Product Fundamentals

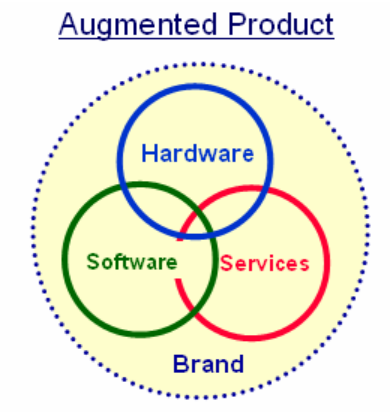
Product, is arguably the heart of any marketing strategy since, after all, something needs to be marketed.

And ultimately, the impact of the other marketing Ps is critically dependent on the market's response to the core product offering. For example, while bad advertising can sometimes doom a great product, even great advertising can't perpetuate a bad one. Advertising's effectiveness is eventually "bounded" by the inherent benefits delivered by the product.

"Product" can be broadly characterized to include ***hardware*** (physical goods that can be seen, touched, held, etc), ***software*** (e.g. intellectual property, proprietary operating protocols, digital content), or ***services*** (including pre- and post-purchase support, purchase facilitators such as credit financing and installation, and purchase assurances such as warranties and guarantees).

Augmented Products

Few products are single-dimensional, most are ***augmented products:*** multi-dimensional composites of hardware, software, and services that are sometimes pulled together under a strong brand umbrella.



For example, soft drinks are augmented by their packaging and distribution, e.g. Gatorade that is purchased in a gallon jug at a grocery store is a different product than Gatorade in an ergonomic single-serving sports bottle bought from a vending machine. The latter is augmented by a service (chilled availability) and complementary hardware (the unique package) that delivers supplemental benefits.

Similarly, a State Farm insurance policy (a service) comes with a personal agent and a network of claims facilities that support the coverage (also services). That offering is a different product than GEICO insurance coverage, which is supported by remote service centers accessed via an 800 number. Neither offering is necessarily better or worse than the other; they are just different products.

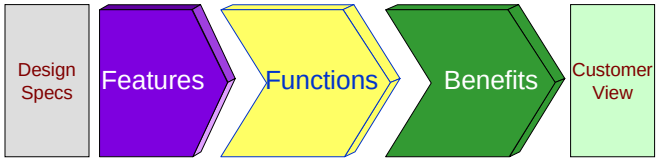
An augmented product may be an ***integrated system*** of matched hardware, software, and services. For example, a pc is more than the "box" that contains the electronic and mechanical components. In fact, the box is of little value without the peripheral equipment (monitors, printers) and software (operating system, applications). And, all pc's come with some services, ranging from "use and care" instructions and basic warranties to 24 x 7 technical help lines. The pc "product" is the augmented combination of the hardware, software, and services – often bundled under a reassuring brand name (like Dell or IBM).

Again, the implication of product augmentation is that a product is usually much more than may initially meet the eye. Product augmenters may be critical to making a product useful to buyers (i.e. creating a "whole" product) and may be the basis of product-to-product differentiation, especially as products mature and differentiation is defined "at the margins" of relatively similar core products.

Benefits Orientation

A fundamental principle underlying the product P is that ***products deliver benefits*** which customers desire (and for which they are both willing and able to pay) ***at the right cost*** (designed and delivered cost-effectively to enable profitable sales).

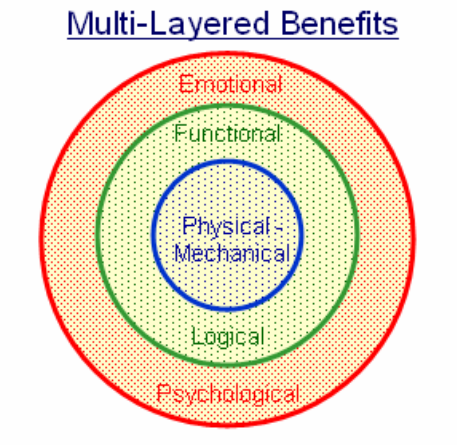
So, from a strategic perspective, products can be conceptualized as ***benefit bundles***. Ultimately, customers buy products for the ***perceived benefits*** that they deliver, not for their specific features (e.g. a Pentium 4 chip) or their specific functionalities (e.g. pc processor speed). Of course, the features and functions may be critically instrumental to delivering the benefits.



This note was developed by Prof. Ken Homa as background for class discussions and is incomplete without extensive supplemental oral elaboration.

But, a product's features and functions - which are often the focus of technically developed design specifications - are simply the envelope for delivering the customer desired benefits. The classic example is that people don't buy a drill simply to have a drill, but rather to have the capability to make holes.

More generally, the benefits that a product delivers can be ***physical*** (mechanical), ***logical*** (functional), or ***emotional*** (psychological).



For example, a pc provides the physical capability to move and store bits and bytes, which enables the logical compilation of documents and spreadsheets that provide the emotional satisfaction of completing important projects and making sound decisions.

Similarly, a drill can make a hole (physical) to build a deck (functional) that is the talk of the neighborhood (emotional).

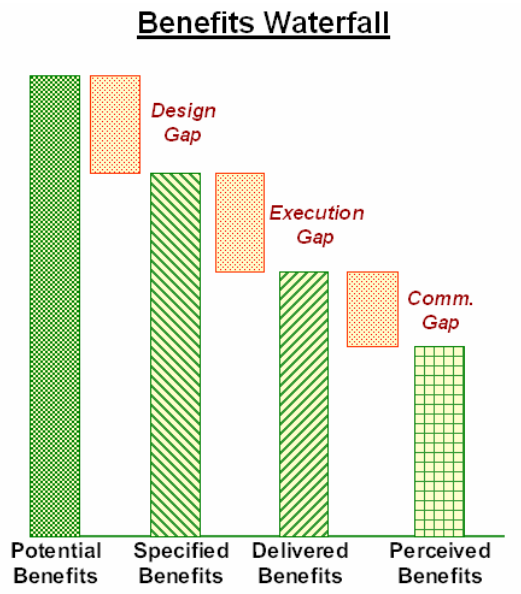
Or, a soft drink can quench thirst (physical), taste good with burgers (functional), or – so we're told in ads - make an image statement (emotional).

Benefits Waterfall

A product will typically be designed to balance the ***potential benefits*** of an ideal product (from the buyer's perspective) with a company's cost and profit economics. The difference between the potential benefits desired by customers and the specified product is a ***design gap*** that may be the result of explicit trade-off decisions or a misreading of customer requirements.

The product that is actually made and delivered may or may not meet the ***design specifications***, depending on the realistic practicality of the specifications (i.e. whether the product design is "operational"). The difference between the specified and ***delivered benefits*** in the final product is an ***execution gap***.

The delivered product can be characterized by objective performance criteria (i.e.. validated by laboratory tests), but a company only "gets credit" if customers recognize that the product delivers the benefits that they are seeking.



Customer Perceptions

The bottom line is that customer perceptions are the ultimate acid test of whether desired benefits are delivered. The difference between the delivered and ***perceived benefits*** is largely a ***communications gap*** – a failure to get customers to understand the level of benefits being delivered and be willing to pay for them.

In other words, meeting some level of objective performance criteria is necessary but not sufficient.

Assuming that a product is designed to appropriately rationalized market-driven specifications and "delivered to spec", non-product Ps – especially promotional elements like advertising and other customer communications – must operate to close any gaps between the positive realities and customer perceptions (e.g. if customers are unaware that a product delivers a specific benefit).

Conversely, effective promotion may be able to generate the transient allusion that a poor product delivers the desired benefits, but if the product doesn't actually meet the customers' requirements, then ultimately, the perceptions are likely to converge on the realities – probably sooner rather than later.

Economic Value to Customers (EVC)[1]

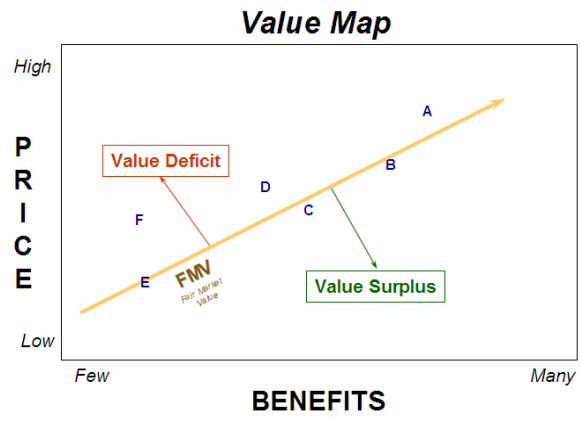
In some instances, the perceived benefits may be straightforward ***economic value to customers (EVC).***[2]

For example, an industrial customer may buy a machine to produce finished goods that generate a profit. The portion of profits attributable to the machine, less its cost, is the machine's EVC. To the extent that the economic benefits (e.g. increased throughput, higher quality) are measurable and traceable back to the product, customers should recognize them (especially with appropriate sales force "education") and be willing to pay for them.

Value Maps

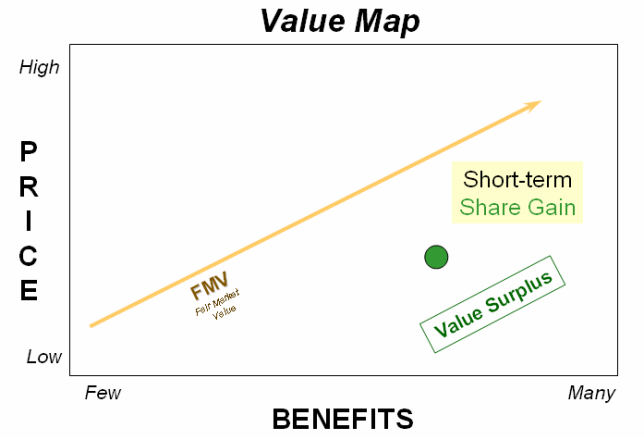
More typically though, the economic value of a product's benefits is more vague than explicit, the economic value may be enhanced or diminished by non-economic factors (e.g. brand image), or the customer's purchase decision may be driven by non-economic factors.

That is, in theory, buyers make decisions by weighing a product's price against the aggregated benefits (economic and non-economic) that they perceive getting from it. The visualization of this relationship, in a competitive space, is called a ***Value Map***.[3]

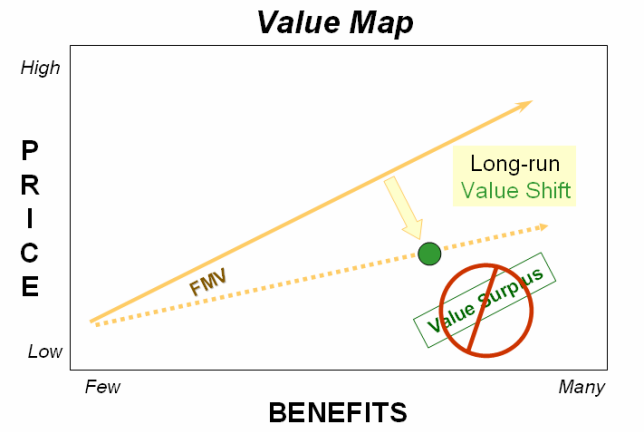


The Value Map is a conceptual framework that relates the aggregate perceived benefits delivered (on the horizontal axis) by a set of comparable products (the letters) against their respective prices (on the vertical axis). Products that deliver the level of benefits that is expected by the market, given their prices, fall on the ***fair market value line***.

Products provide a ***value surplus*** (to customers) if they deliver more benefits for their prices than the customers expect. A company offering a product with a value surplus is likely to gain market share until competitors respond with reduced prices or modified product offerings (i.e. more benefits).



If competitors do fully respond, the share gains may be transitory, and conceptually, the fair value line rotates clockwise as the market becomes accustomed to getting more benefits per dollar expended.



The implication is that products need to do more than deliver benefits. They must deliver benefits at a price that meets or beats competitive products in the market. In other words, they must ***create value***. If they do, they have ***competitive advantage*** that can be converted into market share and profitability.

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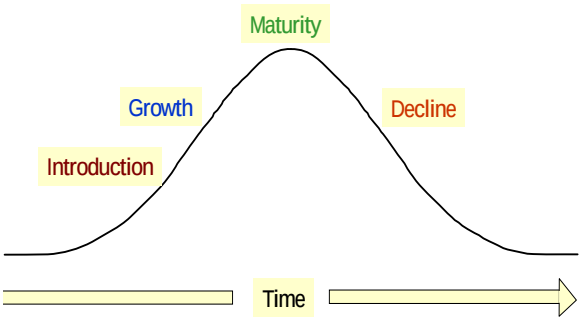
[1] Also referred to as "value in use"

[2] See HomaNote – Pricing Fundamentals for more details on EVC

[3] See HomaNote – Pricing Fundamentals for more details on the derivation of the Value Map and its relevant applications.

Product Life Cycle

Over time, products often conform to a classical pattern of sales and profits called the ***product life cycle (PLC)***



The PLC is a conceptual characterization of the stages that a product typically goes through over time:

- ***Introduction***: the initial launch and "seeding" of the product into the market

- ***Growth***: a period of increasing sales as more customers buy the product – in increasing quantities

- ***Maturity***: markets become saturated and fewer new customers are available, so sales are mostly existing customers' repurchases for replenishment

- ***Decline***: when the product is eventually overtaken by substitutes or rendered unneeded.

The classical PLC most often depicts a sales pattern (i.e. revenue) over time. But, profits and cash flow[4] are often most relevant and appropriate for product management decisions.[5]

In general, the product life cycle is a framework that is:

- ***Broadly representative*** of empirical patterns for specific products, brands, and markets (e.g. geographic markets).

  While there may be "exceptions to the rule", they can usually be rationalized (i.e. "explained away") as isolated unusual cases. In other words, it is usually safe to consider the classical PLC to be innocent until proven guilty.

- ***Not necessarily predictive or definitive*** since the precise pattern of magnitudes and durations vary widely across products.

  That is, some products may have relatively long PLCs (e.g. cigarettes), and others may have relatively short PLCs (e.g. many technology-based products).

  And, some products may eventually reach a very high volume peak; others may fail to establish any meaningful marketplace traction.

- ***Practical and insightful***, providing a useful starting point for strategic analysis (e.g. making "go – no go" decisions, assembling product line portfolios) and tactical planning e.g. deciding the nature and magnitude of marketing support)..

- ***Empirically observable and theoretically-based.***

  Not only is the PLC commonly observable in real life, it logically follows from two conceptual models: ***diffusion of innovation*** and ***technology adoption***.

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[4] In essence, cash flow – a measure of money going in and coming out of a business – can be calculated by adding back non-cash expenses (like depreciation) to profits and subtracting investments made.

[5] The strategic and tactical implications of relationships among sales, profits, and cash flow will be discussed later in this note.

Diffusion of Innovation

Basic ***diffusion models*** – a foundation of PLCs – are premised on the notion that buyers will generally fall into two broad categories:

- ***Innovators*** are comfortable being pioneers, strive to be "first in" to a product, and act based on primary information that they get directly from the market (e.g. the producing company or technical reporters)

- ***Imitators*** are followers who want the security of buying "proven" products, and are more motivated by interpersonal influences (e.g. recommendations of trusted acquaintances and consumer watchdog publications).

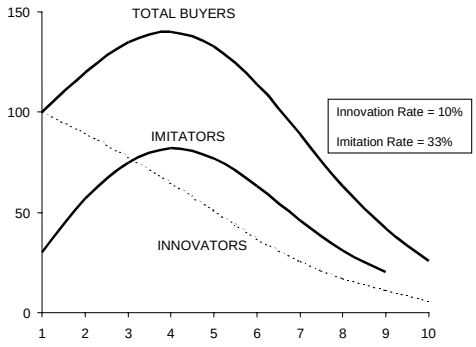
Initial sales are typically to the leading-edge innovators. As the number of innovator-buyers reaches a noticeable level, the early imitators enter the market[6].

Over time, based on the diffusion model logic, ***market penetration*** – the percentage of potential customers who have actually bought the product – will increase at an initially accelerating rate as innovators and then imitators enter the market.

Eventually, the pool of innovators is exhausted and the number of imitators increases until a point of ***market saturation***, i.e. when practically all customers who are likely to buy have bought. As the market becomes saturated, gains in market penetration slow.

So over time, the number of innovator-buyers declines (since, by definition, innovators buy early-on); the number of imitators initially increases, but it eventually crests as the market becomes saturated; and, the combined number of total buyers (innovators plus imitators) conforms to the familiar shape of the classical product life cycle.

Illustrative Diffusion Model Buying Pattern



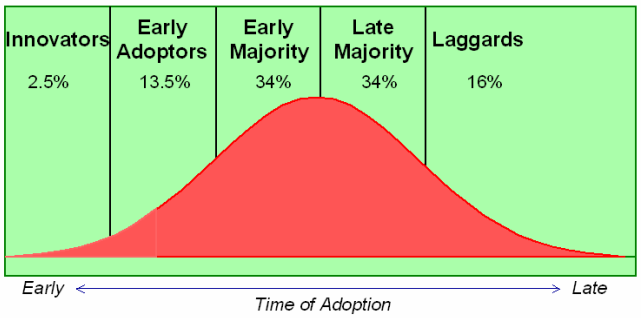
[6] See the appendix to this note for a more complete discussion of diffusion model dynamics.

Technology Adoption

Diffusion models provide one theoretical and empirical foundation for the PLC

A second conceptual rationale for the PLC – especially applicable for very highly innovative products – is the ***technology adoption model***.[7]

Technology Adoption Model



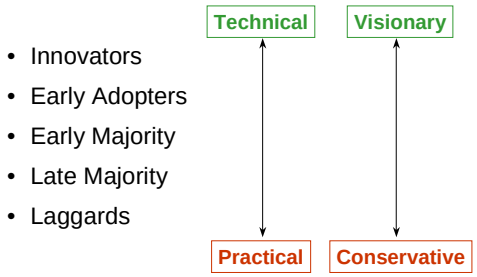
In essence, the technology adoption model posits that the two categories of buyers (innovators and imitators) can be further broken down into multiple distinct groups that are developed sequentially, not concurrently.

Innovators – the technical visionaries - are still the initial buyers, but represent a relatively small number of potential buyers. After the innovator group is saturated, ***early adopters*** - the next most innovation prone group - begin to enter the market.

Following the early adopters are the two largest groups: the ***early*** and ***late majority***. These groups extend a product from niche to broad market status.

Finally, market ***laggards*** – the extreme practical conservatives - are dragged into the market.

Technology Adoption Model



[7] This section is adapted from Geoffrey Moore, Crossing the Chasm and Inside the Tornado. The origin of the concept is often attributed to Everett Rogers, The Diffusion of Innovations, Free Press, 1983.

These groups are penetrated, more or less, in sequence. The rationale for the sequential development stems from the basic technology adoption motivations of the groups.

More specifically, the ***innovators*** – who are the technical visionaries – are inclined to adopt new technologies early, largely for the sake of the technologies themselves. They want to be first with the newest technologies and are willing to experiment with underdeveloped and unproven technologies.

Early adopters are more interested in what the technology can do for them. They jump on the bandwagon relatively early – not because they are intrigued by the technology itself – but because they believe (or hope) that the technology can provide them with an edge over slower adopting competitors.

The ***early majority*** seeks productivity – a more tactical form of competitiveness. The ***late majority*** – who wait until technologies are essentially debugged – enter the market in an attempt to keep up with competition.

Finally, the ***laggards*** – who would just as soon stay with legacy technologies – are forced into the market, often because the old technologies are no longer supported or because external incompatibilities emerge (e.g. the old systems can't "talk" to partners' new technologies).

Technology Adoption Model

Group	Motivation
Innovators	*Technology "High"*
Early Adopters	*Competitive Edge*
Early Majority	*Productivity*
Late Majority	*Conformity*
Laggards	*Compliance*

Diffusion and Technology Adoption Models

Like the diffusion models, the technology adoption models conform to the familiar shape of the PLC. But, there are fundamental differences between the models:

- The diffusion models are predicated on a generalized relationship of innovation and fast-follow imitation. In effect, the "water level" goes up on a fairly continuous basis until market saturation, then crests and falls off. The conforming shape of the sales curve is a function of the model's interacting mathematics.

- The technology adoption models are more specific with respect to the causal dynamics, and represent market development as a more sequentially staged process. The conforming shape is a reflection of the proportioned population falling into each adoption category.

But, the bottom line is that the diffusion and technology adoption models both provide strong conceptual rationales for the product life cycle framework.

PLCs , Profitability, and Cash Flow

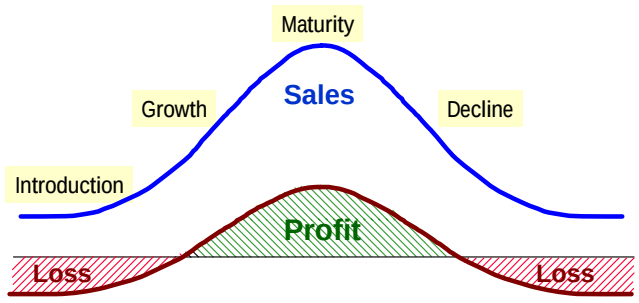
The classical PLC most often depicts a sales pattern over time. But, profits and cash flow[8] are often most relevant and appropriate for product management decisions.

A stereotypical PLC profit pattern has characteristics that follow directly from the sales curve.

During the introduction phase, new products will typically generate losses, reflecting the heavy front-end spending required to ramp up production capabilities, the inefficiencies of low volume manufacturing, and the high costs of marketing launch support.

As sales volume reaches critical mass (typically during the growth phase), the initial spending can often be leveraged into profitability.

[8] In essence, cash flow – a measure of money going in and coming out of a business – can be calculated by adding back non-cash expenses (like depreciation) to profits and subtracting investments made.

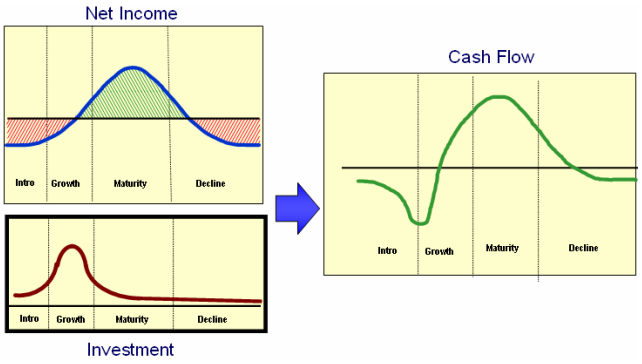


The maturity phase is potentially the most profitable and prolonged stage, when most of a product's profits are earned.

During the maturity phase, sales are at their peak, and spending can be contained to maintenance levels and spread over a relatively large volume base.

Finally, during the decline phase, most products tend to slip into a loss position. In some cases, proactive management can stretch the period of profit generation, or at least, contain losses (most often by dropping the product).

When restated to a cash flow basis, the profit pattern is amplified. Early-on investment and spending on R&D, manufacturing capacity, and marketing support typically requires substantial cash outflows (from the company). In the maturity (or late growth) phase, cash flow eventually turns positive since sales and profits increase disproportionately to investment and spending, and stays positive until the decline phase.



As will be discussed below, these profit and cash flow dynamics are the primary drivers of many product management decisions.

Product Management Priorities

The Value Map and the Product Life Cycle frameworks provide a conceptual backdrop for the ***three overarching product management priorities:***

1. Developing a steady stream of value creating products for high potential markets

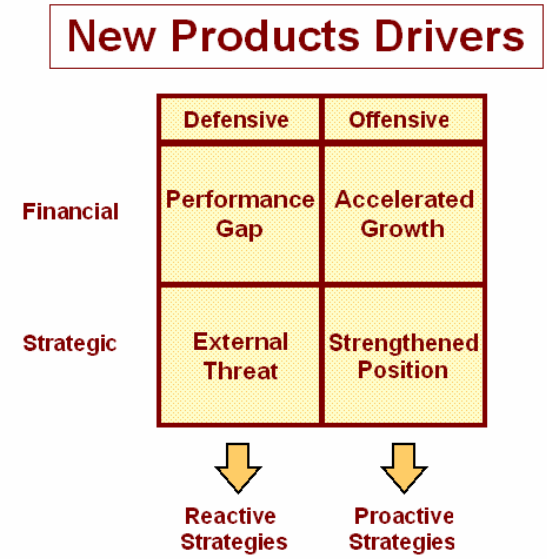
2. Aggressively managing products through their life cycles to maximize long-run profitability

3. Assembling a strategically strong and financially viable portfolio of complementary products.

Priority # 1 - New Product Development

The first product management priority is ***developing a steady stream of value creating products for high potential markets.***

Most companies invest substantial time and effort in new product development. In general, their motivations may be strategic (enhance competitive position) or financial (maximize profitability), and may be reactively defensive (protect current positions) or proactively offensive (establish better positions).



More specifically, new product initiatives are most often driven by financial targets (to meet growth targets or stem deteriorating results), competitive threats (e.g. a lower cost or more benefit-laden product), emerging technologies (that may pose threats or opportunities), customer requests (especially from leading-edge users), or enacted legal requirements (e.g. mandated safety requirements).

”New” products can be minor incremental refinements to existing products (cost reductions, feature enhancements), imitative products that are new to the company, or bold concepts that are new to the world.

Types of New Products

IMPROVEMENTS & REVISIONS	**26%**
LINE EXTENSIONS	**26%**
NEW TO THE COMPANY	**20%**
COST REDUCTIONS	**11%**
NEW TO THE WORLD	**10%**
REPOSITIONINGS	**7%**

Studies typically conclude that less than 1 in 3 new products are truly “new to the company”, let alone “new to the world“, prompting experts like Theodore Levitt to observe that: “*Breakthrough innovation receives more attention in the press than it deserves. The greatest flow of newness comes from imitation, not innovation, and most progress results from imitating something that already exists*.”

The bias to incrementalize is understandable since, by some estimates, ***almost half of all resources*** allocated to product development and commercialization by U.S. firms is ***spent on products that are cancelled or fail*** to yield an adequate financial return.

So, companies often favor projects that offer quicker, more certain paybacks and avert the risk incumbent to bold strokes. These risks are significant since the failure rate on new products is very high: ***for every 4 or 5*** projects that enter development, ***only 1 gets launched*** in the market. For an average consumer goods company, only 15% of the new product concepts that make it to the design phase end up as marketplace successes.

New Products Success Rate

Development Stage	Probability of Success	
	Consumer	Industrial
Design	50%	60%
Market Test	45%	65%
Introduction	70%	75%
Overall	**15%**	**30%**

These high failure rates can typically be traced to a few recurring causes:

- Technology, rather than customer-oriented marketing, drives the new product process resulting in “better mousetraps that nobody wants” or “products in search of markets”

- Unambitious “me too” products (incremental changes) lack distinguishing advantage versus entrenched competitive products, or competitors quickly follow with “one up” products that cannibalize the innovation.

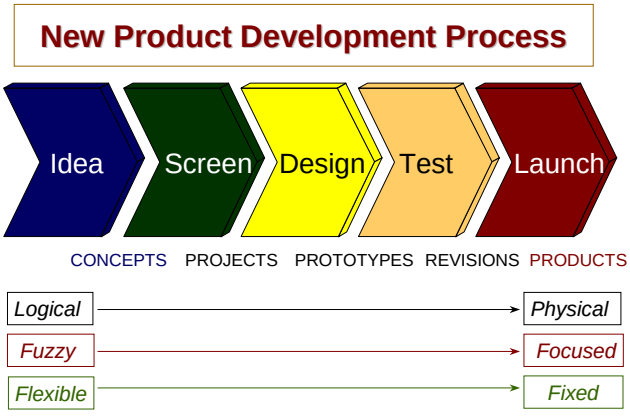
- Products miss performance specifications (that may be changed excessively during the project[9]), or are over-engineered, missing cost targets (resulting in unsatisfactory margins, or unacceptably high “recovery” prices).

- Projects are underplanned, underfunded, understaffed (too few people, too much “churning” of the project team), or unrealistic with respect to timing or technical feasibility.

The key to overcoming the traditional failure rate is following a structured new product development process that blends creativity and systematic rigor to increase the odds of success.

NPD Process

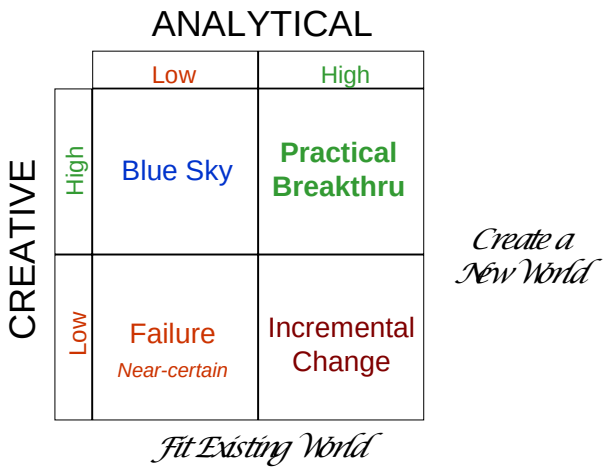
An effective NPD process will generally follow five broad steps (more or less) that are conceptually sequential, but are, in real life, highly iterative and sometimes concurrent.



[9] Constant changes during the course of a project is sometimes called ***design-creep*** or ***features creep***, indicating that new features are “creeping” into the product specifications.

NPD – Ideation

The NPD process starts with the generation of pursuable ideas. This initial phase – often referred to as the "fuzzy front-end" - is typically the most frustrating for left-brained managers who self-describe themselves as long on analytical skills, but short on creativity. In fact, though, effective new product development is a blend of creativity (creating a new world) and analysis (fitting an existing world) that maximizes potential while containing risk.



The inspiration for the new product ideas can come from a driven leader (top-down) or can bubble up from the trenches (bottom-up).

	INCREMENTAL	BREAKTHROUGH
TOP-DOWN	**Sony Walkman**	**N.A.S.A. Moon Landing** **MacIntosh PC**
BOTTOM-UP	**Rubbermaid Home Products**	**3 M Post-It Notes**

And while ideas can occasionally emerge from near-divine spontaneous inspiration, most mere mortals have to resort to systematic idea generation processes that range from traditional market research techniques (surveys and observation) that seek the "white spaces" in the existing world – to mind-stretching analyses of cultural and technological trends and scenarios that provide far-reaching directional visions of the future.

Idea Generation

Information	Source
1. Expressed desires of current customers	Traditional research
2. Unexpressed needs of current customers	Customer interaction
3. Desires of lead and heavy users	Expert observation
4. Unrecognized desires of future users	Empathic study
5. Scenarios of future markets	Futures visioning

Source: Leonard-Barton, Design Mgmt. Journal, Summer 1991

Some studies have concluded that over 85% of the relevant customer input can usually be garnered from relatively small "impact" samples of 10 to 20 subjects.

Accordingly, the middle ground on the above continuum – intensive analysis of heavy and leading-edge users, change agents, and decision-makers by multi-disciplined experts – is the mainstay of consultants[10] and an increasing focus of influential academic research.[11]

A few empirical observations that are commonly drawn by experts with respect to ideation are:

- Internal company thinking tends to be very conservative, staying within a comfort zone by incrementalizing past successes

- Similarly, most market research tends to be similarly "near in" (focusing on current dis-satisfiers and unmet needs) since customers' thinking is contained by their bases of experience and technical knowledge.

- Pure marketing initiatives often require invention or an impossible combination of features and costs.

- Technology-driven ideas often lack a clear target market or require an impractical level of market development.

So, the most effective ideation is multi-disciplinary (technology and marketing), externally focused (especially on competitors and high impact customers), and thought-stretching within practical boundaries.

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[10] For example, Kenichi Ohmae, the oft-quoted former McKinsey consultant says "Personally, I would rather talk with 3 housewives for 2 hours each on their feelings about, say, washing machines than conduct a 1,000 person survey on the same topic. I get much better insight and perspective on what they are really looking for."

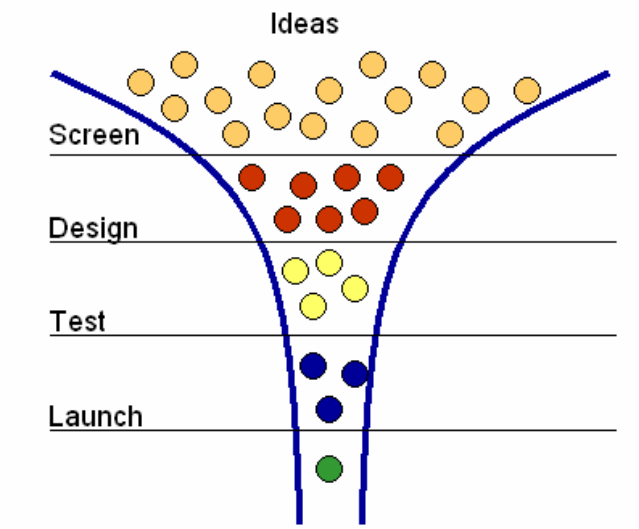
[11] For example, "Spark Innovation through Empathetic Design", Leonard & Rayport, HBR, November 1997.

NPD - Screening

A classic NPD question is whether success is built on the quantity of ideas (making lots of "$2 bets") or fewer, higher quality ideas (having better "at bats").

As a general rule, "more" tends to be appropriate during the ideation stage when the goal is far-reaching creativity bounded only by a modicum of practicality ("innocent until proven guilty"). But, successful companies are reported to put 10 times fewer new product ideas into development per successful product as unsuccessful companies.

So, an effective NPD process is, in effect, a funnel with a large number of initial ideas sequentially pared down to the chosen few with the highest potential. The screening stage is the first tollgate in the paring process.



In essence, the process of screening and prioritizing NPD ideas is a function of three factors:

(a) ***Strategic attractiveness***: Does the initiative enhance the company's competitive position by leveraging existing (or prospective) strengths to capitalize on an opportunity, or neutralize a competitive or technological threat?

(b) ***Financial attractiveness***: Are profits (long and short-run) sufficiently high relative to required front-end investment (ROI) when project risk is considered?

(c) ***Capability to execute***: Does the company have the requisite skills and necessary resources to complete the project and support the launched product?

These factors – which are invariably blends of hard (quantitative, objective) and soft (qualitative, subjective) inputs – must be consolidated and critically assessed in absolute (vis-a-vis pre-defined benchmarks or hurdle rates) and relatively (project to project rankings).

Companies often fall for predictable traps during the screening process:

- Focusing disproportionately on financial attractiveness, favoring incremental initiatives with smaller investments and quicker apparent paybacks (and unfortunately high vulnerability to cleverly "managed" projections).

- Stressing questionable strategic attractiveness (e.g. "must match competition", "must offer a full line") when financials are unacceptable

- Overestimating execution skills and underestimating required time and resources, putting projects in a vulnerable position from the start.

- Succumbing to organizational politics and mangers' clout that polarizes judgments and biases project evaluations.

Again, the management key is to have a structured screening process in place that includes predefined evaluative criteria, rigorous fact-based scrutiny of inputs, and a formal method tracking of results (an "invisible hand" that may contain unwarranted initial optimism).

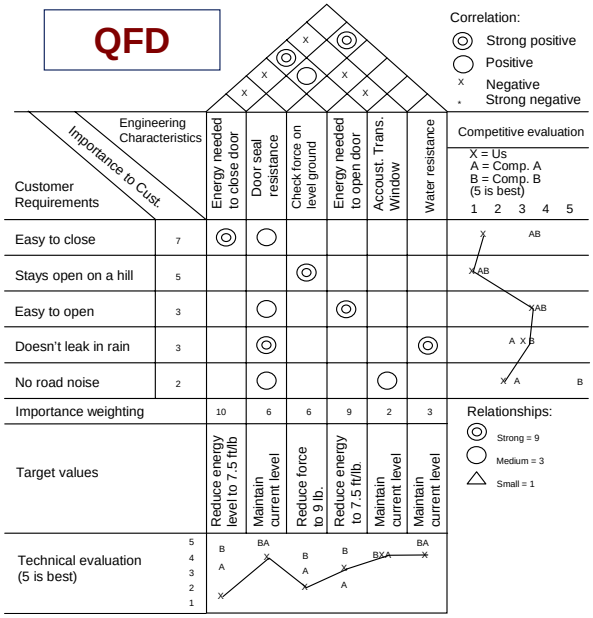
NPD - Design

The output of the screening phase is a reduced set of projects passing through to a formal design process that includes developing product specifications, selecting technologies, compiling engineering drawings or digital representations, and building prototypes.

Recognizing that customer perceptions are paramount and that roughly 75-80% of a product's ultimate costs are "hard wired" in during the design phase, there are four complementary concepts that frame the design process:

- ***Quality Function Deployment*** *(QFD)*
- ***Target Costing***
- ***Design for Manufacturing*** *(DFM)*
- **Rapid *Prototyping***.

QFD is a structured process for getting the product "right" by translating customer benefits into engineering requirements and product specifications.[12]



The essence of QFD is, first, to specify products in "the voice of the consumer", reflecting the end benefits that are most important to potential buyers, while paying particular attention to ***quality cues***, those attributes that most powerfully communicate a product's overall level of quality (e.g. the firmness of keys on a laptop pc). Engineers then translate these consumer benefits into a more technical definition of design requirements. Finally, the engineering definitions are translated into very precise specifications that provide the measurements for implementing and monitoring the manufacturing process.

Once the product is technically "right", the process is reversed and communications convey back to the customers that the benefits have been delivered in the product.

Relating back to the Benefits Waterfall, the essence of QFD is to properly interpret customer requirements (define the "potential"), convert the requirements to doable specifications (reduce the "execution gap"), and provide a basis for informing customers of the delivered benefits (closing the communications gap).

* * *

Target costing is a formal process that matches a proposed product's features (benefits) with a viable market price that achieves the company's profitability goals by:

- Determining a viable price point (or range of prices) for an approximate combination of features and benefits.

- Subtracting a desired profit from the market price and determining the maximum bearable level of costs.

- Iterating the product design – eliminating or reducing unnecessary attributes with costs that can't be recovered in higher prices – until the cost target is met.[13]

- Revalidating the viability of the market price for the redesigned product.

In effect, target costing works backwards from the value buyers put on a product, as a whole and as a sum of parts, and bounds the product design process.

Relating back to the Benefits Waterfall again, target costing largely focuses on the "design gap" - making rational trade-off decisions between the potential benefits that might be delivered and the rationalized level of benefits that should be delivered.

* * *

Design for manufacturing is the concurrent consideration of what a product is and how it is made, in order to insure quality, minimize costs and maximize flexibility.

Narrowly defined, DFM focuses on such things as ***repeatable tolerances*** (making sure that parts are not so precisely designed that they can't be produced in mass quantities), ***ease of assembly*** (e.g. efficient sequencing of "doable" operations), and adaptability to high-speed ***automation*** (which may improve both cost and quality at high volumes).

More broadly, given a growing trend towards mass customization (near infinite product variations for "segments of size one"), DFM includes:

- ***Common components*** and ***standardized parts*** across products, that enable more stable forecasting (the pooling effect) and efficient management of shared inventories.

[12] See "House of Quality", Hauser & Clausing, HBR, May-June 1988 for more details on QFD.

[13] Often, market research techniques such as conjoint measurement are used to calibrate the "part-worths" that buyers put on specific product attributes. Low value attributes with high costs are the primary candidates for compromised specifications or outright elimination.

- ***Modular platforms*** that include base models and a variety of add-ons that can be pre-assembled and managed "virtually".

- ***Postponement*** of product differentiation until the latest possible stage in the manufacturing process ***(end of line customization)***, enabling both a high degree of standardized production and a highly customized product.

* * *

Rapid prototyping is a technique that attempts to quickly present managers (or customers) with visualizations of how a final product (or part) is likely to look and perform. Recognizing that most people respond more effectively to objects and pictures than words and numbers, prototypes – which can be physical models or, increasingly, digital representations – provide a more human-responsive basis for evaluation. Rapid prototyping accelerates the process by generating "approximately right" (a.k.a. "quick & dirty") models early in the design process.

* * *

In combination, QFD, target costing, DFM, and rapid prototyping match products to market requirements, increase design efficiency, support the firm's profitability objectives, and reduce the risk of a subsequent failure.

NPD - Testing

Prior to full-scale product launches, many companies put new products and their supporting marketing programs through validating tests.

It is common to ***beta test*** radically new high technology products. The beta tests put near-complete products (such as software) in the hands of impact users to surface any remaining bugs and establish a reference base for the product.

Traditionally, packaged goods companies, such as P&G, might ***test market*** new products in isolated geographic areas that are considered broadly representative (i.e. have characteristics common with other markets). In concept, the test markets provide a "shake out" of the actual product, experiment with alternative marketing programs (e.g. different prices or different levels of advertising support), and provide results that may be projected to other markets.

But, traditional in-market tests are becoming less common for three fundamental reasons:

- Front-end market research and design methodologies have tightened the link with customers, making market responses somewhat more predictable

- Competitors' market surveillance has become more sophisticated, alerting them to test market activity and allowing them to influence (i.e. contaminate) test market results

- Companies fear giving competitors a "heads up" that may signal the need for them to launch a fast-follow product of their own.

So, leading-edge companies like P&G are increasingly using more efficient digital methodologies (e.g. internet simulations) and bypassing physical in-market tests.

Regardless of the specific methodology, when products are test marketed, the results are fed back to the NPD system for possible pre-launch product and program refinements. If fatal flaws are exposed, the product may be scrapped entirely. While that may seem like bad news since substantial development resources may have already been "sunk"; it's actually good news since the high costs of a potentially futile launch are avoided.

NPD - Launch

During the launch phase, there are two dominating objectives:

- Secure an adequate distribution base (i.e. get intermediaries to carry the product)

- Build and convert purchase intention among potential buyers.

Intermediaries are gatekeepers for new products. For upstart or unproven brands, signing up intermediaries may be a formidable challenge. For large national brands (e.g. Black & Decker), broad scale distribution support is relatively assured based on prior performance (reputation) and established account relationships. Many companies solicit intermediaries' input early-on in design process to benefit from their perspective and induce eventual "buy in".

Creating and converting purchase intention typically follows the hierarchical sequence of building brand and product awareness among potential customers, communicating the product's distinctive benefits and value proposition, and informing customers when and where the product can be bought.

The level of resources (time, money, people) required to launch a product can be substantial, including dedicated sales people (to secure distribution), advertising (to build awareness and purchase intentions), promotional incentives (e.g. introductory allowances to create urgency), and merchandising support (product displays or in-store demonstrators).

Accordingly, product launches can range from a "big bang" release into all markets, or sequential phasing by geographic market, channel of distribution, or customer segment. For example, a product may be launched in a confined region and then rolled out to other areas, or select intermediaries (like Walmart) may get initial exclusive rights to the product, or current customers may be given an early opportunity to upgrade legacy versions of the product.

Typically, a phased roll-out is most appropriate when:

- Required launch resources (e.g. ad budgets or dedicated sales people) are substantial

- The "ramping up" of production and distribution capacity is progressive, but slow

- Time is not of the essence (e.g. competitors are not likely to be first-in to deferred markets)

- The product must be "proven" for widespread acceptance by intermediaries and end-users.

The line between phased and big bang launches is blurring. While products may be launched in strategic phases, the time between phases is typically getting shorter (i.e. the launch cycle is faster).

NPD Summary

In summary, an effective NPD process is characterized by:

(a) ***Top management commitment***: willingness to assume prudent risk and drive the organization to demanding NPD objectives.

(b) ***Disciplined process, fast pace***: sensitive to both the need for thoroughness (all critical steps taken) and the need for speed (shortened development and life cycles).

(c) ***Practical creativity, rigorous analysis***: stretch to find the "white spaces" but cull out inherently bad initiatives.

(d) ***Proven or predictable technology***: avoiding the need for high cost, high risk "invention on demand".

(e) ***Explicit multifunctional coordination***: recognizing the product is unique among the Ps in that it touches most organization functions.

(f) ***Realistic time schedules and budgets:*** drive for heroic performance, but don't stretch to breaking point.

(g) ***Predetermined milestones & decision criteria:*** avoid setting "go / no go" criteria in the heat of battle when the natural bias is to continue on course

(h) ***Sufficient & scaleable launch resources***: providing the critical mass of initial support, and having the wherewithal to ramp-up if successful

(i) ***Team continuity before & after launch***: avoiding the temptation to shift the key players and their accumulated knowledge prematurely

(j) ***Relentless attention to detail***: ultimately, the difference between success and failure lies in execution, which is inherently detailed-oriented.

Again, the NPD process can be characterized as a big funnel with numerous ideas and concepts systematically reduced to the highest potential opportunities that are executed and launched in the market.

For products that survive the culling process, the challenge is making them successful in the marketplace and managing them aggressively over their profitable lives.

Product Priority #2 - Life Cycle Management

The second product management priority is ***aggressively managing products through their life cycles to maximize long-run profitability***. That is, rather than accepting the stereotypical shape of the PLC as an inevitable given, taking strategic and tactical steps to shape it to the company's advantage by:

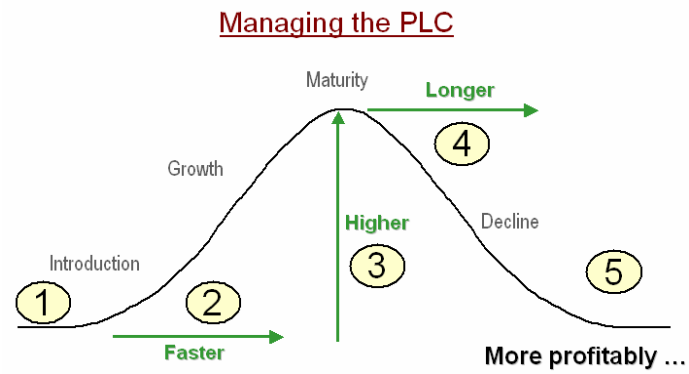
(1) Executing successful product introductions

(2) Accelerating through the growth stage

(3) Amplifying peak market potential

(4) Stretching the profitable maturity stage

(5) Sustaining positive cash flows during the decline



(1) Executing successful product introductions

As noted above, many new products, as high as 50% by some estimates, fail in the introduction stage. These failures are typically attributable to:

(a) Fatal product flaws that were not caught in pre-introduction stages

(b) A poor value proposition, usually traceable to excessively high prices that are driven by cost over-runs

(c) Inadequate marketing launch support (e.g. too little advertising)

(d) "One-upsmanship" by competitors who fast-follow with comparable or superior products.

More generally, some new products fail to reach critical mass quickly enough, i.e. volume remains too low for economical operations. They simply crater under unrecoverable high costs.

Other products are unable to break through to a level that stimulates mass acceptance. That is, they miss on one or more of the classical "Five Factors", or in contemporary marketing jargon, they fail to hit a "tipping point" or "cross the chasm"

Roger's Five Factors[14]

The widely varying rates of technology diffusion across products has been the subject of extensive empirical research.

Everett Rogers – generally considered the pioneering thought leader in explaining the diffusion of innovation – concludes from his research that most of the variance in innovation adoption rates can be explained by 5 factors:

1. **Relative Advantage**: the degree to which an innovation is perceived to be better (e.g. favorable economics, more social status) than the idea it supercedes, especially if the innovation's benefits are positive (e.g. saves money) and immediate vs. preventive (e.g. protects from disease) and deferred

2. **Compatibility:** the degree to which an innovation is perceived to be consistent with the existing values, past experiences, current processes and needs of the potential adopters

3. **Simplicity**[15]: the degree to which an innovation is easy to understand and use (intuitive appeal), and the fewer the number of people involved in the adoption decision

4. **Trialability**: the degree to which an innovation can be experimented with on a limited, low commitment basis (risk reduction), and the extent to which adoption incentives are provided (e.g. generous trade-in allowances)

5. **Observability:** the degree to which the results (i.e. benefits) of an innovation are visible to others (copycat factor)

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[14] Everett Rogers, Diffusion of Innovations, 4th edition, 1885

[15] "Simplicity" is the Inverse of Rogers' original "complexity" factor.

For example, iPods and MP3 players have advantages over portable CD players (e.g. compact size, extensive playlists), are reasonably compatible with pc music download functionality, are relatively simple to operate (especially for tech savvy teens), are relatively inexpensive, and are highly observable (i.e. visible and "cool" when in use). So – save for issues regarding technical standards and intellectual property rights – the high adoption rate is understandable.

The 5 factors provide a structured template for pre-judging a product's likely diffusion rate. Often, the factors isolate likely impediments to adoption, but – equally often – miss the rapid upside reached by breakthrough innovations..

"Tipping Points" [16]

Complementing the 5 factors is the empirical observation that some innovative products never break though and gain momentum; some diffuse through the market at a slow but steady rate; and some seem to take on a life of their own – spreading like wildfire.

That is, some products hit "tipping points" - thresholds that seem to spark an ignition of customer interest and demand.

Some observers have noted that some diseases, cultural trends, and products seem to take-off with explosive growth, while others languish at low incidence rates and are eventually extinguished.

Tipping points are directly linked to diffusion models and the relationship between innovators and imitators.

If a reference base of innovators is slow to build and the imitation rate is low, products will stall in the starting gates. But, if the imitation rate is very high and the "right" innovators conspicuously "buy-in", the sales pattern may accelerate or "tip".

The observed factors that seem to precipitate a tipping point are:

- A visible group of zealots who credibly promote the product ("communicators")
- A base of innovators with established relationships in multiple customer groups ("connectors")
- A "context" in which the product becomes highly desirable, bordering on "must have" status

For example, early PDAs reached a tipping point when digital devices, in general, ascended to "must have" status over analog products (e.g. paper-based calendar systems) and tech-savvy managers (the innovators) began flaunting their PDAs inside and outside their companies.

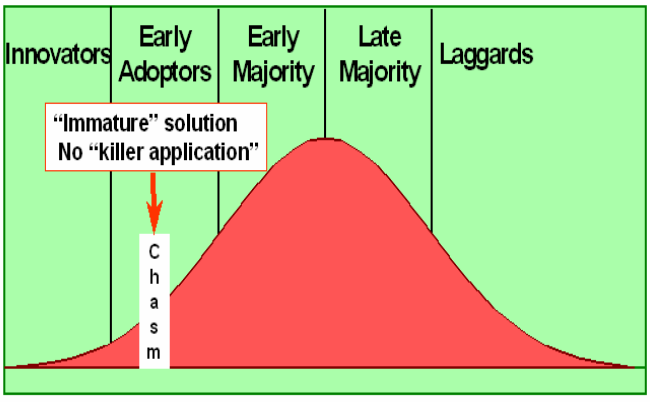
The tipping point logic provides a retrospective socio-behavioral rationale for diffusion of innovation and focuses on observed keys for success, suggesting the elements that need be in place to make market growth "explode". But, the logic provides little basis for quantitative projections.

Crossing he Chasm

The "chasm" is a concept derived from the technology adoption model.

In essence, the chasm - common for highly innovative technology products - is an observed discontinuity in the technology adoption curve: a gap between the early adopters and the early majority.[17] Many highly innovative products fail to "cross the chasm".

The Technology Adoption "Chasm"



[16] Malcolm Gladwell., The Tipping Point: How Little Things Make a Difference, Little Brown, 2000

[17] The formidability of a chasm -- i.e. its width -- can be qualitatively assessed using Roger's 5 Factors: relative advantage, compatibility, simplicity, trialability, and observability. .

Again, innovators and early adopters are the technical visionaries who are inclined to adopt new technologies first, and are willing to experiment with unproven technologies and "work around" underdeveloped products.

The early and late majorities, though, are practical conservatives who wait until technologies are debugged and able to deliver clear value and competitive advantage.

So, the downfall of many highly innovative products is that they fall into the chasm because they are:

(a) Unfocused, attempting (either implicitly or explicitly) to penetrate too many market segments, some prematurely

(b) "Immature" products with significant bugs and glitches remaining

(c) Incomplete products that fail to deliver a "whole" solution to a problem (e.g. early-on, the Mac pc was not considered a whole product since it came with a very limited set of applications software)

(d) Lacking a killer application that, in itself, provides enough benefit to justify buying the product (e.g. the spreadsheet is generally considered the killer app for the pc, and email for the internet)

Strategically, the success formula for crossing the chasm directly addresses the above shortfalls:

(a) Establish a dominant position in vertical market niches (e.g., one specific industry or function) for which the product is best suited

(b) Deliver a compelling functionality (i.e., a killer application) via a complete, debugged product

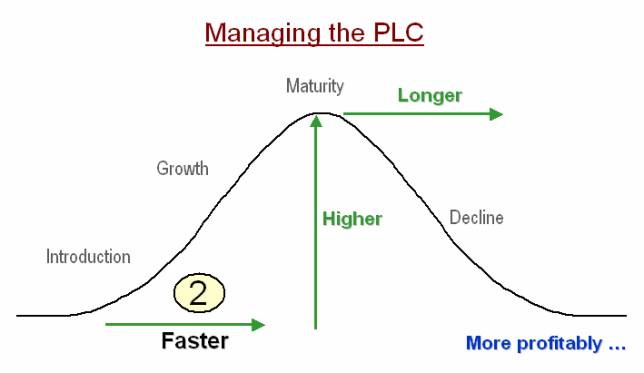
(c) Use the initial niche as a reference base for expanding horizontally (i.e., across other segments)

(d) Leverage the established positions to become, if possible, the *de facto* product standard for the industry (e.g., Microsoft Windows is a *de facto* operating system standard*)*

For example, PeopleSoft established a strong initial position in Human Resource Management systems from which it built an expanded presence in ERP software.,

(2) *Accelerating through the growth stage*

Having survived the introductory stage, the product management priority shifts to accelerating sales during the growth phase.



Initially this task requires building the imitatable reference base of innovators (diffusion model) or sequentially expanding to horizontal market niches (tech adoption model).[18] Then, focus shifts to converting the imitators at an increasing rate (diffusion model) or capturing the early majority (tech adoption model).[19]

Regardless of the model of choice (diffusion or technology adoption), the conversion keys are common:

(a) Stimulate buying by innovators to build the leveragable installed base**,** deferring short-run profitability if necessary

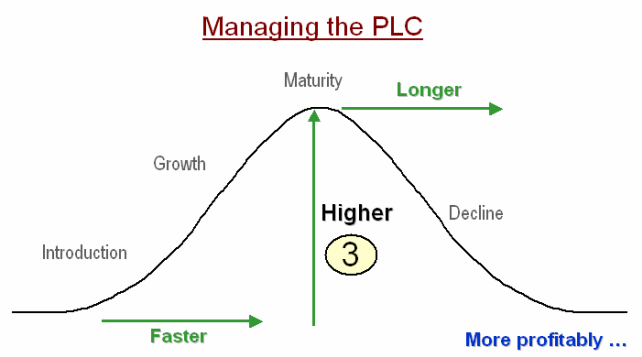
(b) Commoditize the offering for the broader mass market, selectively tailoring the product as necessary

(c) Deploy an efficient fulfillment infrastructure geared to cost-effective, high volume delivery with streamlined service.

[18] Moore refers to this action as the "bowling alley" with each pin representing a vertical market niche to be knocked over.

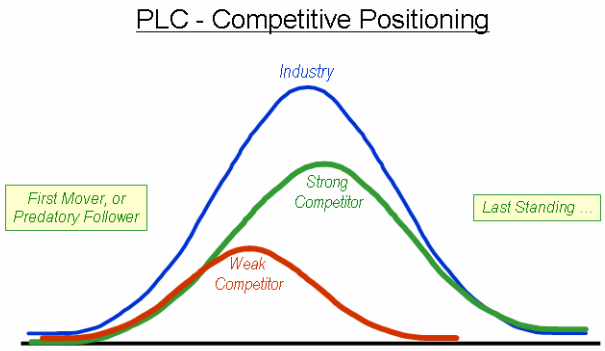
[19] Moore calls this the "tornado" stage

(3) *Amplifying peak market potential*



Conceptually, an industry PLC is the composite of the PLCs of individual competitors (or specific products).

So, the PLC for a specific product) is bounded by the industry PLC, and company-specific PLCs will have a different shape depending on a competitor's strength.



More specifically, the strongest competitor (typically a cost-advantaged ***first mover*** or ***predatory fast-follower)*** is likely to reach a disproportionately high peak relative to weaker competitors, and extend the PLC relatively longer (by being the last standing player).[20]

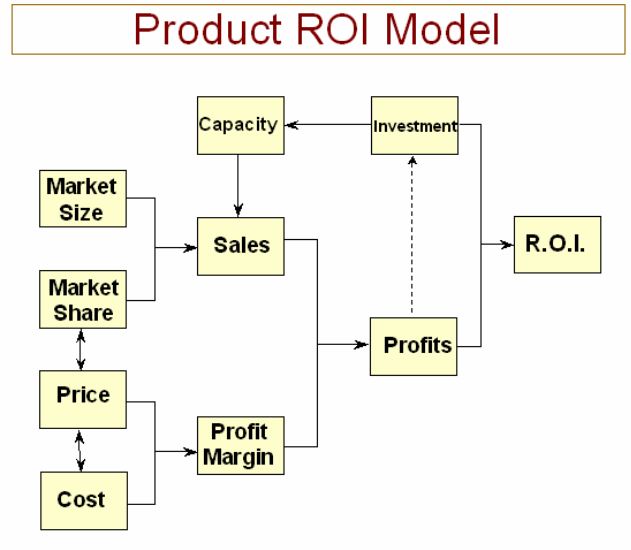
Logically following, there are basically three complementary ways to maximize a product's PLC's peak potential:

(a) Grow the overall market (raise the upper bound and "increase the size of the pie")

(b) Capture a high market share ("take a larger slice of the pie")

(c) Increase profitability rates (via higher prices, lower costs, or lower investment).

These intertwined options can be visualized in a simplified ROI model:



Again, ROI (an ultimate measure of profitability since it relates profits to the investment required to generate the profits) rises directionally with increases in market size, market share, and profit margins. Profit margins go up with increases in price (that may have a dampening effect on market share) and decreases in cost (that may be impacted by sales volume). Sales are constrained by production capacity, which is, in this closed system, supported by investment that is funded by profits.

From a strategic perspective, individual competitors may be able to create an initial market and expand it incrementally. For example, a company might introduce a stripped-down version of their base product (i.e. by removing or compromising a feature) to hit a lower price point and open up an adjacent value-oriented segment of the market, or add a step-up model (more features, higher quality) to hit higher price points.

More generally, companies may introduce ***line extensions***, slightly modified models tailored to specific market requirements (e.g. new flavors or package sizes), to tap additional customers.

For some products, notably software, companies constantly introduce new, improved products that drive existing customers through an ***upgrade cycle.***

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[20] Conventional wisdom – often reported – is that the first entrants to a market accrue substantial strategic benefits by gaining technology knowledge ahead of competitors, by pre-empting scarce resources, or by locking in a base of customers. But, recent research suggests that 1st mover advantages are often misreported, usually overstated and, at best, applicable to special cases, e.g. particularly fast developing markets.

And, some companies adopt a strategy called ***versioning***[21]: introducing multiple customized editions (including, perhaps "lite" versions) that match the needs of unserved market segments.

For example, a company may use the exact same technology to provide differentially priced delayed and real-time stock quotations. Other examples are summarized below.

Versioning: Smart Way to Sell Information
Shapiro & Varian, HBR, Nov-Dec 1998

• Timing	*Delayed stock quotes*
• Convenience	*Peak load pricing*
• Comprehensiveness	*Full text articles*
• Data Manipulation	*Adobe Viewer*
• Community	*Web postings*
• Annoyance Avoidance	*Suppressed advertising*
• Speed	*Printers*
• Processing	*Analysis functions*
• User Interface	*Sophisticated vs. intuitive*
• Image resolution	*Full vs. thumbnails*
• Support	*Tech help tiers*

Often individual companies lack the resources and clout required to drive quantum level market expansions. More commonly, "growing the market" is the result of collective action by industry competitors: more product choice, more advertising, more sales calls, etc.

So, at the risk of grossly oversimplifying, the primary market focus for individual companies is selecting attractive aggregate markets and growing profitable share in them by:

(a) Offering a compelling competitive value proposition (more benefits, lower prices)

(b) Designing, making, and delivering cost-effective products

(c) Aggressively supporting profitable products (and paring the losers)

(d) Building strong relationships with customers (CRM) and locking them in incentives (e.g. loyalty programs)

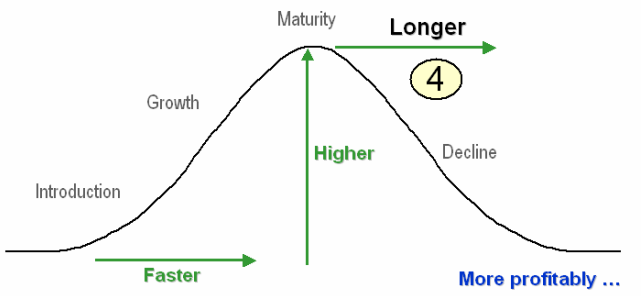
In combination, these strategic thrusts, well executed, create competitive advantage that can be leveraged to amplify the company's PLC peak (the strong competitor effect) and, in some instances, drive the industry PLC peak higher.

[21] See "Versioning: Smart Way to Sell Information", Shapiro & Varian, HBR, Nov.-Dec. 1998

(4) ***Stretching the profitable maturity stage***

As discussed earlier, profitability is typically highest during a product's maturity phase since sales are high, and costs and investment can be contained to maintenance levels. It is clearly beneficial – both strategically and financially - to extend the period of profitability.

Managing the PLC

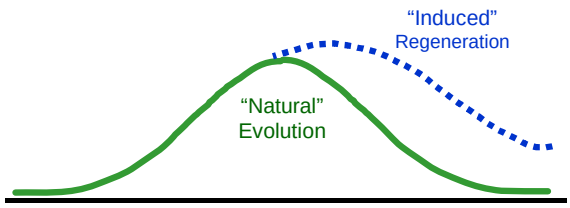


Again, the implicit assumption is that the PLC is a typically characteristic pattern, but it is not a given. So, a manager shouldn't sit back and fatalistically watch the decline happen. Rather, managers should take steps to continually ***regenerate the PLC***.

The classically trite example of simple PLC regeneration is Arm & Hammer baking soda. As demand for baking soda for food preparation began to decline, the product was ***repurposed***. Baking soda began to be touted as an odor suppressant for use in refrigerators. The new use gave customers an additional reason to buy and breathed life into a declining product.

Similarly, repurposing the laptops as scaled down, web-accessing "netbooks" drove a new wave in consumer sales.

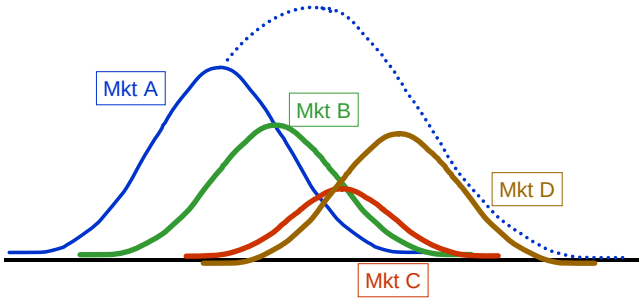
PLC Regeneration



Companies frequently extend the profitable PLC stages by ***porting*** (short for "transporting") the product to new markets. For example, in an era of globalization, products may be initially developed and launched in a single market area, (e.g. the U.S). As the product becomes established in that market, it may be launched in a second geographic market (perhaps Europe), then a third (maybe Latin America or Asia), and so on.

Each of the local market areas is likely to conform to the typical PLC. When the local PLC's are aggregated, they form a combined PLC that is both higher and more extended than the original market's PLC.

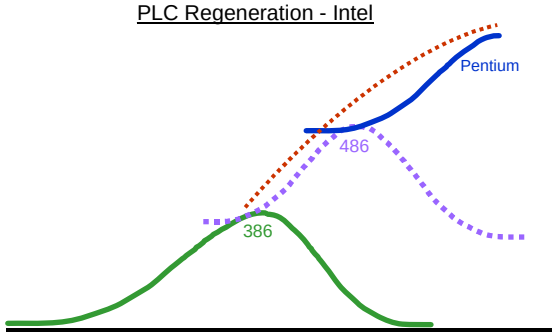
PLC Regeneration



Similarly, some companies, e.g. Intel and Gillette, constantly regenerate their company and product-specific PLCs by introducing higher performance, upgraded versions of their core products.

For example, when the 386 chip was eventually copied by competitors, Intel launched the 486. Price and volume on the 386 were allowed to fall; marketing emphasis was shifted to the 486. When the 486 chip was copied, the Pentium was launched, followed by the Pentium II, the Pentium III, and so on. In other words, Intel constantly ***cannibalizes*** its own products (takes sales away from them and lowers profitability) as a strategy for growing their business.

PLC Regeneration - Intel



This regeneration strategy has worked masterfully for Intel. But, it is a very difficult and costly strategy to execute since it demands a constant flow of noticeably higher performance versions.

Most products, though, are subject to the ***technology S-curve***, the empirical reality that eventually a technology asymptotically approaches a natural or physical limit. The implication is that it becomes increasingly difficult to demonstrate the performance differential necessary for regeneration without a radical shift in technology that changes the game.

For example, Intel is increasingly challenged to demonstrate that newer generations of chips have performance enhancements that are both substantial and necessary.

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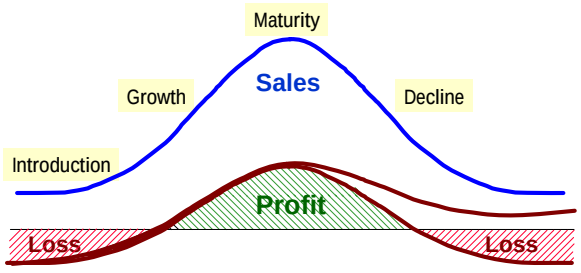
(5) *Sustaining a positive cash flow during the decline*

Despite the best strategic intent and execution, products inevitably face decline. Customer preferences may shift and their demand may wane, or new products and technologies may drive outright obsolescence.



Allowed to simply run a natural course, profits typically erode during the decline phase (since sales fall faster than costs) until finally, the product starts losing money and using cash (rather than generating it). The clear management challenge is to maximize positive cash flow by slowing the profit erosion or, if necessary, cutting losses by discontinuing the product.

More specifically, product management during the decline phase requires:

(a) Carefully balancing price (to protect margins) and share (to keep volume above critical mass)

(b) Aggressively restructuring costs to boost profit margins and cash flow

(c) Expeditiously exiting when product economics turn unfavorable

Sometimes, being the last competitor in a market can be a profitable position. By definition, the last competitor is a monopolist with leeway to restrict supplies and set prices. So, if there is residual demand for the product and the demand is relatively price inelastic (e.g. no substitute products exist), then the company can raise prices to stay profitable.

For example, some complementary maintenance products (e.g. toner cartridges for copiers) may be needed to support an installed base of the primary product (the copier). The last supplier of the required cartridge has wide price-setting leeway since the customer faces a tough choice: pay a high price for the cartridge or buy a new copier. Since the cartridge is a relatively small portion of the cost of a new copier, the customer may, albeit reluctantly, pay the higher cartridge price.

Differentiated PLC Management

A common thread that runs through the above discussion is that products should be managed differently in each of the PLC stages.

Differentiated PLC Management

PLC Phase	Investment Policy	Strategic Role	Management Focus
Introduction	Phased / Selective	Establish a strategic beachhead	Market position 1st Mover ?
Growth	Aggressive	Provide a base of future cash flows	Sales/Share Installed base
Maturity	Contained *(e.g. cost reduction and line extensions)*	Generate cash for current needs *(including NPD)*	Profitable Share
Decline	Highly Restrictive	Maximize short-term profits; contain any wind-down losses	Profits/Cash Last standing ?

Taking a broad view, the strategic goal in the introduction and growth phases is to establish a position in the market; profits may be secondary, and cash flow is expected to be negative. In the maturity and decline phases, the focus shifts to earning profits and generating cash.

Accordingly, investment policy shifts with the phases. Early on, investment is required to build the supporting infrastructure (i.e. plant and equipment) and launch the product. During the later stages, investment is restricted to maintenance and fast payback incremental initiatives such as cost improvements.

In the early stages, price may be conceded to build share, but in the later phases, price must maintained (or raised) to protect margins.

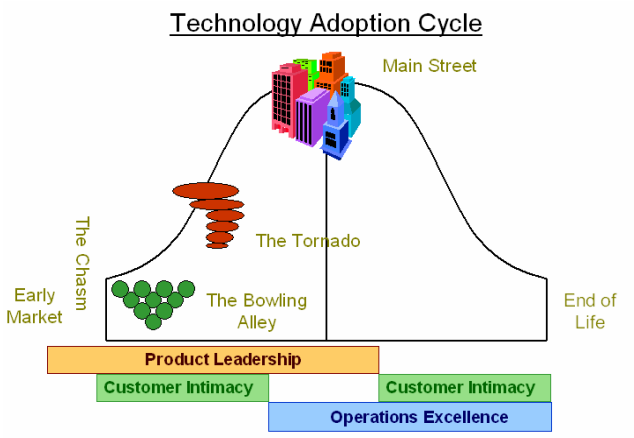
All elements of the product management mix must be carefully tailored to the requirements of each PLC stage.

Value Disciplines

Taking another view of differentiated product life cycle management, marketing strategy is typically focused on leveraging one of three ***value disciplines***[22]

- ***Product leadership*** through constant innovation
- ***Customer intimacy*** that is achieved by understanding, anticipating, and meeting specific customer needs
- ***Operations effectiveness*** that delivers quality (of product and service) and low (that provides the flexibility for profitable low prices)

The relevance and importance of each of the value disciplines varies across the PLC. [23]



For example, taking a technology adoption view, product leadership is essential in the early stages of the PLC, supported by a clear understanding of customer needs to identify vertical niches and hit customers' purchasing criteria.

As the market matures, product leadership remains important, and operations effectiveness (being able to supply mass quantities at competitive costs) becomes increasingly critical. Since the focus in this phase shifts to mass market volume, there is little need or opportunity for attention to individual customers, so the leverage from customer intimacy diminishes.

During the later stages, product leadership is less important (almost by definition); service and price

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[22] See The Discipline of Market Leaders, Treacy & Wiersema

[23] Adapted from Geoffrey Moore, Inside the Tornado, HarperCollins, 1995

become key differentiators. So, operations effectiveness (especially low costs) continues to be crucial, and customer intimacy is a resurrected focus as companies customize products to retain existing customers or entice new ones.

Product Priority #3 – Portfolio Management

The third product management priority is ***assembling a strategically strong and financially viable portfolio of complementary products.***

Priorities #1 (developing new products) and #2 (managing through the PLC) are centered on the dynamics and principles for managing individual products.

But, there are few enduring single product companies. Rather most successful profit-maximizing companies diversify into multiple product categories that are constantly rejuvenated with a steady flow of new products.

During the early stages of the new product development process, product ideas are generated for high potential target markets and then screened based on three criteria: strategic attractiveness, financial attractiveness, and ability to execute. These criteria are the guideposts for assembling the company's product line portfolio.

Again, the goal is to develop a portfolio of products that is strategically powerful (i.e. provides a competitive edge), and financially viable (profitable on a cash flow basis) by:

(1) Targeting high potential markets where the likelihood of winning is highest

(2) Balancing the portfolio to be self-funding (rather than reliant on external financing)

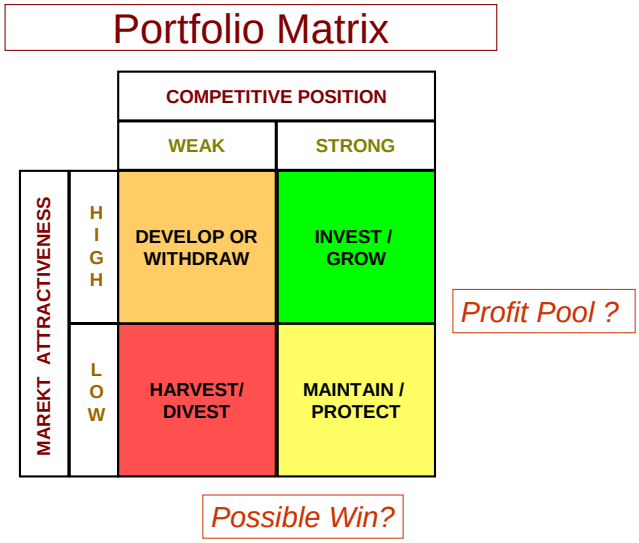
(3) Reinforcing core product positions with an array of complementary products

(4) Managing based on product-specific profitability

(1) Targeting high potential markets

The basic conceptual framework for managing product lines is the strategic portfolio matrix.

The essence of the portfolio matrix is that businesses, products, and markets[24] can be categorized along variants of two fundamental dimensions: market attractiveness and relative business strength[25].



Ultimately, ***market attractiveness*** is a calibration of the size of the prospective profit pool available in the market.[26] In essence, it is an analytical assessment of the industry's aggregate PLC profit peak.

Competitive strength is a measure of the likelihood that a company can win a substantial share of the industry profits. These odds are, of course, based on current or emerging competencies that the company may have.

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[24] A company may have multiple business units (SBUs) that in turn have several product lines composed of multiple products with variants (items, SKUs). The portfolio matrix is most applicable at the corporate level (which SBUs?), and at the SBU level (which product lines?). The matrix is also useful for sorting markets, e.g. regional geographic markets with different characteristics.

[25] For example, the pioneering BCG matrix categorizes businesses based on relative market share (a proxy for business strength) and market growth (a selective measure of market attractiveness). The popular GE / McKinsey matrix sorts by multi-factor consolidated measures of business strength and market attractiveness.

[26] Defining "the market" is a critical, non-trivial exercise. If the market is defined too narrowly, the strategic relevance may be questionable and market position may be overstated. The vice versa is true when markets are defined too broadly.

The portfolio framework can be reduced to a very simple resource allocation principle: companies should invest in products that have large prospective profit pools (the ultimate measure of market attractiveness), and for which the company has an existing or potential competitive advantage that enables it to capture a meaningful share of the profit pool.

Accordingly, the most desirable products are in attractive markets (big prospective profit pools) where the company has relevant competencies that can translate to a high share of the industry profits. These are potential ***growth businesses*** that typically merit ***investment*** support.

At the opposite end of the continuum are unattractive markets where a company has no particular competitive strength. These are small or declining markets that should be avoided. If the company has legacy products in this category, they should be ***harvested*** (i.e. cut costs and raise prices to maximize profit) or, if unprofitable, ***divested***.

The most questionable products are in attractive markets where the company has a weak or unestablished competitive position. Action must be taken to strengthen (***develop***) the competitive position (moving the business to the invest / grow quadrant) or the company should cut its losses and ***withdraw***.

The fourth category is comprised of markets where the company is competitively strong but the market is unattractive. In these cases, "attractive" may be in the eyes of the beholder. The aggregate markets may be mature or declining, discouraging participation by most companies. But, the markets may still be profitable, especially for companies with strong established positions (i.e. high share, low costs). These companies should ***maintain*** their positions and ***protect*** the profits and cash flow generated by the businesses.

The portfolio matrix provides directional guidance for allocating investment resources and differentially managing businesses. Importantly, the guidance is not a set of hard rules, and is directional, not specific to any particular business, product or market. So, care must be taken to tailor the guidance to specific cases.

Further, the initial sorting and categorization is a static representation. But, markets and competitive positions are dynamic. Markets are always changing (e.g. growing or declining, becoming more or less profitable), and competitive positions can be changed via strategic and tactical initiatives. Projecting these dynamics is fundamental to effective portfolio management.

(2) Balancing cash flows

From a financial perspective, a concentration of products in any one of the matrix quadrants is fundamentally unstable.

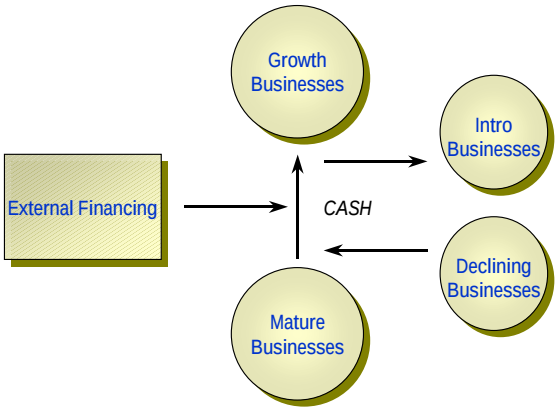
For example, products in the maintain / protect quadrant typically generate cash, but may be prospectively vulnerable as the market passes through maturity and declines. Products in the invest / grow category have future potential, but drain resources (people and money). Accordingly, companies that place a very high emphasis on near-term financial results tend to favor incremental new product initiatives like line extensions and cost reductions.

Growth-oriented companies, on the other hand, have an understandable inclination towards new products. But, as many of the new economy dot-coms demonstrated, a portfolio consisting only of new products is typically illiquid and unaffordable without substantial external financing.

The bottom line is that products in their introduction and growth phases consume cash. Mature (and sometimes declining) products generate cash that can be distributed to shareholders or reinvested to develop the new products that may eventually become the mature cash cows.

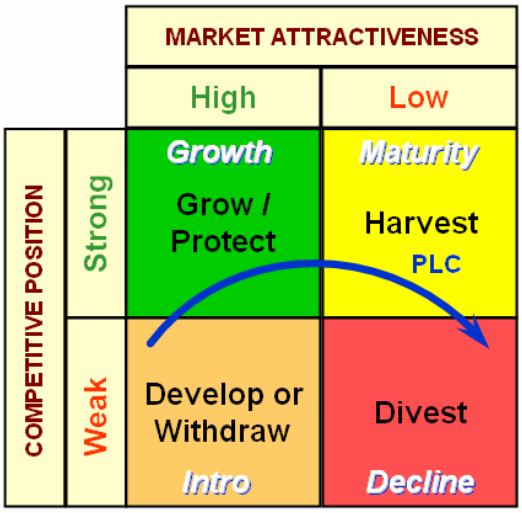
So, from a high level strategic perspective, a company needs a ***product mix*** of new and mature products: the mature products provide current cash; new products, use current cash, but are the source of future cash generation.

Business Portfolio Cash Flow



Cash flow is the variable that inextricably intertwines the PLC and product portfolio matrix concepts.

By using cash flow as a conceptual proxy for market attractiveness (recognizing that markets are ultimately only attractive if they are cash generators), the PLC can be neatly juxtaposed on the portfolio matrix, directly linking the concepts.



Again, the key takeaway is that a company, to avoid dependence on external financing, needs a portfolio of products. Mature products generate the cash that supports the growth products, which are the future cash generators.

* * *

(3) Reinforcing core positions

From a strategic / tactical perspective, products rarely stand alone. Businesses typically consist of a mix of products and product lines.

For example, as discussed above, ***crossing the chasm*** from the early adopter segments to the mainstream market requires a "whole product". From a narrow perspective, this means having a product that is complete and debugged. From a slightly broader perspective, this means having a full set of ***complementary products*** that provide a complete, workable solution to customers. For example, Black & Decker's core products are power tools (drills, saws, etc.), but the company offers a line of complementary accessories (drill bits, saw blades) to make the product "whole".

More generally, many marketers (and most sales forces) often argue that a broad product line is required to fully cover all (or most) customer / market requirements, and to erect barriers to fend off competition.

So, there is a prevalent tendency to add product lines, extend product lines to more categories (e.g. drills, then saws, then sanders), add products to lines (corded drills, cordless drills, cordless screwdrivers, etc.), and add basic product choices (e.g. features, size, color, package) or quality variants geared to hit different price points (good-better-best, industrial vs. consumer).

Many of these ***line extensions*** do, in fact, provide meaningful strategic or tactical benefits. For example, a longer product line may allow a company to:

(a) Leverage costs via economies of scale and scope

(b) Insulate customers from competitors by enabling one-stop shopping

(c) Offer more choices that are more closely tailored to specific customer requirements

(d) Access incremental profit opportunities (e.g. add-on sales)

Again, traditional financial analysis, and most compensation systems, tend to encourage line extensions. When assessed on a marginal cost basis, individual line extensions are typically appealing. The logic is simple: since the overhead and infrastructure (e.g. manufacturing facilities, sales force) is already in place, any contribution (excess of price over variable cost) that is generated falls directly through to the bottom line.

Unfortunately, the logic isn't quite right. Each and every item added to a line has associated costs. Some of these costs are visible, some are hidden in traditional financial accounting, including:

(a) Administration: the cost of setting items up for processing, reviewing their status, and placing purchase orders

(b) Cannibalization: diverting sales from other models rather than generating true incremental volume

(c) Inventory: disproportionate safety stock is required to maintain service levels when volume is spread across multiple models (the reverse of the ***pooling effect***[27])

(d) Repair parts: separate inventories of model-specific parts may need to be provided throughout the market life of the product

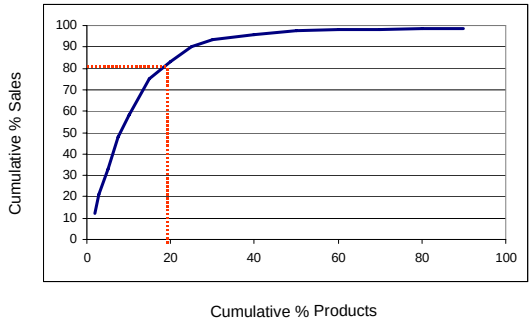
[27] The ***pooling effect*** is a statistical advantage that accrues when products are lumped together. Forecasts of an aggregate group are more precise than for individual items (i.e. lower standard error), so less safety stock is required to deliver the same level of customer service.

While adding products to a line may have low apparent marginal cost, in fact, operating complexity and the corresponding costs increase exponentially as product lines get long. So, the strategic benefits of ***product line proliferation*** must be carefully weighed against the stark financial realities.

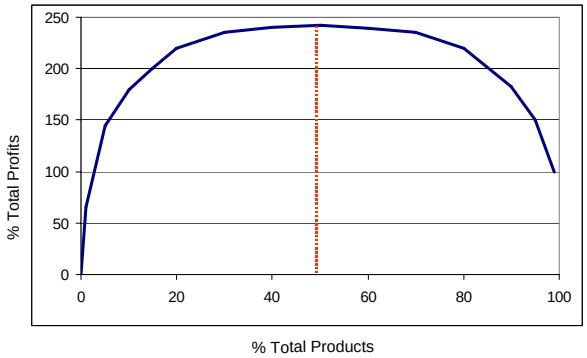
In other words, managers must treat line extensions as major decisions, not marginally incidental ones, and consider all relevant costs. Further, managers should constantly monitor product-specific profitability and make on-going adjustments to optimize the product portfolio.

(4) Managing product line profitability

For most companies, product line proliferation is a profit-drain, actually hurting profits. Specifically, Pareto (and his 80 / 20 Rule) is alive and well in most companies. Based on broad empirical observation, it is remarkably typical that 80% of a company's sales are generated by a relatively small portion of its products (20% or fewer).



On a profits basis, the effect (known as the ***whale curve)*** is even more pronounced: often 50% (or less) or all products generate more than 100% of a company's profits. That is, the bottom half of all products in a line actually lose money and reduce profits.



The obvious question is why don't more companies recognize these profit dynamics and pare back to a profitable core of products?

There are two basic explanations. First, some products do provide substantial (and real) strategic benefits that compensate for their unfavorable economics. In other words, profits earned by other products in the line, or at a later time, would be lost if the loss-producing product were dropped. More specifically, some product models have focused strategic importance:

- ***Flagship models,*** often higher-end products, establish a company's image in the market despite relatively low sales.

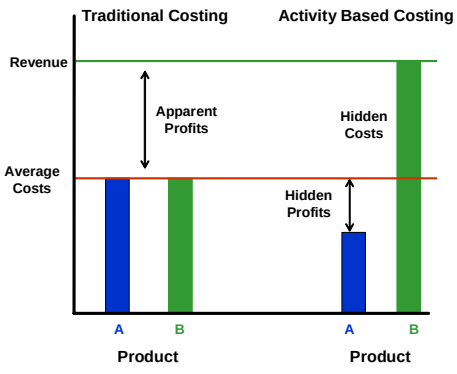
- ***Derivative models*** (slight variations of a core product) are often tailored to specific customer requirements.

- ***Sheltered models*** (also slight variations of a core product) are unique products restricted to select accounts, intended to protect retail margins by frustrating a buyer's price comparison process.

- ***Fighter models*** are typically priced aggressively, sometimes offered at a slight loss, but produced in limited quantities to contain financial downsides and protect core models.

A second explanation for losing products in a line is that traditional accounting systems and statistical averages obscure the real economics, in effect, hiding both costs and profits. In other words, managers aren't aware of the profit implications.

More specifically, most businesses (especially those with a large services component) incur substantial indirect costs (e.g. overhead, support, supervision). Most financial accounting systems assign direct costs (like direct labor and material) back to individual products with a relatively high degree of precision, but allocate indirect costs proportionately (based on sales or some other volumetric measure) across customers and products. So, products that actually generate proportionally more indirect costs (e.g. low volume or specialty products) are, in effect, subsidized by those products that generate proportionally less indirect costs (e.g. high volume, standard products). Profit is overstated for some products, and understated for others.



Activity Based Costing (ABC) is a methodology for reframing traditional financial accounting data to more precisely measure product level profitability by:

(a) Mapping indirect costs by activity (rather than by organizational departments)

(b) Identifying the specific activities that actually drive most costs (e.g. the number of calls to a customer service centers drive their personnel costs)

(c) Determining the relationship between activity levels and costs (e.g. $25 of fully loaded cost per customer call)

(d) Mapping the indirect costs to specific products based on the products' activity levels

(e) Re-calculating product profitability based on direct and activity-based indirect costs

Since ABC requires reclassifying data, approximating based on assumptions, and gathering of raw supplementary information, it is inherently time-consuming and, to some extent, imprecise. But, the process more than adequately reveals the sources of profitability, and flags profit drains which can be remediated by one or more of 5 Rs:

(a) Repriced at higher levels to increase margins

(b) Reprogrammed: modifying ordering terms and conditions for higher profitability, e.g. instituting minimum order quantities

(c) Redirected: inducing customers to buy more profitable substitute products

(d) Replaced by redesigned products that are more profitable (e.g. cost-reduced versions, or higher margin step-up models)

(e) Retired from the line (i.e. dropped), foregoing the sales and avoiding the losses

As a general rule, classical thinking has been that a company should strive for the shortest line of products that is strategically viable, and manage its product mix by rigorously screening line extensions, being constantly vigilante of product-specific profitability, and being willing to manage losers aggressively.

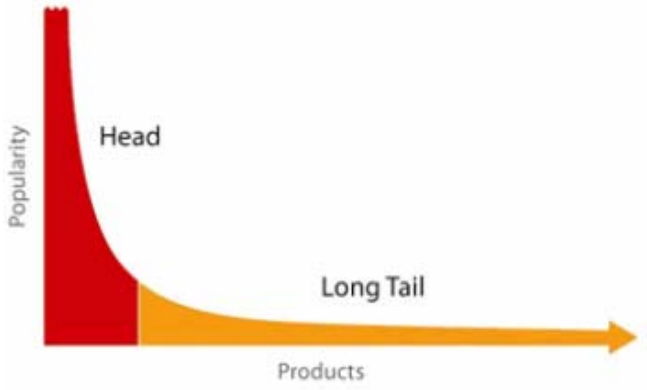
The Long Tail[28]

The view that product lines should be kept is being challenged as markets fragment into an increasing number of micro-segments and consumers seek out greater product variety.

It is argued by some that variety-seeking had been suppressed by the limited assortments in space-constrained local brick & mortar outlets, and by the high cost of shipping "eaches" across the country. .

But, broadband access has put Internet searching and ordering in the hands of the masses, and increasingly competitive and efficient distribution systems (e.g. via the Internet for digital products like music, and via FedEx, UPS, and USPS for physical products) have made long distance shipping of small quantities economically viable. So, companies can "roll up" geographically dispersed local markets and service them from centralized distribution points,

As a result, these "long-tail" products -- essentially the low volume items that Pareto's 80-20 rule dismisses – are becoming an significant part of some companies business mix .



For example, both Amazon and Netflix do a substantial amount of business (approaching half of their orders according to some sources) selling titles that are low volume individually (so they aren't carried in many space-constrained brick & mortar stores), but high volume collectively (when local market demand is aggregated on a national level).

Long-tail advocates argue that selling more than the "hits" offers high untapped profit potential for many companies. Skeptics answer that the long-tail may hold true for the digital world, but that -- for most physical products -- time-tested inventory economics, the diseconomies of operational complexity and oil-fueled shipping costs will keep product line proliferation in check.

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[28] The Long Tail concept traces to an article by Chris Anderson in Wired Magazine, October 2004

Product Summary

In summary, the product P revolves around a few core concepts, frameworks, and principles:

- Augmented products deliver bundles of benefits
- Customers buy based on relative perceived value
- Value mapping provides insight into RPV
- Products go through life cycles
- The PLC can be managed to enhance profitability
- Products must be combined into strategically powerful and financially viable lines

And while products are central to a company's marketing strategy, they must be supported by an **integrated marketing mix** of complementary program elements (i.e. the other 3 classical Ps).

For example, if a product is designed to the proper market-driven specifications and "made to spec", then non-product Ps – especially promotional elements like advertising and other customer communications – must operate to close any gaps between customer perceptions and positive realities (e.g. when customers are unaware that a product delivers a particular benefit).

Conversely, while effective promotion may be able to generate the transient allusion that a poor product delivers the desired benefits, a product is doomed if it doesn't actually meet the customers' requirements. Ultimately perceptions converge on realities.

Product Strategy Frameworks - Summary

The foundation product strategy framework is the Product Life Cycle, which is conceptually derived from Diffusion Models and the Technology Adoption Model. The likelihood and rate of adoption can be assessed using Roger's 5 Factors.

While the PLC is broadly representative, it is not a "law" or an inevitable fate. The PLC must be managed to maximize profitability.

Some products hit "tipping points" and grow quickly, others fail to "cross the chasm". Specific actions can be taken to increase the odds of crossing the chasm: initially focus on vertical niches, attacking them with a complete "killer application"

Products are typically most profitable in their maturity stages, which can often be prolonged through PLC regeneration – e.g. repurposing, porting, or upgrade cycling.

When approaching end of life, products can be harvested for maximum profitability, or discontinued if losses seem inevitable.

Recognizing that new products are heavy users of cash, and that mature products often generate cash, companies try to construct self-funding product line portfolios that have a mix of new and mature products.

Longer product lines are a natural tendency since most accounting systems under-cost incremental products added to a line.

The "long tail" framework suggests that longer product lines offering increased variety are strategically desirable (bordering on necessary) and are becoming economically viable (thanks to Internet searching and ordering, and highly competitive shipping rates from centralized distribution points).

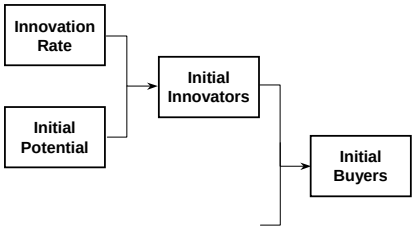
Appendix A – Simplified Diffusion Model

The essence of ***diffusion models*** – the foundation of PLCs – is that buyers will typically fall into two broad categories:

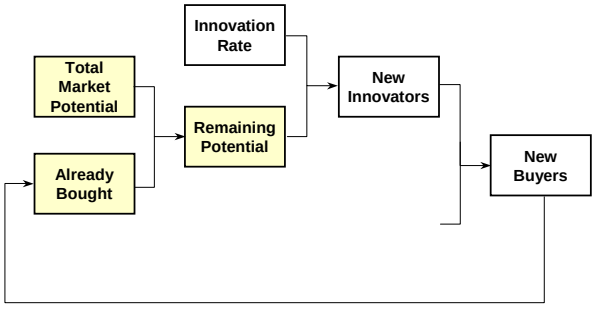
(a) ***Innovators*** strive to "first in" to a product (or are, at a minimum, comfortable being pioneers) and are motivated by primary information that they get directly from the market (e.g. the producing company, leading edge reporters)

(b) ***Imitators*** are followers who want the security of buying "proven" products, and are more motivated by interpersonal influences (e.g. recommendations of trusted acquaintances and consumer watchdog publications).

Conceptually, in a simplified diffusion model, the first round of product sales is a function of the total base of potential customers (***initial potential***) and the proportion of early-in innovators in the base (***innovation rate***). These factors yield the number of ***initial innovators*** who buy in the first round and are, by definition, the only ***initial buyers.***

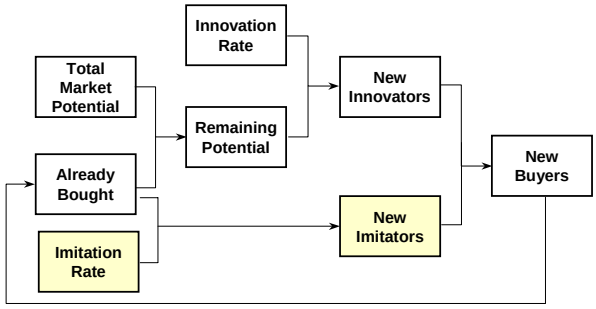


The second and subsequent rounds are slightly more complex. The number of buyers in the first round (***already bought***) is subtracted from the ***total market potential*** (assuming for simplicity that the potential market itself doesn't grow) to determine the ***remaining market potential***. The second round ***innovation rate*** (which may be higher or lower than the initial innovation rate) is applied to the remaining market potential to determine the number of ***new innovators*** entering the market as ***new buyers***.



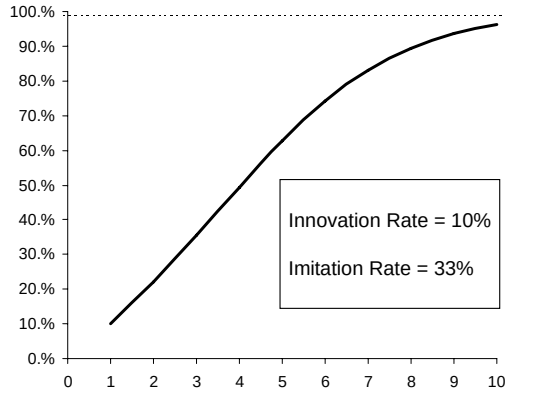
These innovators will be complemented in the second and successive rounds with imitators who enter the market. Some innovators bought the product in round one, and they serve as reference points for the earliest-in imitators.

So, to complete the picture, the imitators must be included in the sales base. The number of ***new imitators*** is simply a function of the population that ***already bought*** and the ***imitation rate,*** which captures the time phased influence of buying pressure implicitly exerted by the early buyers. So, the greater the existing sales base is, the higher that the number of imitators will be (assuming a relatively constant imitation rate).[29]



Over time, based on the diffusion model logic, ***market penetration*** – the percentage of potential customers who have actually bought the product – will increase at an initially accelerating rate as both innovators and imitators enter the market. Eventually, a point of ***market saturation*** is reached, i.e. practically all customers who are likely to buy have bought. As the market becomes saturated, the market penetration rate slows.

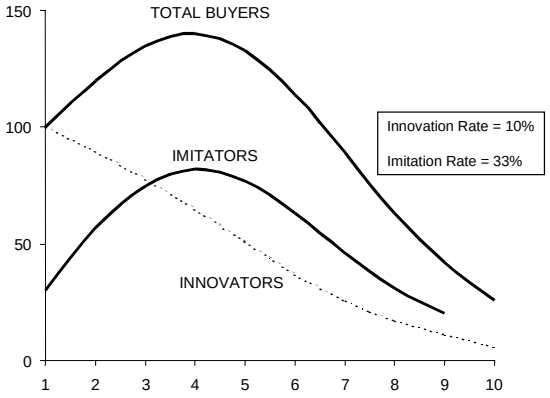
Illustrative Diffusion Model Penetration Pattern



[29] In the rounds subsequent to the second, an adjustment must be made to include only the number of new incremental imitators.

Also over time, the number of innovator buyers declines (since, by definition, innovators buy early-on); the number of imitators initially increases, but eventually crests as the market becomes saturated.

Illustrative Diffusion Model Buying Pattern



Most important, the combined number of total buyers (innovators plus imitators) takes on the familiar shape of the product life cycle, illustrating the conceptual link.

Bass Model Math

The mathematically precise Bass Model formula is:

$$N(t) = \overline{N} \left(\frac{1 - e^{-(p+q)t}}{1 + (q/p)e^{-(p+q)t}} \right)$$

where:

p = coefficient of innovation

q = coefficient of imitation

N(t) = total number of adopters of the product up to time (t)

N = total number of potential buyers of the new product

Fortunately, there is a simplified version of the formula that captures the essence of the model's math, that is somewhat less complicated, and that is Excel-ready.[30]

$$N(t) = N(t-1) + [p\,(m - N(t-1))] + [q\,(N(t-1) / m)\,(m - N(t-1))]$$

Which reduces to :

$$N(t) - N(t-1) = [p + q\,(N(t-1) / m)]\,[m - N(t-1)]$$

where,

p = coefficient of innovation

q = coefficient of imitation

N(t) = total number of adopters of the product up to time (t)

N(t) – N(t-1) = total number of adopters of the product in period (t)

m = total number of potential buyers of the new product

For example, the average Bass parameters across a broad range of products are p = .03 and q = .38. Assume a number of potential buyers m = 10,000.

The number of adopters in the 1st period (t = 1) would be 300 [10,000 times the .03 innovation rate = 300].

Plugging into the formula:

p = .03, q = .38

q x [N(0) / m] =
.38 x (0 / 10,000) = 0

.03 + 0 = .03

. m - N(0) = 10,000 - 0 = 10,000

.03 x 10,000 = 300

The number of new adopters in the 2nd period (t = 2) is a bit more complicated. Again, plugging into the formula:

p = .03, q = .38

q x [N(1) / m] =
.38 x (300 / 10,000) =
.38 x .03 = .0114

.03 + .0114 = .0414

. m - N(1) = 10,000 - 300 = 9,700
9,700 x .0414 = 402

[30] For a downloadable working version, go to www.HomaFiles.com and search for "Bass Model Interactive Spreadsheet".

Below is the complete spreadsheet for the parameters [p = .03, q = .38, and m = 10,000] and the corresponding adoption curves:

m	p	q
10,000	3%	38%

t	m - N(t-1)	N(t-1)	# Innov	# Imitators	Total Adds
0	10,000	0			
1	9,700	300	300	0	300
2	9,298	702	291	111	402
3	8,772	1,228	279	248	527
4	8,099	1,901	263	409	673
5	7,271	2,729	243	585	828
6	6,299	3,701	218	754	972
7	5,224	4,776	189	886	1,075
8	4,119	5,881	157	948	1,105
9	3,075	6,925	124	921	1,044
10	2,174	7,826	92	809	901
11	1,462	8,538	65	646	712
12	944	9,056	44	474	518
13	591	9,409	28	325	353
14	362	9,638	18	211	229
15	218	9,782	11	132	143
16	131	9,869	7	81	88
17	78	9,922	4	49	53
18	46	9,954	2	29	32
19	27	9,973	1	17	19
20	16	9,984	1	10	11
21	10	9,990	0	6	7
22	6	9,994	0	4	4
23	3	9,997	0	2	2
24	2	9,998	0	1	1
25	1	9,999	0	1	1