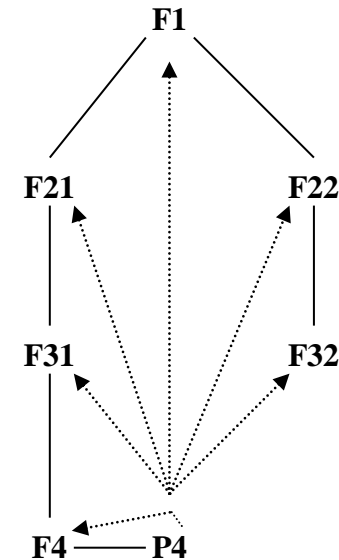
F1

F21   **F22**

F31   **F32**

F4 —— **P4**

Key
F# = Funding Source X
H# = Hierarchical Level X (without funding power)
P# = Project Idea X
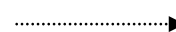
——————▶ = Hierarchical Link
·················▶ = Possible Funding Link

Figure 6-3   Improving Funding Systems

1) Shorten the communications paths between idea sources and funding sources. This has the effect of speeding decisions and reducing information distortion (thus increasing decision quality).
2) Alter who makes funding decisions.
3) Change the types of information used in the decision, typically broadening the range of information used.
4a) Increase the number of funding sources, which will allow a wider variety of projects to be funded.
4b) Managers of a focused company may want to eliminate certain funding sources to ensure that product development will be focused on the one or two areas selected by management.
5) Change the incentives of those who make the funding decisions. Typically, they give people incentives to fund more risky, long-term investments.
The following page depicts figure 6-3 on improving funding systems. (14)

6.5 Final Project Outcomes:

Project outcomes are the indirect result of the funding system. They include:
- New products,
- New product features,
- New revenues,
- Process improvements resulting in time or cost reduction.
- learning about technologies and markets
- Spin-off products or process improvements.

6.6 Summary:

Proper project funding is an essential element to the successful implementation of the new product development process. Managers should concentrate their efforts on efficiently allocating the funds to selective projects as well as balancing the degrees of low and high-risk projects. Companies should also focus their attention on who authority to grant the funding is delegated to, and the amount of fund sources accessible to employees.

7. Innovation and New Product Management

Innovation refers to the entire process encompassing the use of creativity and research to generate new ideas, feasibility studies to evaluate the cost effectiveness of those ideas, risk analysis, design and development, new policies and procedures, market research and marketing, and finally implementation of the new product or service.

Product innovation was thought to be an irregular, random process that operated more by chance than by careful management. However, it soon became clear that successful new product companies were using well-structured procedures to plan, develop, and market their innovations. Effective innovation boosts the effectiveness of organizations as well as individuals. The objective of change, creativity and innovation lies in the development of a better work environment and experiences for individuals.

7.1 The Need for NPM to Address Innovation in Organizations:

In the competitive and dynamic states facing organizations daily, and modern technology reaching its peak, it is imperative that new product managers remain on the edge with new developments and progressions to sustain competitive advantages. The more the individuals within the organization are keen on creating new ideas, products and processes, the more successful the firm's working environment and operations will be. The interesting aspect of innovation is that it can be integrated in any stage of the PD process at any time and by any individual, regardless of their position, department or skills. Hence innovations result in the overall improvement of the organization effectiveness and efficiency.

7.2 Key Phases of the Innovation Process:

Although each organization differs in their objectives, targets and methods, there are certain regularities in the innovation process regardless of how different the projects are. Once these similarities have been identified, this ultimately facilitates the implementation of the innovation process in a systematic manner. The key phases hence can be depicted as the following:
1. Identify the opportunity, challenge or problem.
2. Clarify the precise objectives and expected benefits.
3. Research the background information and state of the art initiatives.
4. Brainstorm creative ideas.
5. Feasibility study and risk analysis.
6. Design, development, prototypes and testing.
7. Policies and strategies.
8. New procedures.
9. Market research and marketing.
10. Implementation of the new product or service.

Each project originates with an idea, which will have arisen at a specific time and place. The idea for a product innovation will include some kind of technical solution to a current or future market need. The people proposing the idea will have found funding to pursue the idea. Then comes the process of pursuing the idea to fruition or development. When development is completed, the decision to launch the new product is made. After the launch, additional post-launch and development may occur.

7.3 Competence Needs Required during the Innovation Process:

Firms require many different types of competence during innovation processes. We can split competence needs throughout innovation into four main types:
1. Technical / technological knowledge
2. Strategic / business knowledge
3. Market knowledge
4. Internal organizational skills

The ability to learn and to innovate is central to economic processes. However, it is imperative that we comprehend what it is that we need to learn. This can be summarized in four simple dimensions described below:
- Know what – factual information about the technology concerned.
- Know why – knowledge of basic scientific and technological principles for the solution of problems.
- Know who – Specific and selective knowledge, learning and knowing who the relevant people are for the solution of problems.
- Know how – Practical skills and capabilities.

7.4 Components of Innovation Performance:

In analyzing manager's efforts to improve innovation performance, four key components of innovation performance have been identified. The first two are related to fit with the customers needs. To have any chance of being successful, new products under development have to fit with either (1) current customer needs or (2) future customer needs. The third and fourth components of innovation performance are speed and cost. Speed refers to time to market, while cost refers to the cost of the innovation system itself.

7.5 Goals for each phase of the innovation process:

Through analyzing interventions, specific goals that were particularly addressed have been listed below:
1. To generate more ideas in relation to current customer needs.
2. To generate more ideas in relation to future customer needs.
3. To speed up the idea generation process overall.
4. Fund more ideas fitting current or future customer needs.

5. Fund fewer ideas that did not fit current or future customer needs.
6. Reduce the amount of time to make funding decisions.
7. Make more effective operational decisions.
8. Decrease overall cycle time.
9. Reduce the costs of development.

This relationship between the phase-related goals and the overall goals is depicted in figure 7-1. (15)

7.6 Idea Generating Process:

As we have mentioned earlier, innovation is the process of generating new ideas and finding solutions to problems. NPM have become aware of its significance and concluded that all problems lead to challenges, challenges lead to opportunities hence opportunities lead to success. It is for this reason that managers have become keen on developing idea-generating process within organizations. There are 9 key steps to innovation and they are as follows:
1. Clearly identify the challenge. Determine objectives, context, resources and constraints.
2. Build knowledge. Sift through plenty or related knowledge and compile.
3. Brainstorm. Rapidly generate and collate ideas without evaluation.
4. Evaluate ideas. Record what aspects of ideas are good and what are irrelevant or not feasible.
5. Mix and match parts of ideas and synthesize new ideas from ideas previously identified.
6. Manipulate and alter ideas by changing the parameters, attributes, and assumptions.
7. View ideas from other perspectives and other contexts. Perhaps an idea would be good for a related activity.
8. Ask other people for their views. Other perspectives can be quite revealing.
9. Repeat this process to build upon previous ideas.

7.7 New Theories on Idea Generation:

These new theories involve recognizing the fact that ideas often develop when people encounter either:
a) a new problem
b) a new phenomena
c) different points of views from individuals
Thus, a manager who desires more ideas is advised to do regularly place employees in contact with customer problems, keep up to date on new phenomena and finally keep them in regular contact with people that think differently. Figure 7-2 illustrates the new theory of idea generating. (16)

7.8 Tools that Impact Idea Generation:

Along with implementing the process and theory of idea generation, NPM have also recognized and developed several tools that substantially aid and influence idea generation. These tools are presented in the Table 7.1.

Interventions

Phase goals

Overall process goals

Ultimate goal

More idea generation: Manifest needs

More idea generation: Latent needs

Better project funding decisions

Better development decisions
= = = = = = = = =

Speedier idea generation

Speedier project funding decisions

Speedier development

= = = = = = = = =

Reducing cost of funded projects

Managers' interventions

Better match with existing customer needs

Better anticipation of future customer needs

More speed versus competitors

Reduced cost

Improved innovation performance

Figure 7-1   Managers' goals as they intervened in the innovation system
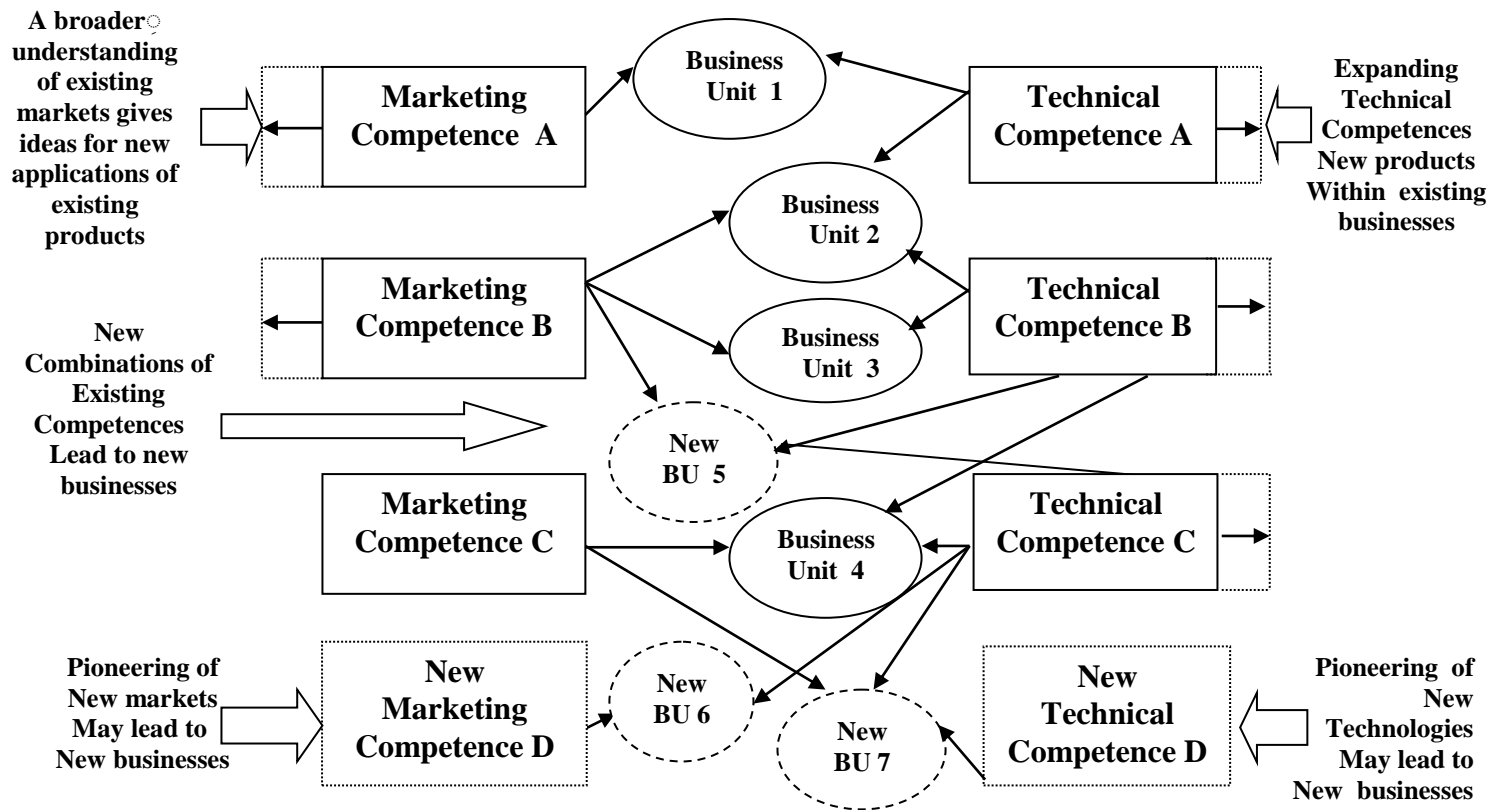
Figure 7-2: The new theory of idea generation

Table 7.1: Tools that Impact idea generation

Type of tool	Tool	Impact
Strategy and goals	• Focus on areas where innovation can give a competitive advantage • Range of linked technologies and markets in fertile areas • Business unit goals for innovation	• High pay-off to innovation • High potential for new activities • Incentive for managers to innovation support
Structure and process	• Horizontal interest group networks • Networks of laboratory managers and business unit managers • Processes for transferring technologies • Flexible organization structure	• Technical progress and best practice spread quickly • Easy to find technical help when needed • Technology transfer possible when needed • Easy to form innovation teams, easy for teams to evolve into business units
Personnel management systems and culture	• Financial, social, career and intrinsic rewards for innovators • Cultural norms support innovation	• People know that they will be rewarded for innovating • Constant reminders of importance of innovation and need to support it
Project management Systems	• Many potential sources of funds • Many projects, much mentoring, coaching for project managers	• Relatively easy to sell a new idea • Easy to learn project management techniques

7.9 Summary:

The degree of importance of innovation within organizations is increasingly augmenting, forcing managers to become more aware and practice the issue within the context of the overall organization. The paradigm shift from economies of scale to the economies of scope has instilled managers with the fact that innovative diversification is the key to success nowadays, instead of the homogenous production applied in the past. Employees within the company should be continuously motivated and encouraged by managers to regularly innovate and present their ideas.

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Annex 1: Glossary

Activity based accounting: Process of developing costs and revenues (and thus profit contributions) for separate activities, in this case new products projects.

Adaptive product: Also called adapted product, this market entry acquires its uniqueness by variation on another, more pioneering product.

Analytical attribute approach: A class of concept generating techniques not based on the problem find/solve route. The techniques are many, usually logical, and tend to make variations in products currently on the market. Attribute analysis and relationships analysis are two categories of this approach.

Attribute analysis: A bundle of idea-generating techniques built on the concept that any product improvement is a change in the attributes of its predecessor. Also a term used to mean the same as analytical attribute approach.

Benchmarking: A process of studying successful competitors and selecting the best of their actions or standards. In the new product program, it means finding the best process methods and the best process times and setting out to achieve them in the firm doing the benchmarking.

Best practices: Set of practices in the new products field that correlate with successful product introductions. Obtained by benchmarking or survey.

Brainstorming: A group method of problem solving used in product concept generation. It is sometimes thought to be an open, free wheeling idea session, but more correctly, it is a specific procedure developed with precise rules of session conduct.

Colocation: The physical grouping of teams that contribute so much to new product projects.

Concurrent engineering: A term applied to the development process when the steps overlap, rather than take place in a sequential, linear fashion. Step two begins well before step one is finished. This method is at the heart of accelerated product development.

Design: The activity of going from the product concept to a finished physical item-technical development phase. The four parts of this design phase are functional/industrial design, technical design, detail design, and manufacturing process design.

Dimensional analysis: An analytical attribute approach technique whereby new concepts are generated from an exhaustive listing of the dimensions of products in a given category.

Empowerment: The act of giving whatever power it takes to enable a manager to get a job done. A way of overcoming a non-authority situation. Risky in that it causes friction on other established line situations.

Facilitator: A person on a team whose task is to enhance the groups productivity and output. A type of leadership consistent with today's reduced reliance on hierarchies.

Focus group: a market research technique where participants are gathered for discussion under the leadership of a trained leader. Discussion is focused on a problem, activity or product.

Fuzzy front end: That period preceding start of technical development. Includes strategic deliberations, concept generation, and especially early evaluation when the concept is being evaluated before being accepted. The concept is fuzzy-not the methods.

Innovation: The act of creating new product or process; includes inventions as well as the work required to bring an idea or concept into final form. An innovation may have various degrees of newness.

Kaizen: Japanese term that describes a process of continuous improvement.

Launch control: the process by which a management plans for and supervises the introduction of a new product; the product's progress is monitored against pre-established norms, variances are detected, and corrections are made such that the original goals set for the product are achieved.

Metrics: A quantitative measurement. In the new products, we deal with many qualitative measurements, but current trend is to find metrics. Benchmarking is heavily metric oriented.

New product development: The overall process of strategy, organization, concept generation, product and marketing plan creation and evaluation, and commercialization of a new product.

New product management: Refers to the overall management of a new product project or a total product innovation program.

Quality function deployment (QFD): System of project management developed for use in very complex situations.

Repositioning: Changing the product positioning, either on failure of the original position or to react to changes in the marketplace.

Stage gates: These are checkpoints where a stage of activity ends and the process managers measure whether the project has reached the goals for that stage.

Strategic alliances: Agreements between different firms, research organizations, and governments to merge efforts in a program of activity. In new products, they usually involve sharing technologies.