

MARKETING REQUIREMENTS for HIGH TECH START-UP & SMALL BUSINESSES

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INTRODUCTION

The reason for the success or failure of a new business or a new product within an existing business is most often marketing, more so than any technology. Marketing links a company to the outside world; it defines the company's interaction and place within its environment.

Surveys of Start-Ups indicate companies don't spend enough time researching the new business idea to determine its viability, they miscalculate the size of the market and the potential market share, they underestimate financial requirements, sales, volume, and timing, and make low cost estimates. These issues may be categorized as *poor market planning and poor product planning*.

The viewpoint here is that of the *high tech* Start-Up or small business. Technologists start most high tech firms but personally often lack skills and experience in marketing and sales. Typically, the inventor becomes VP of engineering, and one of the other founders assumes the CEO position (at least temporarily). The next most important position to fill should be the VP of Marketing. Marketing should be as prominent within the company as actual product creation. Investors do not like risking monies on a technology looking for a market.

Many marketing references are very general, poorly written and the methods are not useful to high tech and not up to date. From personal experience, technologists who become Entrepreneurs/Founders are not averse to marketing—they are pragmatic. They want to know and understand what works since their time and money resources are limited; hence, the motivation for this E-Book—provide a practical resource. It describes and explains methods used by established companies that may be adapted for small business.

Established companies use a Marketing Requirements Document (MRD, the term appears to be derived from systems engineering) to assess needs for new products, determine market sizes and a customer base, to look at new markets, plan the launch of a new product, and also determine the need to partner, acquire, or invest in an opportunity. This E-Book suggests using an MRD within the new small company.

The MRD may be used as an input to a business plan. There are two types of Business Plans. An external plan seeks financing/investment. An internal plan maps the business and describes the overall company purpose, strategy, goals, and products in detail for operations. This document describes the use of a MRD and its relation to Business Plans written to seek external funds. Due to the Start-Up perspective, more emphasis is placed on *strategy* than would be contained in a normal MRD. The MRD also bridges across operations planning linking to product development.

High Technology products generally diffuse from the Top—Down. Business-to-Business (B-to-B) sales occur at the top, with products created that eventually find their way into consumer products - Business to Consumer (B-to-C) - nearer the bottom of the chain. However, this technology diffusion scheme is not a hard and fast rule.

Most high tech Start-Up businesses will not sell products directly to consumers; rather they will sell to existing companies that sell to consumers, industry sectors, and government. The emphasis here is on B-to-B sales of advanced technology products/services. These customers have very different buying habits than consumers.

This document mostly follows the MRD Outline of [APPENDIX A](#), which has five main sections: Executive Summary, Business Case, Market Requirements, Marketing Strategy, and Product Requirements. There is more emphasis given to the Business Case, Market Requirements, and Market Strategy sections.

A MARKETING FIRM'S EVALUATION CRITERIA

High tech Start-Ups unconvinced that marketing and sales are as important as technology, should consider the following.

During the Dot Com boom years of the late 1990s, many Start-Ups subscribed to the services of professional marketing research firms even when they could not afford them. [It is not the purpose here to advocate or not advocate subscribing to services of market research firms.] The Gartner Group created what they called a Magic Quadrant analysis, used to evaluate firms in Information Technology. Investors **expected** to see Gartner's figures in new IT business plans, especially those seeking an IPO. Their proprietary analysis is still used by established buyers to aid purchasing decisions.

The Gartner analysis evaluates whole industry segments and sub-segments then rates companies according to criteria. Their quad chart categorizes companies as challengers, leaders, niche players, and visionaries thus it provides a scorecard to competitors. The vertical axis of the Quad Chart is Execution, the horizontal axis is Vision, and the criteria are listed in Table 1. While their analysis was developed for IT, the evaluation criteria seem appropriate for almost any product/service.

Table 1 GARTNER'S MAGIC QUADRANT EVALUATION CRITERIA DEFINITIONS	
ABILITY TO EXECUTE	COMPLETENESS OF VISION
Product/Service	Market Understanding
Overall Viability (Financial, Strategy, Organization)	Market Strategy
Sales Execution/Pricing, and Sales Channels	Sales Strategy
Market Responsiveness and Track Record	Product Strategy
Market Execution	Business Model
Customer Experience	Vertical/Industry Strategy
Operations	Innovation (refers to total resource mgmt.)
	Geographic Strategy
Ref: Gartner RAS Core Research Note G00137850, Michael J. Blechar, Jim Sinur, 27 February 2006 R1713 6052006	

Note that most criteria relate to things other than the product, referred to only once. This suggests that in the eyes of reviewers the product itself, though important, is not as important as the other components of an operating business. Likely, intelligent investors will have these criteria in mind when evaluating plans from new businesses.

Most times on first looking at the business plan reviewers are not interested in the details of the technological innovation. They assume the product works or will work. But if the company leaves out, inadequately explains, or fails to convince the reviewer about its proposed marketing, sales, distribution, operations, financials, and the business model, the plan will not be taken seriously and is immediately bypassed.

MARKETING REQUIREMENTS DOCUMENT

New high tech companies generally focus most efforts on a product's requirements and development. The typical company likely knows a lot about their technology, design, engineering, and prototyping but not as much about marketing and sales (M&S). The company philosophy tends toward "build it and they will come," or "we have the best product since sliced bread," the product will sell itself.

Mature companies introducing new products follow a more systematic path realizing the importance of market research and analysis on one side and technology development plus engineering on the other side. While some organizations follow parallel paths, a "determine the market, then develop the product," reflects a market orientation and customer first philosophy.

In the mature company there is a near continuous process of monitoring the environment to identify potential opportunities to introduce products as opposed to a process of waiting for problems to occur then initiating development. Borrowing terminology from Systems Engineering, these companies use a Market Requirements Documents (MRD) and a Product Requirements Documents (PRD) to create and introduce new products.

One reason Start-Up high tech companies do not develop a customer and market approach is that funding and additional resources are viewed as more important issues as these are front and center almost all the time. Technology professionals are wary of marketing personnel believing marketing is far less important. The reality is both technology and marketing are vital in producing products that create value for customers and lead to something that can be sold for profit.

RELATIONSHIP BETWEEN MRD AND PRD

A Marketing Manager acquires data from the real external environment then analyzes it to determine the gaps that exist which can be filled by the company's existing products, the pain points that can be alleviated by the introduction of new products, market growth, growth rate, and the competitors and their products. He defines a strategy and ties it to the company's overall mission and objectives.

The Product Manager uses the MRD as an input to create the PRD. The PRD concentrates more on the technical definition, specification, and performance of the product and how to build it.

The Engineering Team uses the PRD and details the make/buy decisions, manufacturing, coding, assembly, integration and testing, and validation of the hardware/software. In large organizations - especially those working under Federal Government contracts - there is an assessment of the Manufacturing Readiness Level (MRL) and a corresponding Manufacturing Requirements Plan is written.

Executive Management approves the MRD, where it passes on to the Product Manager to create the PRD, back to Exec Management for approval, then back to the Product Manager and finally on to Engineering. In some organizations, a Product Director does

the work of the Marketing and Product Manager. The Sales group gets the deliverable out the door and to the Targeted Customer.

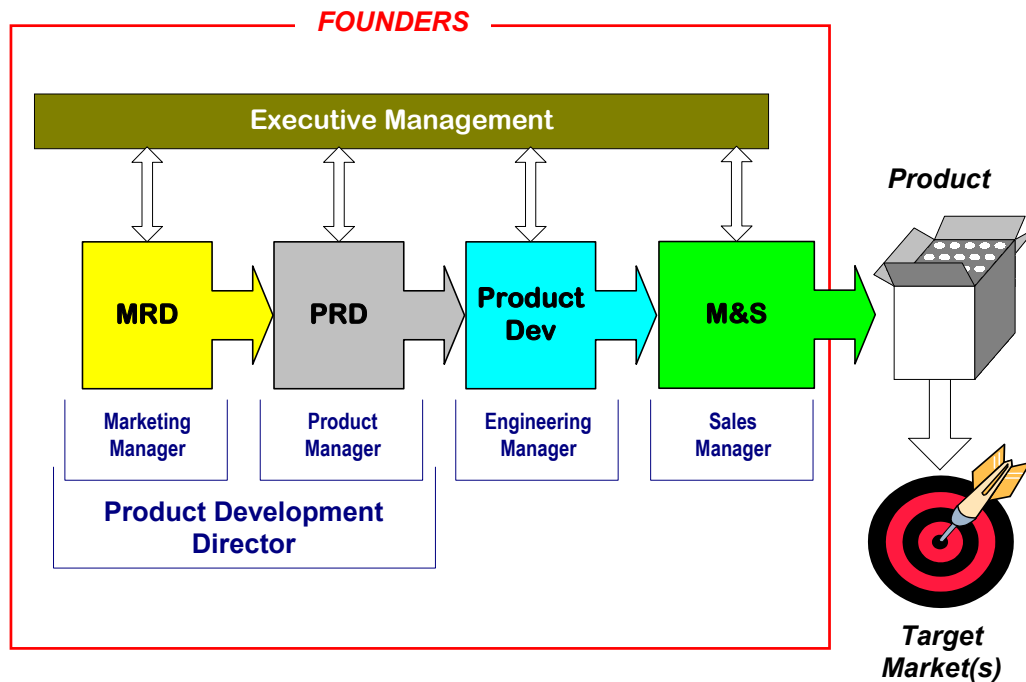


Figure 1 Roles, Relationships for Small Business

Figure 1 shows a typical workflow and relationships from the viewpoint of the small business or start up. Conflicts among Marketing, Sales, Engineering, Manufacturing, and Management are avoided because the Founders manage the company as a whole and in most instances perform many of the functions entirely or partly themselves.

Many large companies have adopted this “Entrepreneurial approach” for product innovation calling it an **adventure team**, or more modestly, a **cross-functional capability**. In the small/start up company environment, the Founders function in multiple roles de facto due to limited resources.

The small business can use both the MRD and PRD in two ways. The complete versions of the documents may be used as *inputs* to an Internal (or Operational) Business Plan that includes creating a new product. These documents are more extensive than the sections found in Investment Plans, which are shorter and highly focused. Excerpts from the MRD provide the basis of the Marketing/Sales section of an Investment Plan, and the PRD provides the basis of the Product section.

The following section starts following the MRD outline of [APPENDIX A](#).

EXECUTIVE SUMMARY

As with most summaries compose this after writing all other sections. This must be succinct—two pages—with four basic considerations as follows.

1. OPPORTUNITY

- A statement of the current **market conditions** based on analyses
- A description of the **targeted market**, its projected **size** and near term **growth rate**
- The exact **product** created to serve the needs of this target market

2. COMPANY COMPETANCE & FIT

- A justification of why the company has the capability to address the target market based on its **sustainable competitive advantages**
- How the product will be created using the company's **resources**, internal and external
- The fit with company **core competencies**
- How this product helps achieve the company's **mission** and **goals**

3. FINANCIAL OBJECTIVES

- **Profit** and **revenue** projections; Margins
- A Measure of **Return on Investment (ROI)** (there is a difference for an established company vs. a Start-Up - see [APPENDIX E](#)).

4. WINDOW OF OPPORTUNITY/DELIVERY

- The market **timing drivers** of the conditions from item 1 above
- The **timeframe** available to create the product and get it to market with key **milestones** identified and tied to a **real calendar**
- Consistent with the targeted market, a **product development schedule** and **financing schedule**

BUSINESS CASE

VALUE PROPOSITION

A Value Proposition is difficult to articulate for many businesses Start-Up or not. It must be pithy and express tangible results, usually in the customer's terms. Elevator speeches may be derived from carefully prepared Value Propositions and Positioning Statements (see section [POSITIONING](#)).

High tech people easily understand scientific and engineering oriented results expressed as, for example, "10 times faster data rates," "package light weighted by 20%," or "friction reduced to resemble a Teflon like surface." For Value Propositions, the product offering should be stated succinctly in terms of what is in it for the customer. Financially oriented phrases support these tangible results. Terms such as increasing revenues, delivering product to market faster, being operationally more efficient, increasing customer retention numbers, increasing market share, and similar quantifications make good supporting statements.

Writing a Value Proposition and overall Business Justification might be better left to the end. Using a market driven approach, customers will be identified, the product will be justified, supporting elements required will be identified and substantiated, etc. The overall process will be easier as the plan will articulate the need and show how to address the need with a valuable product.

BUSINESS JUSTIFICATION

For all firms, new products generally are justified within the context of the firm's mission, purpose, and goals. The particular product must be justified financially using return on investment metrics such as Internal Rate of Return (IRR), Net Present Value (NPV), Return on Assets (ROA), and other financial measures.

These financial measures generally will not apply for the Start-Up. The whole Business Plan must justify and support the new company's creation. Return on the investor's investment is important but cannot be measured by IRR, NPV, or ROA. Venture Capital Investors generally seek returns in excess of 300% within 5 years; meaningful metrics may be Weighted Average Cost of Capital and Economic Value Added (for a concise explanation see [APPENDIX E](#)).

PRODUCT CONCEPT

The high-tech firm will easily expound on the Product Concept and describe in detail its workings. Most of this may be excerpted from a PRD. The trick is to write this succinctly, capturing the essence, and with some imagination for audiences that are neither engineers nor scientists: the buyers and investors.

The detailed descriptions should be available for review at a later time in the process—for the technical buyer/user that thrives on detail and needs it to be convinced, and when a serious investor requires due diligence before investing.

MARKET ANALYSIS

First identify and classify, then summarize sectors. Focus and define the potential customers by:

- **Segmentation** – divides the market into increasingly finer subsets having discrete and similar needs; reduces the universe to manageable, quantifiable pieces
- **Targeting** – prioritizes and selects segments, focuses on most viable (profitable, easy, without competition, high growth) to address based on company's capabilities or competencies
- **Market Size & Growth Rate** – determining segment size using indicators such as volume of product, number of actual users, buyers and their quantity buys, sales revenue, and the expected rate of increase/decrease of the indicator within the segment(s).

This process is as follows. A Segment has similarities and differences. However divided, quantifiable attributes must be defined so that it is clearly seen how a different product fulfills a need of the Segment and how much potential revenue the product may derive from the Segment. In dividing the market into increasingly smaller subsets, the resultant Segment(s) targeted – Target Market(s) – must be large enough to be *profitable*. Ideally the business strives for dominance – monopoly – at least over this slice using its competitive advantages. The Targets must also be *accessible* – it must be possible to efficiently reach each through a marketing/sales strategy.

This is a top—down construct. From a general database, continuously dissect the base into finer pieces until arriving at a segment addressable by the product. Figure 2 conceptually illustrates the segmentation process.

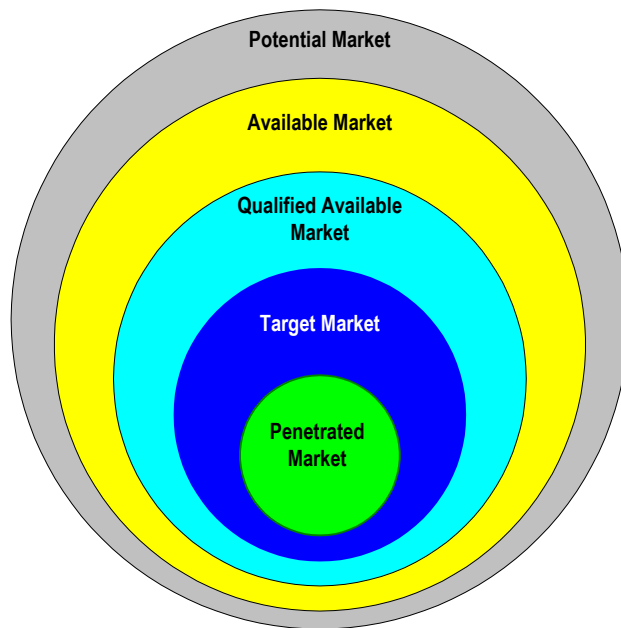


Figure 2 Segmentation Process

For example, a company with a product related to software for downloading video for entertainment may start with a Potential Market of North America. The Available Market may be the number of people with cell phones. The Qualified Market may be the percentage using cell phones for video downloads. The Target Market may be the percentage that downloads video on a cell phone that uses a select operating system. The Penetrated Market will be actual number using the new product. Revenue projections are based on the Target Market Segment.

At any point in time Markets include the immediate past and projected future, about 3-4 years. Determine the Competitors' shares of the market from past performance and future projections and sizes. In the absence of hard-core numbers, an intelligent guess might be made using a percentage that is reasonable, erring on the

conservative side. For example, assume the new product targets 5% of the Qualified Market in the first year and increases each year thereafter.

The most useful aspect to this approach may be a filtering of the market to coarsely quantify bounds. If numbers do not translate into significant revenue, something must change—the product, more products, more segments, changes in sales, or other—this is part of an overall strategy. This is the most popular process in use, but bear in mind, the less hard-core specific information available, the more assumptions made, and the more challenges to defend.

Disruptive high tech products usually serve small markets initially (see [NICHE STRATEGY](#)). The more unique the new product, the less useful the top—down process will be to quantified sales forecasts. The process limits itself to qualitative analysis and analogous comparisons with products in similar sectors.

An alternative uses a bottom-up construct. It compiles a list of prospective customers, narrows it down to a profitable group that the company feels it may serve, and then builds a profile of common characteristics, such as location and buyer preferences. Profiles are used to filter large enough segments to uncover potential new customers and to estimate sales quantities. Products and marketing tactics are refined and tailored to address this profile. This process works if the new company establishes deep relationships with several potential buyers and is able to obtain realistic data. This holds particularly well if those few buyers are large, established, and well known.

While most current emphasis is on a market driven approach to product development, it is true that some advanced technology discoveries still adapt a product driven segmentation approach. For this to apply the new technology must usually be revolutionary even if it is revolutionary only in some small way. But rather than the approach of “build it and they will buy it” the new technology must be translated into a tangible response to a real customer’s need – it must be transformed into a product to determine its usefulness and therefore value.

Segments are defined by grouping customers in the same categories. For advanced technology products from Start-Ups needing to focus their efforts to succeed, the segmentation process will yield a limited number of potential customers especially for B-to-B sales. If a high tech advance is to be integrated into a consumer product, then the industrial company’s consumer user base must be analyzed.

In B-to-B sales, segmentation variables include but are not limited to:

- Company size
 - Number of employees
 - Number of plants
- Geography
 - State
 - Regional
 - National
 - Multi-national
- Organization
 - Centralized vs. localized

- Buying procedures fixed or flexible
 - Buyers vs. ultimate users
 - Decision procedures
 - Company policies
- Economic Factors
 - Type of company's customers, size of customers
 - Production/manufacturing and technology utilized
 - Turnover
- Personal characteristics
 - Degree of Buyer technical competency
 - User influence in Buyer decision
 - Loyalty to existing suppliers
 - Attitude to new, evolutionary, disruptive technology product
- Product Benefits
 - Lowers cost
 - Improves efficiency
 - Improves performance
 - Must be State of Art
 - Ilities
 - One of a kind
 - Other efficiency measure
- Customer's acquisition channels
 - Direct
 - OEM
 - Distributor
 - VAR
 - Other

In most occasions, a company buys for only one or two specific reasons and for specific applications within the company. Once these reasons and applications are identified and some of the above mentioned segmentation variables also associated with the company are known, it is usually easy to get to at least the buyer. The buyer may be different from the user (the usual case with government purchases/contracts) and when this occurs, both must be targeted.

COMPETITIVE ENVIRONMENT

Market Analysis combined with knowledge of the competition and their products provides SITUATIONAL AWARENESS within the current Competitive Environment.

COMPETITION

A “minimum data set” needed for analysis includes identification of: the number of competitors, market share by revenue and volume, sales by brand, sales and profits by market, product distribution method, and advertising strategy. Later, additional data will be very valuable in formulating marketing tactics (see, [COMPETITION STRATEGY](#)). The effort required to obtain accurate, actionable data emphasizes the need for the small business to focus.

The number of competitors and each competitor’s share of the market segment indicate dominance or openness. General guidelines are:

- $\geq 60\%$ share indicates a dominant position
- 30%-60% share a position of strength, and
- $< 30\%$ share is not strong.

The Herfindahl Index is easily computed and used as a gauge. The Herfindahl index is computed simply as the sum of the squares of the percentage market shares of each firm in the segment. It ranges from 0 (atomistic market) to 10,000 (complete monopoly) – or if normalized (by 10,000), from 0 to 1.

The Department of Justice uses the index to evaluate mergers and acquisitions and characterizes an index below 1000 as unconcentrated, 1000-1800 as moderately concentrated, and above 1800 as highly concentrated (U.S. Dept. Justice and Federal Trade Commission, **Horizontal Merger Guidelines**, Issued 2 Apr. 1992, Rev. 8 Apr. 1997, Section 1.5 Concentration and Market Shares; see www.usdoj.gov/atr/public/guidelines/horiz_book/hmg1.html).

As an example, assume one large company with 2/3 of the segment and two others each with equal market share. The index equals 6667. If the three companies divided the market equally, the index equals 3333. This is a highly concentrated market.

A small Herfindahl Index indicates a competitive market without dominant players. Decreases in the index imply an increase in competition. Share statistics may be expressed as unit market share (sales as a fraction of total market volume segment) or revenue share (fraction of total dollar volume of market segment); thus, the value of the index may be different.

When the targeted market has large sized competitors, the small company is disadvantaged due to economies of scale: inability to purchase supplies in volume, higher manufacturing costs, and higher distribution costs. In oligarchic markets, there are barriers to entry put up by the big companies (see [KEY FEATURES TO MATCH AND AREAS OF DIFFERENTIATION](#)).

STRENGTHS, WEAKNESSES, OPPORTUNITIES, THREATS (SWOT)

Strengths and Weaknesses refer to the *internal makeup* of the company while Opportunities and Threats refer to the *external environment*. Figure 3 is an example of this 2x2 matrix. This qualitative matrix is an easy to construct framework indicating the company's state within current environmental conditions – a **situational analysis**. Since the environment always changes, constant monitoring is necessary. The *Taijitu* symbol emphasizes this constant company-market relationship, which is always changing in time.

Politics, Economy, Society, Technology, Environment, and Legal (PESTEL) broadly

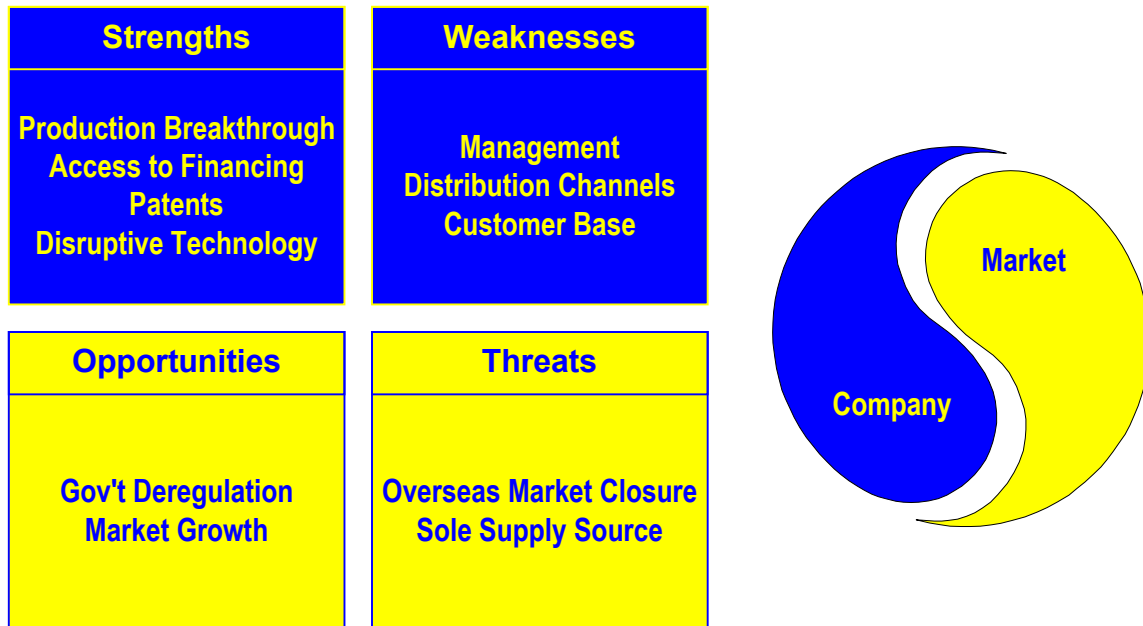


Figure 3 SWOT Table and the Constant Market—Company Struggle

categorize Opportunities and Threats. Other broad categories include Demographics and Competition.

A variation on this matrix weights the identified factors within each quadrant and scores each on a defined scale (using an Analytical Hierarchy Process) to come up with a weighted score. A table of the highest weighted items provides the basis for a Strategy in the *identified timeframe under the current conditions* that is, time is an independent variable.

The (NIST) Malcolm Baldrige Model (www.exinfm.com/excel%20files/baldrige.xls) identifies 91 criteria for assessment in 7 general categories: leadership, information and analysis, strategic planning, human resource capital, process management, quality and operating results, and customer satisfaction. It provides a starting point primarily for an internal assessment and a path for improvement, but no guidance for an external assessment.

TECHNOLOGY READINESS

Evaluation of the company's current technology status may be performed as a key part of the SWOT process. Obviously important to a high tech company, it merits careful consideration. In a worst-case assessment, a product may be technically infeasible.

For advanced technologies, the Department of Defense (DoD) and NASA provide guidance to identify Critical Technology Elements (CTEs), and define examples and best practices to assess Technology Readiness Levels (TRLs). These maturity levels encompass hardware, software, and manufacturing. The agencies use Technology Development Strategies and Technology Transition Agreements to bring items to an appropriate level of maturation. While these procedures may be overkill to commercial products provided by small tech businesses (particularly Start-Ups) it is useful to know of their existence and the TRL definitions.

It is not the intent here to delve into these practices. If a line of business is with the DoD/NASA, it will likely be subject to these assessments. They serve the purposes of risk assessment/management, planning to transition to maturity for the appropriate business application, and in determining funding levels, both internal (R&D) and external (grants, SBIR/STTR, contracts, investment). For some solicitations, the DoD *specifies* the appropriate level the technology *must* be at in order to qualify to bid on development contracts. If you don't know about TRLs and where your technology is in relation to them, you cannot compete. Some independent investors consider companies that have received SBIR contracts as "screened" – they use the SBIR process to vet technology and potentially provide added funds should the company successfully continue to Phase 2 and beyond.

A realistic Business Plan will not develop if the level of the technology is unknown. Venture Capitalists are knowledgeable enough to directly assess technology and when they cannot, will hire someone who can (the DoD uses experts routinely for technical assessments and reviews, and for systems engineering and supplementary program management functions). Overstating the development state of the technology in the Business Plan may lead to thinking it will be transitioned to a commercially viable product in a short period of time when it will actually fall short - this may be fatal.

An assessment is not for the purpose of convincing investors that the technology is new or better compared to competitors' technologies. An honest assessment determines the amount of *additional effort, and therefore resources required*, to turn the Start-Up's technology into a viable and profitable product in the targeted market. In the investment business plan a portion of the funds sought would be required to bring the product's state to the *appropriate maturity level*. Note that at the end of a Phase II SBIR contract the technology is generally at Level 4-5 while the DoD usually seeks Level 6-7 for a follow on, transitioning contract.

For reference the DoD TRL Definitions for Hardware and Software are contained in Tables 2 and 3, respectively. They serve as a starting point to assess the Start-Up product's current maturity level.

Table 2 - Hardware Technology Readiness Levels in the DOD (Source: Technology Readiness Assessment (TRA) Deskbook May 2005)	
Technology Readiness Level	Description
1. Basic principles observed and reported.	Lowest level of technology readiness. Scientific research begins to be translated into applied research and development. Examples might include paper studies of a technology's basic properties.
2. Technology concept and/or application formulated.	Invention begins. Once basic principles are observed, practical applications can be invented. Applications are speculative and there may be no proof or detailed analysis to support the assumptions. Examples are limited to analytic studies.
3. Analytical and experimental critical function and/or characteristic proof of concept.	Active research and development is initiated. This includes analytical studies and laboratory studies to physically validate analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative.
4. Component and/or breadboard validation in laboratory environment.	Basic technological components are integrated to establish that they will work together. This is relatively "low fidelity" compared to the eventual system. Examples include integration of "ad hoc" hardware in the laboratory.
5. Component and/or breadboard validation in relevant environment.	Fidelity of breadboard technology increases significantly. The basic technological components are integrated with reasonably realistic supporting elements so it can be tested in a simulated environment. Examples include "high fidelity" laboratory integration of components.
6. System/subsystem model or prototype demonstration in a relevant environment.	Representative model or prototype system, which is well beyond that of TRL 5, is tested in a relevant environment. Represents a major step up in a technology's demonstrated readiness. Examples include testing a prototype in a high-fidelity laboratory environment or in simulated operational environment.
7. System prototype demonstration in an operational environment.	Prototype near, or at, planned operational system. Represents a major step up from TRL 6, requiring demonstration of an actual system prototype in an operational environment such as an aircraft, vehicle, or space. Examples include testing the prototype in a test bed aircraft.
8. Actual system completed and qualified through test and demonstration.	Technology has been proven to work in its final form and under expected conditions. In almost all cases, this TRL represents the end of true system development. Examples include developmental test and evaluation of the system in its intended weapon system to determine if it meets design specifications.
9. Actual system proven through successful mission operations.	Actual application of the technology in its final form and under mission conditions, such as those encountered in operational test and evaluation. Examples include using the system under operational mission conditions.

Table 3 - Software TRL Definitions, Descriptions

(Source: Technology Readiness Assessment (TRA) Deskbook May 2005)

Technology Readiness Level	Description
1 Basic principles observed and reported.	Lowest level of software technology readiness. A new software domain is being investigated by the basic research community. This level extends to the development of basic use, basic properties of software architecture, mathematical formulations, and general algorithms
2 Technology concept and/or application formulated.	Once basic principles are observed, practical applications can be invented. Applications are speculative, and there may be no proof or detailed analysis to support the assumptions. Examples are limited to analytic studies using synthetic data.
3 Analytical and experimental critical function and/or characteristic proof of concept.	Active R&D is initiated. The level at which scientific feasibility is demonstrated through analytical and laboratory studies. This level extends to the development of limited functionality environments to validate critical properties an analytical predictions using nonintegrated software components and partially representative data.
4 Module and/or subsystem validation in a laboratory environment (i.e., software prototype development environment).	Basic software components are integrated to establish that they will work together. They are relatively primitive with regard to efficiency and robustness compared with the eventual system. Architecture development initiated to include interoperability, reliability, maintainability, extensibility, scalability, and security issues. Emulation with current/ legacy elements as appropriate. Prototypes developed to demonstrate different aspects of eventual system.
5 Module and/or subsystem validation in a relevant environment.	Level at which software technology is ready to start integration with existing systems. The prototype implementations conform to target environment/interfaces. Experiments with realistic problems. Simulated interfaces to existing systems. System software architecture established. Algorithms run on a processor(s) with characteristics expected in the operational environment.
6 Module and/or subsystem validation in a relevant end-to-end environment.	Level at which the engineering feasibility of a software technology is demonstrated. This level extends to laboratory prototype implementations on full-scale realistic problems in which the software technology is partially integrated with existing hardware/software systems.
7 System prototype demonstration in an operational high-fidelity environment.	Level at which the program feasibility of a software technology is demonstrated. This level extends to operational environment prototype implementations where critical technical risk functionality is available for demonstration and a test in which the software technology is well integrated with operational hardware/software systems.
8 Actual system completed and mission qualified through test and demonstration in an operational environment.	Level at which a software technology is fully integrated with operational hardware and software systems. Software development documentation is complete. All functionality tested in simulated and operational scenarios.
9 Actual system proven through successful mission-proven operational capabilities.	Level at which a software technology is readily repeatable and reusable. The software based on the technology is fully integrated with operational hardware/software systems. All software documentation verified. Successful operational experience. Sustaining software engineering support in place. Actual system.

KEY FEATURES TO MATCH AND AREAS OF DIFFERENTIATION

Incumbent companies often use their marketing research to determine features of successful existing products then attempt to match these, improve on them, and add new features to distinguish themselves in some manner. This will does not work well for an entrant company.

Christensen and Raynor (Clayton Christensen and Michael Raynor, 2003, **The Innovator's Solution, Creating and Sustaining Successful Growth**, Harvard Business School Press) found that historically, incumbent companies making improved versions of already available and popular products (Sustaining Products) almost always prevail in the market. Incumbent resources are allocated to maximize profits, and Sustaining Products require only incremental innovations. Sales volumes and profits are predictable, risk is low, and such products maintain the growth of the existing businesses. Under attack by new companies with similar products, incumbents use their resources to *put up barriers to entry* to retain market share because it is *cheaper for them to retain existing customers*.

An entrant with a disruptive product will more likely beat incumbents because the established companies are more motivated to vacate the market. Incumbents may need new technology (expensive, see section, [PRODUCT LIFECYCLE](#), Sunk Costs), the new products may not interest their existing customers (they service the high end with rich features), they may need different sales channels, and they may need to compete with or cannibalize existing products. Sales volumes and profits are unpredictable. Used to doing the same things the same way, incumbents ignore the threats and eventually give up the segment to the new company.

Accordingly, the Start-Up is better off targeting a market where incumbents do not sell at all; matching features is unimportant. **Differentiation** is more important – creating tangible and intangible differences among products and competitors.

General differentiators include: the functions of the product, its price, (psychological) perception of the product, and how and when it is actually used. Technology products use factors relating to technical performance that are generally the “ilities”: quality, reliability, maintainability, dependability, durability, mobility, transportability, interoperability, interchangeability, et al. The most important should be identified and quantified - for example, the new widget lasts a minimum of ten years, is self-contained requiring no maintenance, and uses 25% less power than any item on the market today.

The differentiators will be used later to develop Positioning Statements in conjunction with a Marketing Strategy (see section [POSITIONING](#)).

MARKET ATTRACTIVENESS & COMPETITIVE STRENGTH FACTORS

This is a 3x3 matrix with the horizontal axis representing “Competitive Strength,” and the vertical axis representing “Market Attractiveness.” Products are represented as color-coded circles. The overall diameter represents market size – most of the time this is volume or revenue - and the slice size represents market share. Strength Ratings are divided as Low, Medium Low, Medium, Medium High, and High. This analysis is credited to **GE/McKinsey**.

Factors may include some of the following as shown in Table 4. The lists are representative, not exhaustive.

Table 4 Market Attractiveness + Competitive Strength Factors	
<i>Market Attractiveness Factors</i>	<i>Competitive Strength Factors</i>
Market size	Strength of assets
Market growth rate	Brand strength
Market profitability	Market share
Segmentation	Market share growth
Fit with company’s skills	Customer loyalty
Cost of entry	Relative cost structure
Competitive intensity	Relative profit margins
Pricing trends	Distribution strength
Distribution structure	Production capacity
Demand variability	Record of technological or other innovation
Overall risk of returns in the industry	Quality
Strategic importance	Access to financial capital and other investment resources
Barriers to Entry	Management
Potential left within market	(Disruptive) Technology
Status of market leading suppliers/buyers	Specific competencies
Opportunity to differentiate products and services	Patent portfolio
Distribution structure	Trade Secrets
Technology development status	
Threat of a substitute product	
Government regulation	

It is unnecessary to use all the factors all the time. Select the factors most meaningful and *rate the selections for the same timeframe*. There is always a **STRATEGIC WINDOW OF OPPORTUNITY** - a limited timeframe when the fit between the Market Attractiveness Factors and your unique Competitive Strength Factors are aligned and optimum.

A generic representation of this method, shown as Figure 4 for a hypothetical situation, presents three marketable products on the grid. The red coded product has a high

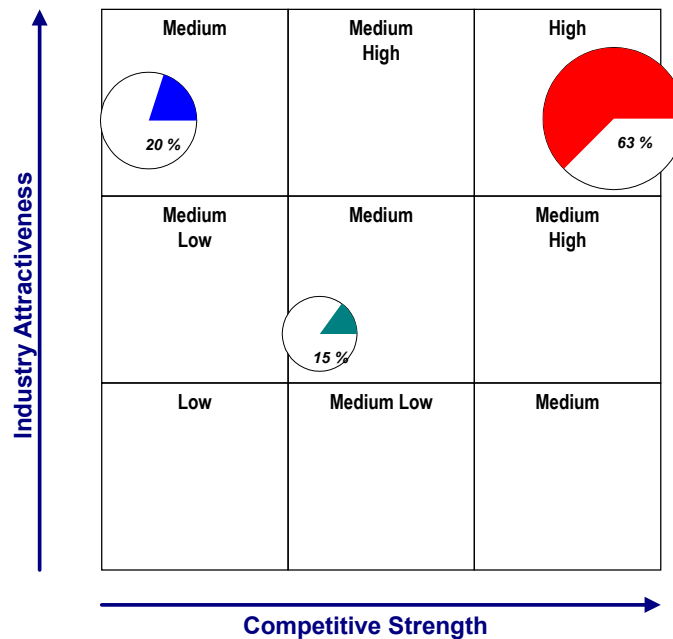


Figure 4 GE/McKinsey Matrix

attractiveness and high strength rating for the company. However, a competitor dominates 63% of the market. The decision is to pursue the remaining third of this product's market, which is larger than the market for two other products, or put efforts into the other markets. Both the blue product and the green product are attractive targets, and are more open to competition at 80% and 85%, but the new company's competitive strengths are weaker compared to the red product.

Figure 5 depicts five selected Competitive Strength Factors – Cost of Production, Patents, Technology, Management, and access to Capital – and compares each against a single competitor using a simple weighted scoring system (other scoring methods such as the Analytical Hierarchy Process may be used). The Strength Factor is weighed from 1 to 5 and the Score from 1 to 10—each Factor scores a maximum of 50.

The factors selected are often those used to evaluate high tech companies against a known competitor. In this figure, the Patent Portfolio and Technology Factor is superior for the new company, but its Management and access to Capital is weaker. Production Costs are rated equal and the new company believes it can at least compete on this basis since its new technology also brings with it lower production costs.

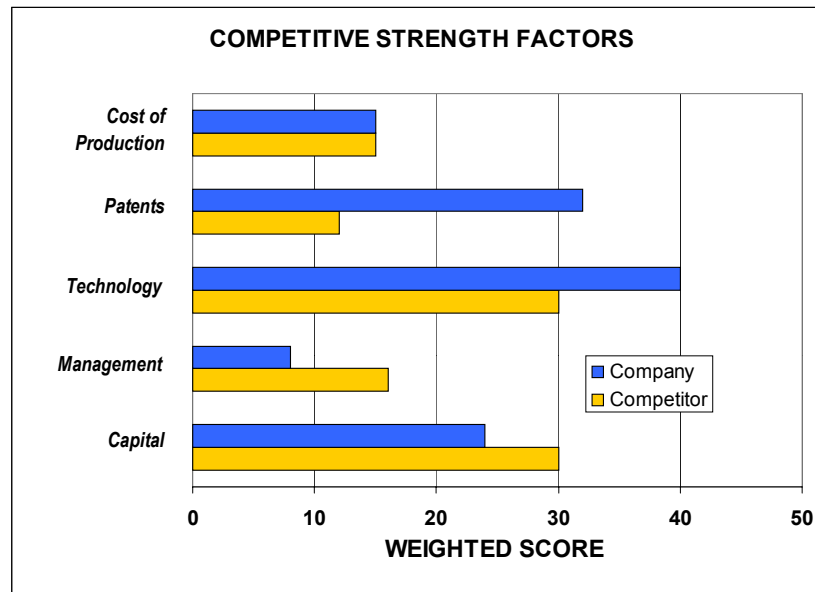


Figure 5 Competitive Strength Factors

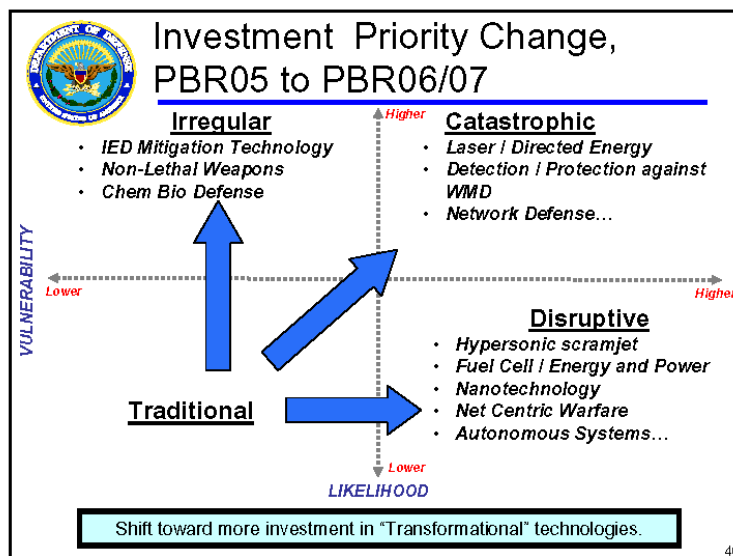


Figure 6 Source: Briefing, Enhancing the Impact of SBIR Program: The Commercialization Pilot Program, M. Caccuitto & C. Van Wyck, 27 Sep 2006, p. 40

For high tech firms, by far the most important Competitive Factor is the strength of their technology. Figure 6 is taken from a 2006 SBIR briefing on Commercialization. It shows the new emphasis by the DoD in seeking technologies that are "Disruptive," "Irregular," and "Catastrophic." [This is a form of Perceptual Map (see section [Perceptual Mapping](#))].

Clayton Christensen used the "Disruptive Technology" phrase in 1995 and has written

about it ever since. The term was replaced with **disruptive innovation** to describe a technology advance combined with a strategy that significantly impacts a market (**The Innovator's Solution, Creating and Sustaining Successful Growth**, Clayton Christensen and Michael Raynor, Harvard Business School Press, 2003).

STRATEGIES FOR HIGH TECH

Normally a discussion of overall business strategy will not be included in an MRD. The following sub-sections relate especially to technology Start-Ups that are simultaneously formulating an overall strategy for the company, creating marketable products, and seeking investment.

PRODUCT LIFECYCLE

Figure 7 depicts the well-known generic product life cycle (it may also be called a cash curve for the product). Depending on the type of product the company develops, it may be inserted it into the target market at the wrong time or the perfect time. Market research will clarify the proper insertion point.

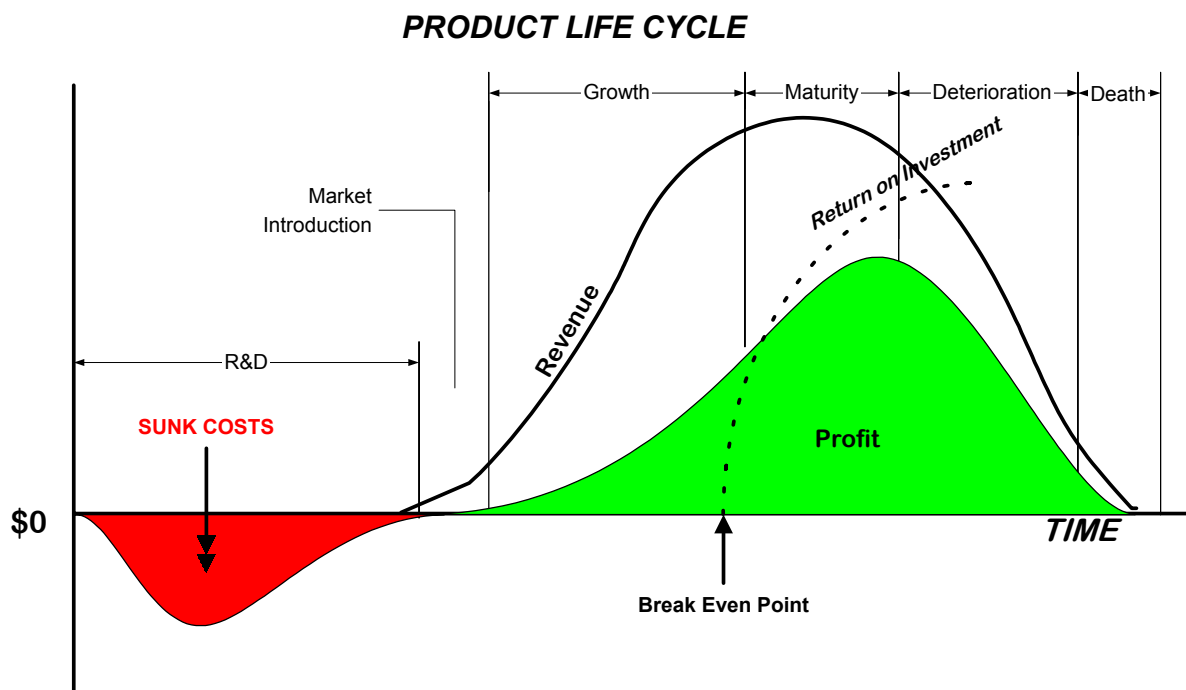


Figure 7 Product Life Cycle

Products tend to go through the same stages. There must be an initial stage where all money is spent on development, the technology itself is the primary risk element, and all money is a loss. If development is terminated at this point, these monies are irretrievable; hence the term "Sunk Costs." The source and mix of Sunk Monies varies and depends a great deal on the skills of the Founders.

There is the stage of product introduction. There are likely more losses, which offset gains, but eventually revenue starts to pick up. This is the point where market risk is more important than technology risk (assuming the product is sufficiently funded).

Next is the growth stage where revenue grows fastest, costs are lower due to production volume, promotion is high, and there are gains in market share.

In maturity, the product is well known, market share is highest, most revenue is made, and there is less required promotion. Competition sets in and prices tend to drop but overall profits are high. Market risk continues.

As more competition enters the market, there is a decline of share, revenue, and profit as the deterioration stage starts and evolves. Distribution and production become more important to retain revenue. Market risks continue and come from many directions, not just from the novelty of the product.

The product will be terminated because it lacks market share unless a new cycle can be started based on spin off products, new products, continued services, or perhaps due to the “Long Tail” phenomenon – see Figure 8 (Anderson, 2006, **The Long Tail: Why the Future of Business is Selling More of Less**, Hyperion).

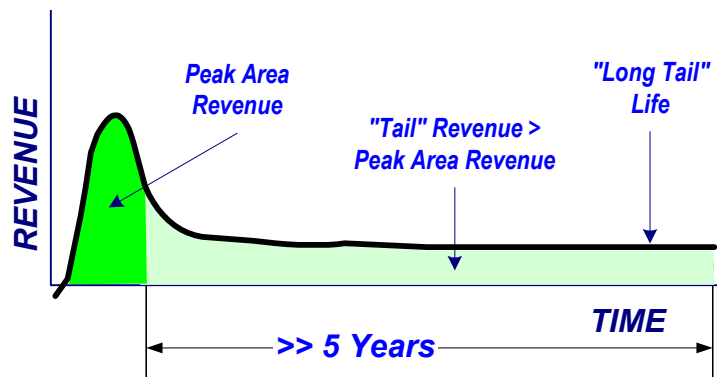


Figure 8 Illustrating the “Long Tail” Phenomenon

The long tail occurs when small, finite quantities of popular product versions may be sold to a limited market over a very long time period. Inventory and distribution are primary costs at this stage. The tail of the PLC is so long that the cumulative revenue in the “Tail” may exceed the peak revenue for the product. However, this does seem to apply well to the original

creator of the product; rather it applies to those companies whose primary service is in distribution and warehousing limited numbers of a large aggregate number of *different* products or those with the ability to create then distribute on demand such as print-on-demand book publishers.

A Product Lifecycle Analysis depends on good data and defensible assumptions. Figure 9 shows Sales volumes in units for three competitor companies and the new company over a 5-year period and during the current year (2007) the company seeks funding. A is clearly the market leader, B is in straight decline, and C follows the overall trend though at a lower level than A. The overall trend indicates maturation by 2011, with a decline thereafter. Figure 10 depicts Market Share percentages (for clarity, only the first two years are shown).

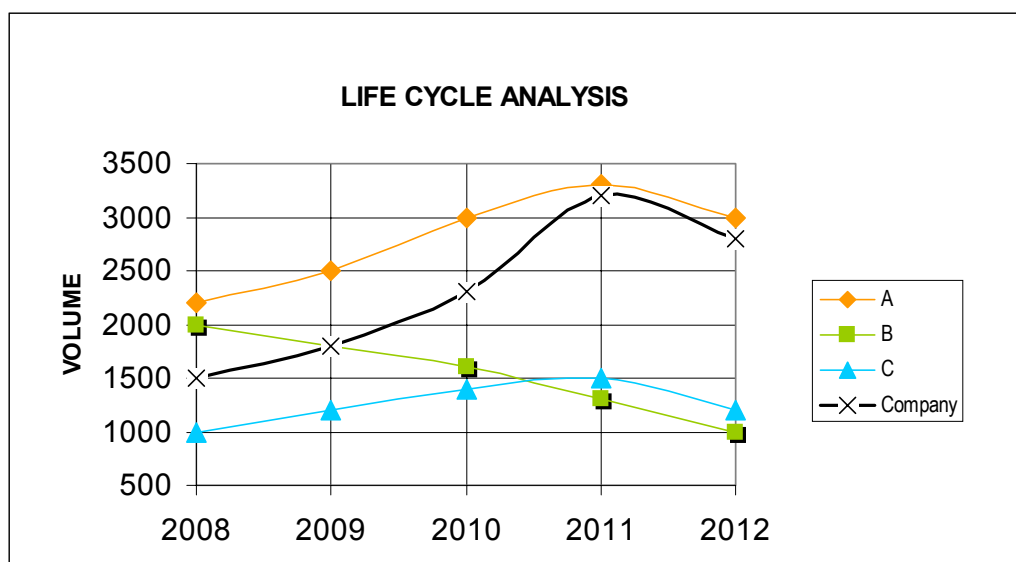


Figure 9 Forecasted Life Cycles for Different Company Products

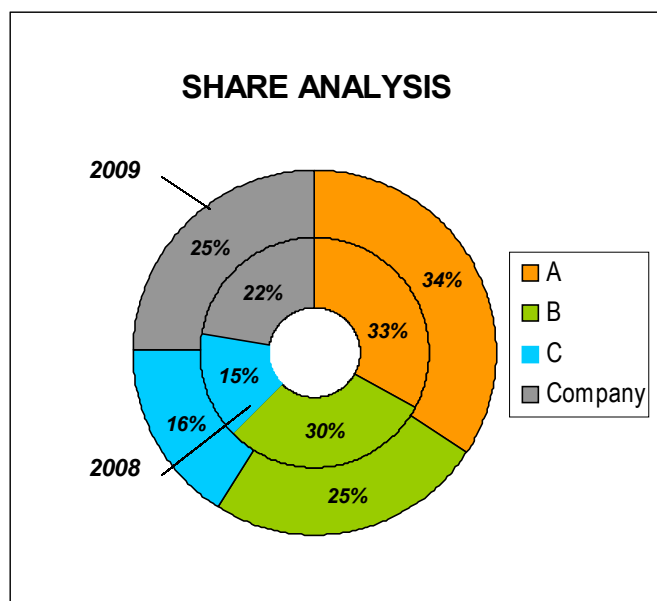


Figure 10 Market Share

Table 5 projects the volume (unit production of widgets) for the targeted market, plus trends of average price and gross margin over the five-year period. This product will sell to other businesses, thus it has a lower volume and relatively higher price level (compared to, for example, a consumer product).

The first issue to answer is whether or not to tackle this market, which shows decline in the near term. Projections show gain at the expense of competitors B and C. The gross revenue is significant but is net

income enough to warrant investment?

If the plan projects to immediately ramp up to a sizable number of units after receiving funding in the first year, it must substantiate how to get 1500 units in the first year after receiving funding, especially if a portion of the funds goes to initial production capability. If the company is somewhat older and already shows evidence of production

Table 5 New Company Forecast vs. Competitors A, B, C

All Competitors	2008	2009	2010	2011	2012
A	2200	2500	3000	3300	3000
B	2000	1800	1600	1300	1000
C	1000	1200	1400	1500	1200
Company	1500	1800	2300	3200	2800
Projected Volume	6700	7300	8300	9300	8000
Projected Size	\$ 152,760,000	\$ 163,520,000	\$ 181,770,000	\$ 198,090,000	\$ 164,800,000
Avg. Price (\$)	\$ 22,800	\$ 22,400	\$ 21,900	\$ 21,300	\$ 20,600
Gross Margin (%)	50.0%	48.0%	45.0%	40.0%	32.0%
Company					
Projected Size	\$ 34,200,000	\$ 40,320,000	\$ 50,370,000	\$ 68,160,000	\$ 57,680,000
Gross	\$ 17,100,000	\$ 19,353,600	\$ 22,666,500	\$ 27,264,000	\$ 18,457,600

capability and seeks to improve capability, chances may be better. These are only a sample of the issues to address.

If good data are available and reasonable projections made, very good decisions can be made about product introduction, product enhancements, and funding for development.

BLUE OCEAN STRATEGY

(Source: W. Kim & R. Mauborgne, **BLUE OCEAN STRATEGY**, Harvard Business School Press, Boston, 2005, www.blueoceanstrategy.com)

As an alternative to the PLC strategy, Kim and Mauborgne created the Blue Ocean Strategy, summarized metaphorically as follows. In the Red Ocean, boundaries are known and accepted, everyone knows the competitive rules, and the game is to gain more market share in an ocean where there are more competitors fighting for less profit and diminished growth. Most companies fight for customers using the Red Ocean Strategy and this has been the focus of strategy over the last 25 years.

The Blue Ocean has latent potential for high growth and new markets. Competition is made irrelevant at least initially because the astute company sets its own, new rules. It suggests that an organization need not follow the PLC analysis and ride it into oblivion. Opportunities lie in creating new industries or reformulating existing industries – all the time. The bottom line is: **Go to or create a position where there are no competitors** so that it will take time for the competition to catch up.

Table 6 summarizes Red vs. Blue Ocean Strategies, while Table 7 summarizes the Principles of Blue Ocean and the risk each principle attenuates.

The first step creates a STRATEGY CANVAS indicating the company's position/performance across the sector's relevant factors of competition. Identifying which factors are prevalent is important, as these are both variable and specific to the sector targeted.

Table 6 Blue Ocean Strategy Summary	
Red Ocean	Blue Ocean
Compete in existing market space	Create uncontested market space
Beat competition	Make competition irrelevant
Exploit existing demand	Create & capture new demand
Make the value vs. cost trade off	Break value vs. cost trade off
Align organization with strategic choice of differentiation or low cost	Align organization toward differentiation and low cost

Table 7 Minimize Risks, Maximize Opportunities In Formulating & Executing Blue Ocean Strategy			
Formulating Principles	Reconstructing market boundaries	Reduces Search Risk	Formulation Risks
	Focusing on the big picture, not demand	Reduces Planning Risk	
	Reaching beyond existing demand	Reduces Scale Risk	
	Getting the strategic sequence right	Reduces Business Model Risk	
Execution Principles	Overcoming key organizational hurdles	Reduces Organizational Risk	Execution Risks
	Building execution into strategy	Reduces Management Risk	

After creating a STRATEGY CANVAS, the Blue Ocean Four Actions Framework suggests to:

- **REDUCE:** Which factors should be reduced well below the industry's standard?
- **CREATE:** Which factors should be created that the industry has never offered?
- **RAISE:** Which factors should be raised well above the industry's standard?
- **ELIMINATE:** Which of the factors that the industry takes for granted should be eliminated?

Figure 11 shows a sample Strategy Canvas Chart. The vertical scale may be scored simply from 0 to 10. A score is computed for each factor for each competitor – these value curves could be shown for each company. The sample shows just two curves: the average for all competitors, and the company's score based on a fair comparison of its new product in the market. It is important to perform a brutally honest evaluation here.

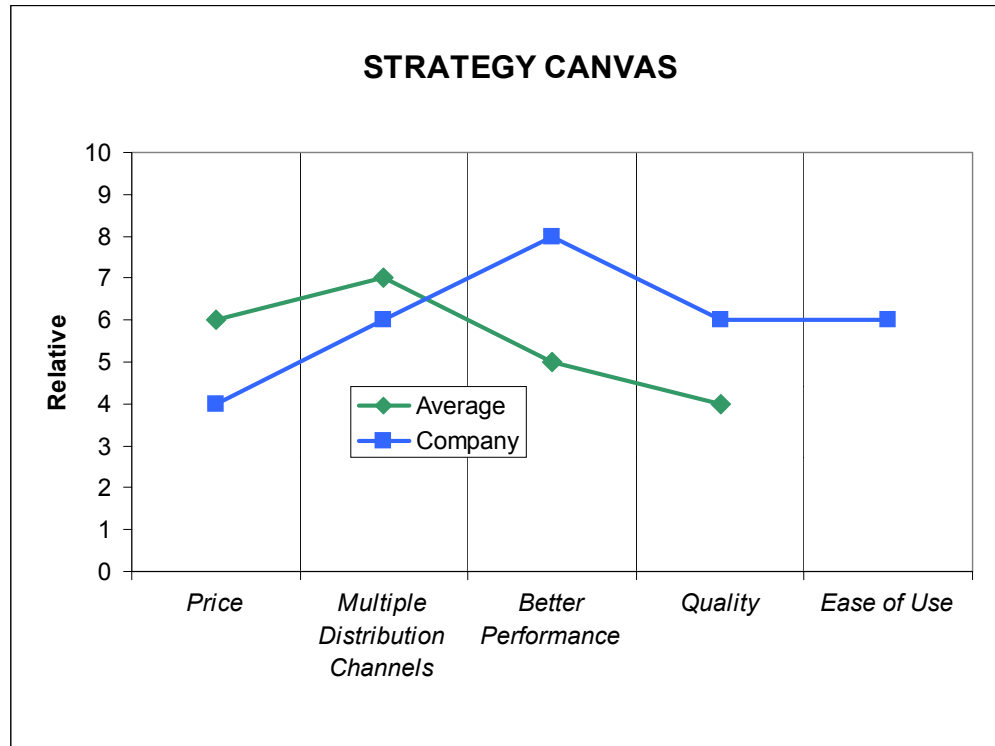


Figure 11 Sample Strategy Canvas

For this example, the new company decided that their product would be lower in price (*REDUCE* costs), of higher quality (*ELIMINATE* returns), and operate better (*RAISE* performance) within their industry. Performance should be quantified explicitly, for example, “20% higher data rate with 10% lower error rate.” Additionally, they decided that *Ease of Use* would be a valuable factor to add to the product (*CREATE*), which presently is not offered in the industry.

The next four steps after creating the STRATEGY CANVAS are:

- Put product managers face to face with users.
- Create multiple new strategy canvases that enable the company to stand out in it the market, including compelling taglines.
- Present these strategies to a cross section of executives, potential customers, non-customers, customers of competitors, and existing customers to solicit opinions and to vote on the best alternatives and why they like them.
- Combine all results into a new Strategy Canvas to use as a reference point for investment decisions.

The identification of the relevant competitive factors is essential - something the Start-Up must do as a minimum as it evaluates itself versus the competition. The Strategy Canvas is straightforward and easy to use tool, which shows areas of the segment where competition is converging and thus points to areas for product differentiation.

NICHE STRATEGY

For *new technology product adoption*, (E. Rogers, 1995, **Diffusion of Innovations**, 4th Ed., The Free Press, New York) adopters divide into five groups that follow a *normal distribution*: 2.5% (of the total area under a normal distribution) as innovators (aka enthusiasts), 13.5% as early adopters (aka visionaries), 34% as early majority (aka pragmatists), 13.5% as late majority (aka conservatives), and 16% as laggards. While the description applies especially to consumer products, it also applies to business-to-business products. The Bass Model of Diffusion may be used to forecast the uptake of new technology products ([APPENDIX B Bass Diffusion Model](#)).

Geoffrey Moore's book (G. Moore, 2002, **Crossing the Chasm**, Harper Collins, New

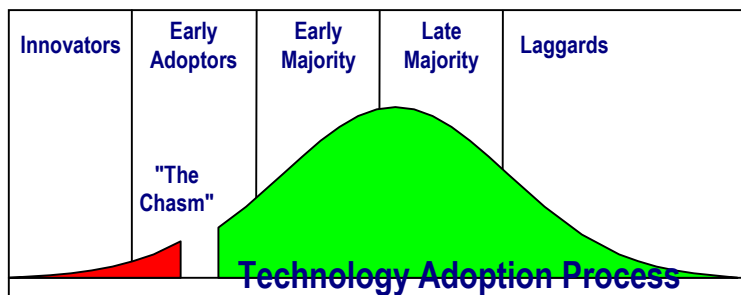


Figure 12 Disruptive Technology Adoption

York) has become a de facto standard for technology firms. In his view there is a CHASM—see Figure 12—a break point on the steep upward portion of the normal distribution. To get to the Early Majority of Users and thus toward a large market share, the CHASM must be crossed and this accomplished by selling to the pragmatists.

This concept is especially valuable for the high tech firm attempting to launch something new. Pragmatists are vertically oriented, communicating with others in their industry, and won't buy until the product is well established. Yet the product will not be established until they buy it – the classic chicken and egg problem. References and relationships are important. They buy from proven market leaders because third parties produce support products leading to an aftermarket. *Competition is important because it validates the market for them.*

Pragmatists want companies to: be conversant with industry issues, develop applications specific to their industry, be installed in their companies within their industry, and have a reputation for quality and service. They want to see the company at trade shows, industry specific conferences, and in trade publications. Their pace is slow. The mainstreamers prefer ease of use, packaging, and service.

The strategy according to Moore is to:

- Find a Niche Segment (highly focused narrow target market)
 - Focus all resources entirely on this niche and create a compelling reason to buy, dominate it
 - The niche should be positioned to be a starting point for penetration into other segments
- Market a whole product – an integration approach

- Add whatever is necessary by whatever means to produce a whole product to satisfy the reason to buy including training, billing, support, etc.
- If the company cannot provide a whole product itself, form alliances and partnerships with other vendors
- Do not Focus on the Product, Focus on Market Values
 - Market share, industry wide support, industry endorsement
 - Strategic partners, top tier customers
 - Financial analyst endorsements
- Positioning
 - Acknowledge the competition while providing differentiation
 - Market to the skeptics, not the converted
 - Use Business Press coverage
- Use Direct Sales
 - Make the product easy to buy rather than easy to sell

This strategy applies to *discontinuous or disruptive technologies*, not continuous ones that are still better modeled by a normal distribution without gaps (such as consumer appliances). There is an emphasis on being first to cross the chasm but this does not always lead to dominance. Often being first or at the bleeding edge means going out of business for lack of turning a profit within a reasonable time.

Revisions to Moore's approach add chasms at all break points but the first break point is most applicable to a Start-Up high tech firm. Additionally, Moore still maintains that the small business should continue to focus on getting closer to its customers by whatever means necessary and outsource services as much as possible. [Listen to: **How Your Business Can Cross the Chasm with Technology**, an interview with G. Moore, aired 14 Jan 2007, available as a podcast at <http://www.businesstechnologyradio.com>].

This niche strategy focuses very narrowly on a highly specialized product line. For this to work markets must be segmented vertically by industry, not horizontally by technology or application. If two customers purchase identical products for identical reasons but do not reference each other in that decision, they are not part of the same niche market. For business-to-business sales a situational analysis like SWOT often results in geographically segmenting the market. Markets might be broadly Europe and North America, more narrowly, selected countries and states. Further down selection selects only certain kinds of businesses within the geographic areas. This strategy uses the very limited resources of a Start-Up/small business most efficiently.

HYBRID & BOOTSTRAP STRATEGIES

Figure 13 illustrates four different strategies from a funding standpoint with the vertical axis representing cash flow or revenue and the curves depicting only the upside of the product adoption curve. Circles with dollar signs illustrate injections of capital monies.

The Red Curve depicts a company that obtained too much external funding too soon, forcing it to spend rapidly on non-essentials. It then undergoes a severe correction and

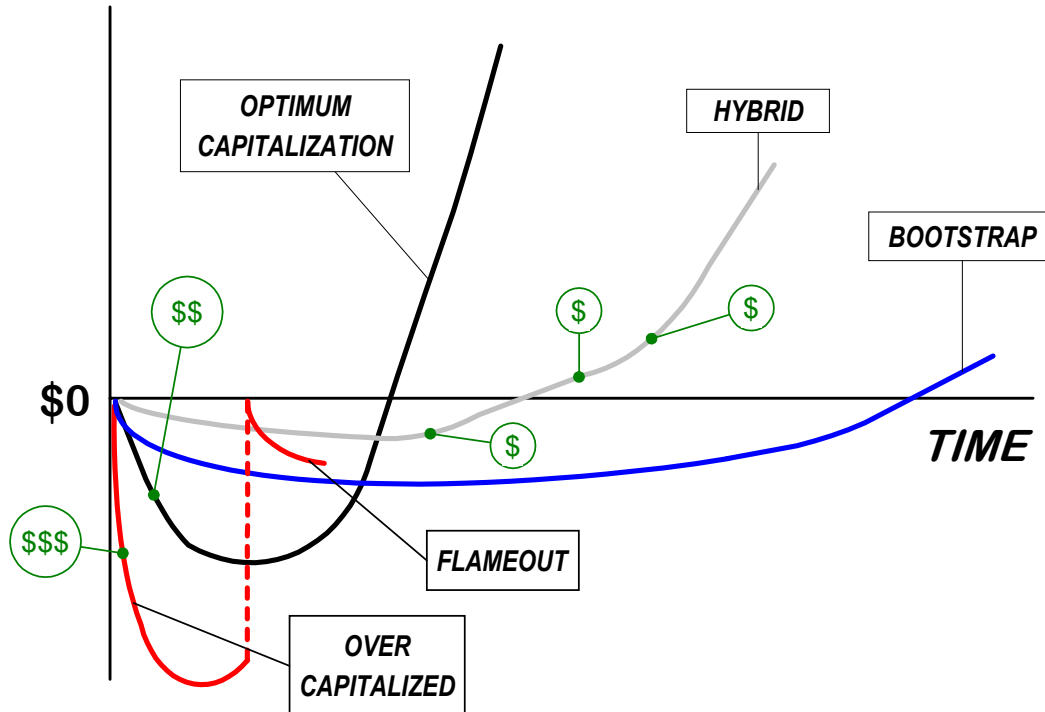


Figure 13 Capitalization Strategies

attempts recovery but the investors are now disinterested, pull out, and the company fails.

The Black curve depicts a company that receives sufficient investment, likely follows Moore's NICHE strategy, and balances out product development with management, marketing, sales, service, etc. It achieves rapid growth and high profits relatively quickly. Significant equity must be given up.

There is minimal external funding in the Blue Curve BOOTSTRAP Strategy. The Founders fund it initially (and possibly Angels). Operations don't start until capture of the first client. Additional customers and potentially suppliers may provide funds. There is minimal risk but very slow growth and low profitability. Sometimes cash flow is so minimal the curve fluctuates slowly up and down about the \$0 axis. The Founders retain more ownership, closer to 100%. Many investors consider this company to be a "hobby shop;" however, this may be the path most desirable to the founders from their perspective.

Entrepreneur advisor **Milton Chang** (Laser Focus World, July 2004) commented on the Bootstrap method. “There are two assumptions—there are no market-window, first-mover strategic-advantage issues and the business can succeed with a small up-front investment and incremental investments as the business expands. The other assumption you make is that the first product will be highly profitable and provide you with the funds to pursue the second product. This process trades off risk with patience. Most technical entrepreneurs I have worked with are starting businesses for the first time and therefore have no business experience; starting small without having to ramp the business rapidly significantly reduces the risk of failure. The company doesn't have to stay small because it can pursue bigger opportunities as the entrepreneur gains experience.”

The HYBRID starts out like the BOOTSTRAP – Founders investments, minimal external funds, a few customers. Then small amounts of external funds are periodically injected in a form that gives up minimal equity. The funding is incremental, dependent upon achieving specific milestones, and may only be spent to achieve certain goals. The growth rate increases and significant profit made, though usually less and a slower rate than the NICHE strategy. This strategy is especially attractive for technology needing additional development to bring it to the proper readiness level (see section, [TECHNOLOGY READINESS](#)). If successful, the company may be able to market the improved product and acquire additional external funds from investors for commercialization, accelerating the growth rate.

Generally the Start-Up has a prototype already and funding for the hybrid path comes through one of three sources: a strong alliance with a large established company as buyer, supplier funded arrangements, and grants and contracts through the government.

A large established company may want to incorporate the Start-Up's technology into its products so much so that it invests directly in return for some equity position and product customization. The large company may also simply arrange a deal to be the primary buyer without investment. The Start-Up may gain funding and an immediate large customer. It is always dangerous to have only one customer, especially one that provides funds.

Suppliers may fund a Start-Up by direct cash investment and/or by supplying components and equipment in return for equity. There are numerous downsides to vendor-funded vehicles. In the telecomm sector some Start-Ups received multiples of \$100M in return for exclusivity. When suppliers had trouble sustaining themselves after the telecomm downturn in the late 1990s they lost interest in the Start-Ups leaving them on their own.

The government awards contracts through SBIRs, the Advanced Technology Program (ATP), and grants through the National Institute of Health (NIH) as examples (there are other many contract vehicles and other programs/agencies). If the company's technology fails to develop on a contract through the SBIR Program, the money does not need to be paid back. The Federal government retains rights to the technology for its own use

without paying royalties but otherwise the company retains intellectual property rights and no equity is given up.

On the downside, competition for funding is high, the government dictates all contractual rules, limits the amount of profit that can be earned, and may terminate a contract at any time even if the company performs well. Except for the SBIR Program, some programs provide only matching funds – the company must match all or a percentage of government monies or in kind resources such as paying direct labor.

OPPORTUNITY STRATEGY

A different strategy starts a company using technology and experience gained working at an existing company (Dan Heath and Chip Heath, Mar 2007, “The Myth about Creation Myths”, **Fast Company**, Issue 113, p. 61). Many very advanced tech companies started this way. Sometimes a company gives up on technology, sometimes it does not exploit it completely or fast enough, and sometimes it cannot service all the customers or limits itself to select customers. A small group within the company decides to break away and pursue a perceived opportunity.

Some keys to an improved chance of success by this scheme include the following.

- Many products are created based on unprotected technology and/or the *tacit knowledge* acquired by working at a previous company. Such knowledge is very difficult to quantify but is a competitive advantage to the previous company. The Founders were educated as scientists or engineers, previously worked at a tech company, and thus have specific knowledge of the relevant segment. Often they worked for a non-profit such as a university or government sponsored lab. The Start-Up avoids a part of the Sunk Costs.
- The Founders acquired rights to the technology from the previous company, which also eliminates Sunk Costs. While possessing strict legal rights is often unnecessary to create a new product, it smoothes transitioning out of the previous company. Licensing is one example.
- The Founders are well grounded in systems engineering and integration. It is easier to create a new product by assembly and integration of off-the shelf components than by creating everything from scratch.
- Complementary skills required to create the entire product are widely known and/or easily purchased. Examples are drafting and writing non-specialized software.
- The manufacturing required is limited, non-specialized, and can be contracted.
- Founders have leads to at least a few key customers and suppliers through contacts at the prior company.
- Founders are usually willing to contribute a large amount of Sweat Equity. However, the targeted segment must be labor intensive rather than capital intensive otherwise this effort may be wasted.

Capitalization may take any of the forms illustrated by Figure 13.

FAST INNOVATION STRATEGY

Michael George (M. George, J. Works, and K. Watson-Hemphill, **Fast Innovation**, McGraw-Hill, 2005, p.7) states that 90% of publicly traded companies cannot maintain above average growth and shareholder returns for more than a few years. Findings indicate highly differentiated products succeeded 82% of the time and increased market share 54%; “Me-too” products succeeded 18% of the time and increased market share 12%.

George’s recommendations are for incumbent companies and meant to counteract new competitors. Sustaining innovations (without patent protections) last through about five years of high growth and margins before becoming a commodity, which means the product has gained about 50% of what it can earn. A differentiated product or a new product is required or a new company having the new product will disrupt the incumbent.

The ideas draw on and expand Christensen’s findings (see p. 19) but are more detailed and directly applicable. Accordingly George substantiates the case and states the keys are: 1) differentiation, leading to successful innovations, 2) fast time to market, leading to higher margins and usually more market share (possibly monopoly), and 3) disruptive innovations which obsolete competition.

Based on these findings the Start-Up should find a truly disruptive product and make certain the product is highly differentiated from existing products—part of the Segmentation process described earlier.

Disruption comes in three broad categories: 1) a new product/service (the most common and discussed throughout this paper), 2) a new market definition, based on existing customer relationships and finding new segments for existing products, and 3) a new process/business model which seeks improvement of a process and may lead to a new operational architecture.

Getting to the market quickly may apply to the incumbent but not necessarily to the Start-Up. First Movers may achieve market share but do not always achieve greater profits or survive longer (T. Laseter, D. Kirsch, and B. Goldfarb, “Lessons of the Last Bubble,” **strategy+business**, issue 46, Spring 2007, pp. 27-32).

First Movers often fail for reasons unknown initially but transparent after they flame out. The companies who learn from the mistakes of the failed companies, fix the causes, and salvage the best ideas often succeed at a later time. A prime cause of failure during the “dot-com” investment period (peak March 2000 to nadir September 2002) was an emphasis on gaining market share fast rather than seeking profitability.

First Movers often incur large costs in development and marketing. If a new component, technology, or distribution process produces a cost *advantage*, then there may be a benefit. The risk of failure for being first is greatest due to: buyers/users not convinced of product usefulness, perceived rapidly changing technology environment, perception that product is immature or will be easily imitated.

Second Movers may create a better product costing less. A cost saving example would be a First Mover that designed 75% of the components of a product, while a Second Mover used off-the-shelf items to produce the same product. The Second Mover also often benefits by not spending as much on advertising to educate the user on the usefulness of the breakthrough product. Fewer resources are spent on marketing and more on product improvement/perfection.

Laggards come after First and Second Movers often producing “Me-too” products that may leapfrog the new existing products and may benefit by targeting performance enhancements to changes in perception by the early buyers and users. Lower development costs and agility are important to create products at lower prices that are responsive to market conditions.

There is still that Window of Opportunity to consider for the Start-Up, when conditions are optimum for product introduction. If the timing is off, the window closes and chances of launching *any* product are reduced. The First Mover is most advantageous to those that can sustain their leadership position. Often this means a strong portfolio of intellectual property.

Figure 14 depicts the strategy of the disrupter using a series of PLC type curves.

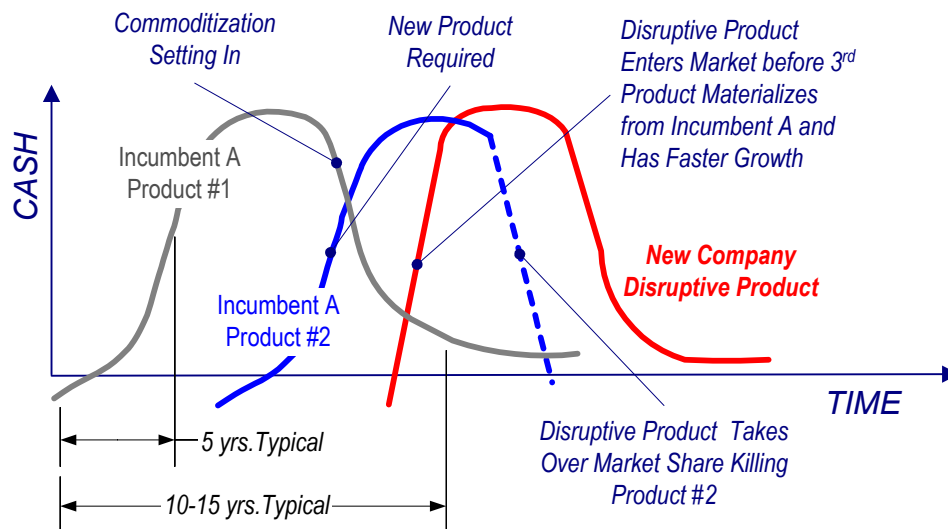


Figure 14 New Technology Insertion in a Series of PLCs

Company A is the Incumbent with Product #1 in the market for some time. As soon as sales of Product #1 declined and was in danger of becoming a commodity, Product #2 launched. Initially, this strategy retained market share and revenues for Company A. While it was busy with Product #2, a new company realized what was happening in the market and created an entirely new product, brought it to market very rapidly, gained market dominance, and caused Company A to lose its share entirely, killing off Product

#2. For whatever reasons, Company A did not get out a third product quickly enough to compete. If you are the incumbent, you want a situation of rolling out a series of products 1,2,3.... overlapping them appropriately to continue market dominance. If you are the Start-Up, you want to roll out the Disruptive Product.

It is important to note that Venture Capital will be required to achieve the steep upward slope depicted schematically in Figure 14 for the Disruptive Product. The canonical numbers are: roughly \$100M (at least) revenue, time period of 5 years, and assuming that the new company is a significant player, about a 25% market share. Thus the total market valuation is on the order of \$400M. If the target market does not approach this value, a path other than strict VC funding may be needed. [Note these financial figures are generalizations but based on rules of thumb, see [APPENDIX E](#)]. A product might last for 10-15 years before its market disappears – this is consistent with results observed using the Bass forecasting method (see [APPENDIX B](#)).

REVERSE MERGER

This involves a private company effectively taking over a publicly traded and listed company without going through the IPO process. A typical scenario starts with finding underperforming public companies in the market likely to go out of business or be de-listed, or the shareholders may wish to give up their business and cash out on whatever assets exist. This company is a “shell.” The company could be in any sector.

An agreement between the two companies leads to the shell issuing a large number of shares to the private company usually in an all cash deal. The private company thus legally assumes control through acquisition of a majority of shares, and the new owners take over management and control of the shell. After this acquisition, the old shell owners remove themselves and cash out according to the agreement.

Two main reasons a small company may follow this path are to raise capital through a new stock offering, and to go public without dilution of ownership and at far less cost. Once in control the new owners may change company direction over to their technology product line. This path is complex and most likely requires the help of an inside broker plus other intermediaries.

There are many pros and cons to examine but this is out of scope. One way this strategy makes sense for a start-up involves the start-up joining with another tech firm already generating significant revenue from existing customers but wishing to expand. There should be a good business reason to “merge.” For example, the partner firm’s product may be used in the start-up’s new product; both agree to pursue several new product lines based on a market opportunity.

These two firms agree to merge and together pursue the reverse merger. This at least puts the company in the position of generating some immediate revenue while the new products are developed with the new stock offerings.

POSITION WITHIN SUPPLY CHAIN

The company's distinct contribution to the product – its particular **added value** – must be clearly stated. The Start-Up should identify its sources of supply for hardware, software, and labor, and the methods to be used to integrate everything to create its product.

The company should also recognize its own place in the chain compared to its customers. For example, the product might entail a whole subsystem sold to a large integrator company, typical of the aerospace and telecomm sectors. Or the product might be a key component used in turn to enable several different products that greatly improves their performance. Generally the more complete the system delivered, the greater the complexity, fewer customers are available, the higher the sales price, and the more targeted the market.

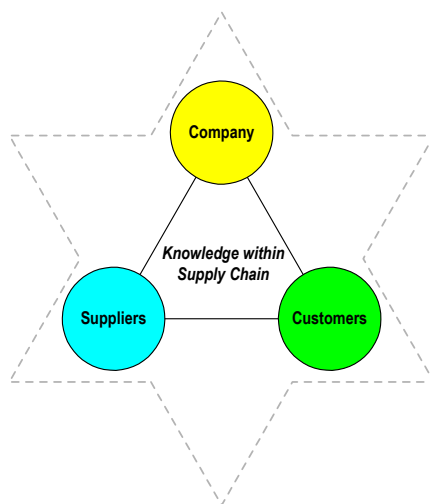


Figure 15 Supply Chain Structure with Implicit Barrier to New Entrants

Start-Ups will not do well when an existing supply chain forms the fortress structure shown in Figure 15. Much tacit knowledge is contained within this closed structure, and a lot of new development occurs. An implicit barrier forms to new entrants.

A similar closed structure occurs when a sector starts to formulate standards. Once standards take hold, so do the large established companies. They usually monopolistically *determine* the standards because they control the major production part of the industry and protect this knowledge. Newcomers will have to “pay to play” and entry costs are usually high. In fairness, there are cases where a small company's technology is so disruptive that it had to be incorporated into the standard but this is rare.

RISKS

In business, paradox and contradiction are the norms. The only certainties are death, taxes, and changing market conditions. Any strategy has risk. No matter how similar circumstances appear, tactics used by a competing company may not work for another company. Executing a plan incurs risk. ***Luck plays a big role in achieving a successful outcome***, which for now is obtaining funding, establishing the business, maintaining it, and reaching profitability. Facing so many obstacles, the best that can be done is to be persistent and act on the plan. In executing the plan leave as little to chance as possible.

The plan is about ***pursuing an opportunity***. The value of the opportunity can be expressed as: $\text{Value} = (\text{Benefits} - \text{Risks}) / \text{Costs}$. [A monetary expression of this equation is: $\text{Value of Investment} = (\text{Return on Capital} - \text{Cost of Capital}) / \text{Cost of Capital}$]. The strategy and tactics incur risks that lessen the benefits of the opportunity; thus, exploiting the opportunity while mitigating the risks increases value as does reducing costs.

Borrowing from program management and systems engineering, risk management includes identification, planning, assessment, prioritization, handling and mitigation, and monitoring. These processes are aimed at reducing the risks, and will prepare the company for inevitable trouble.

The plan must identify and acknowledge the top-level most important risks and explain what the Start-Up will do to lessen, eliminate, and otherwise handle the risks. Top-level risks fall into the categories of technology (again this is related to the product's maturity level), cost, schedule for product rollout, and producibility (or manufacturing). The next level of risk relates to how the Start-Up reacts to competitors reactions to the new product.

Risks unique to the product should be identified up front as no one like to be surprised. An example might be a hardware product that relies on a component that has only one or two sources of supply.

MARKET REQUIREMENTS

CUSTOMER CATEGORIES

Broadly, there are Buyers and Users. The User is the ultimate user of the product while the Buyer may or may not be the same as the User. A simple example is: a Federal agency Buyer procures software services under a large General Services Administration schedule (contract) while the Users are department managers within the agency.

In established firms it has become popular to create a fictitious image of the typical member of a Segment - labeled a Persona (or Profile). Problems are ascribed to the Persona and described as goals, and solutions to these problems are addressed by product development. This approach allows this ideal user to describe goals, which are open ended, as opposed to requirements, which are more restrictive. The concept is that the development team can be more creative and innovative. Companies developing software use this approach. Describing the ultimate user should be sufficient for the Start-Up.

Note the big difference between this approach and that followed in government procurements. In government contracting, the buyers and users are clearly defined. Requirements are usually set out in specific terms through a Statement of Work (SOW), which in procuring advanced technology is often spelled out in detail. This simplifies the marketing and sales aspects compared to non-government products. On the down side, profits are limited by government mandate.

CUSTOMER NEEDS & FEATURES

Popular methods to determine customer needs use statistical surveys of customer demand, internal brainstorm meetings, customer surveys, and product testing. These do not provide the qualitative information that is needed most. Customer needs are best determined by direct observation – what the problem is, who has the problem, when does it occur, how often does it occur, where does it occur, how could the problem be alleviated.

For established companies, Michael George (M. George, J. Works, K. Watson-Hemphill, **Fast Innovation**, McGraw –Hill, 2003, pp. 36-46) recommends the following.

- Include customers in company meetings where key requirements are debated.
- Use rapid prototyping – test subsets of feature implementation with customers before the whole product is finished.
- Use flexible performance target design to balance features, time to market, and price.
- Use an ethnographic process aiming for quality of information rather than quantity of information. This is a descriptive qualitative method that conducts *field studies of customers in a relevant environment* as a basis for understanding needs and problems. This method:
 - Uses a trained team of observers to observe customers and develops a holistic view of needs by looking at all the behavior associated with a need not just a single task including all activities that surround the product.

- Observes what people do automatically – subconsciously.
- Identifies frustrations and areas of suboptimal efficiency related to the product or not.

The recommendations on including customers in requirements meeting, rapid prototyping, and flex design are well worth considering for the small business. The process especially works when a prototype is available and at least a few key potential customers are identified and willing to work with it. The ethnographic process is costly to implement due to the labor and time needed.

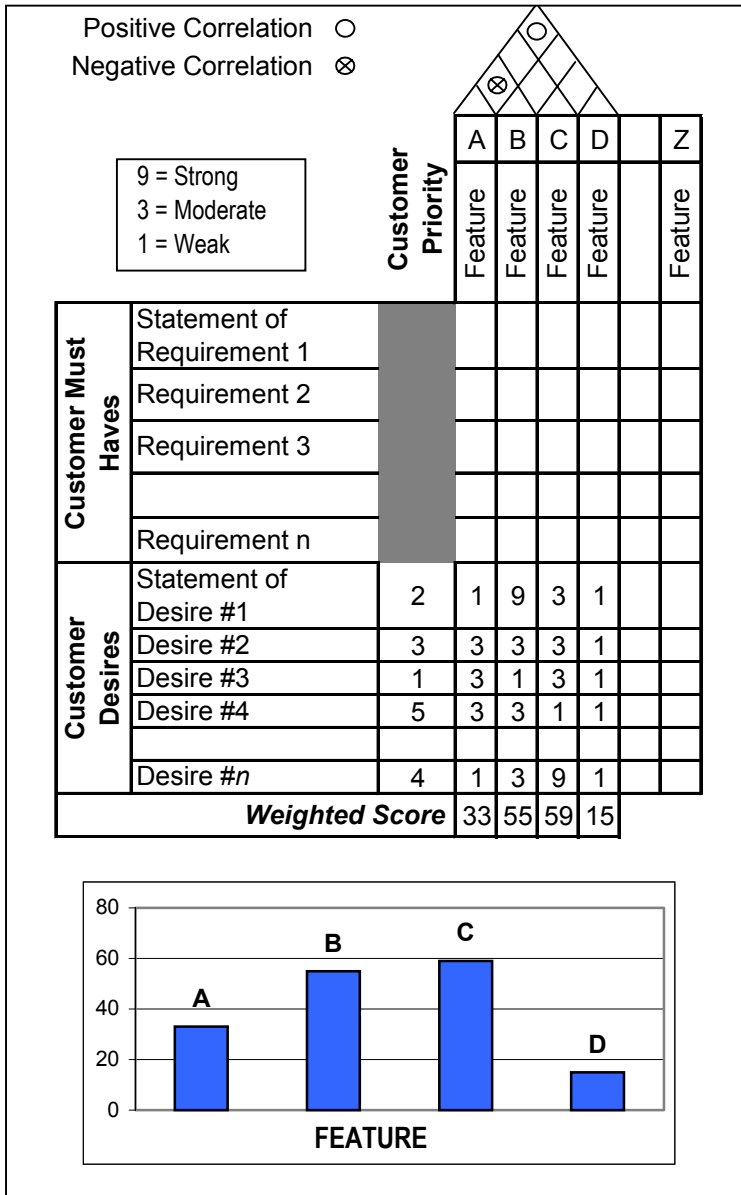


Figure 16 House of Quality Example

Consumers purchase on the basis of benefits more than features. But for B-to-B sales, features may be more important. Obviously tech products need to perform with highly specific features and fulfill requirements set out for them.

The next step is to take the customer data and translate it into product features, then requirements. The House of Quality tool (part of Quality Functional Deployment, QFD) translates customer needs into product specifications through prioritization of customer interests and analysis of product features. Many versions of the House of Quality exist and this process can become very complicated. A simple version, Figure 16, displays customer information versus mandatory and possible Product Features—sufficient for the Start-Up product.

Must have statements are firm requirements that must be fulfilled by a product feature. All other customer

identified needs are desires that may or may not be incorporated into the product as a

feature. Customer desires are prioritized on a 1-5 scale while the relationship between a feature and a desired element is rated 1, 3, or 9, which will emphasize scoring differences. A simple weighted score shows which desire-feature set *might* be incorporated.

Not every feature that can be put into a product should be put into a product. The following self-descriptive labels may be used to categorize features: Required Features, Desirable Features, Future Considerations, and Not Implemented (in the current version). In Figure QFD, Feature D scores so low in comparison to the others that it rates “Not Implemented,” while C rates “Desirable.” These are used in a Requirements Table (see [APPENDIX C](#)). The selected Features will also find their way into a Features-Benefits Table used as an element of the Marketing scheme (see section [FEATURES VS. BENEFITS](#)). The QFD process may be continued to define the Product Concept, Develop Specifications, and Develop the Design, though this is not recommended for the Start-Up.

USE SCENARIOS

Use scenarios describe the main tasks performed by/with the product by the User. It is a specific example of a goal or requirement explaining a common scenario that illustrates why a requirement may be necessary. This is not the same as a full use case, which details the complete sequence of actions and shows full functionality (see [APPENDIX C](#)). It is useful to have an example of real world use to describe to customers and investors how the product performs and what it is supposed to do.

REQUIREMENTS, MILESTONES, LABOR AND BOM

Functional requirements are displayed in a Table ([APPENDIX C](#)). At least a set of major milestones should be developed which are linked to a real calendar (see [APPENDIX D](#)).

A Bill of Materials (BOM) is a listing of all material, components, subassemblies, and tooling needed to create the product. It could be an engineering BOM at the design stage - “as planned” - or a manufacturing BOM at the “to build” stage. It should note whether items are “make” or “buy.” The list will be summarized, priced, and direct labor costs and indirect charges added to produce the cost of goods sold (COGS).

PRODUCT REQUIREMENTS

The Product Requirements section links the requirements identified by Marketing to the development of the product by Engineering, through top-level specifications. Engineering will take over from here and write the Product Requirements Document and assume responsibility for actually creating the product.

The high tech firm will have more than enough detail here to use in the Business Plan’s Product Description section. The actual requirements are not for public consumption and do not appear in a Plan for investing—they are used internally by engineering.

MARKETING STRATEGY

The essence of this strategy involves four processes.

1. Determine the company's present position by performing a SWOT qualitative analysis including the technology's readiness to address any market. Quantitative numbers are needed for revenue projections, to determine amount of funds needed, and to assess viability of reaching profitability.
2. Formulate a strategy to proceed through a plan based on the preceding step that includes market timing. The Marketing must be consistent with the general Mission Statements, Goals, and Objectives of the company plan. For the Start-Up the focus is usually on opportunities and the goal is usually growth toward profitability.
3. Implement the strategy through programs/projects with associated budgets and establish basic company procedures. Determine requirements for quantity production (including make or buy) and the company's position within the supply chain.
4. Evaluate and create Marketing, Sales, and Distribution functions. Control the overall Strategy by providing feedback from these functions in the form of hard data/information as a means to correct and reformulate any of the three preceding processes.

COMPETITION STRATEGY

To be competitive, the Start-Up must at least consider functional areas already in place at established competitors. Some *organization* issues to address, if they have not already been considered, include:

- Engineering vs. R&D
- Manufacturing (in house vs. outsourcing)
- Supply Chain (exact value added by the company)
- Marketing (Tactics)
- Sales
- Distribution
- Customer Service (Customer Relationship Management)
- Finance (loans, external funds, vendor supplied, et al)
- Quality Assurance.

Data on the specific competitors identified previously (see [COMPETITION](#)) enables detailed tactical planning. These data include announcements of new product launches, advertising effectiveness, distribution costs, real customer satisfaction, customer retention percentages, terms with suppliers, customer databases, and details of any joint venture or strategic partnership. To a lesser extent other data that may be useful includes senior management profiles, organization structure, and how well operations perform.

Formulating a total picture is more important than obtaining every last piece of data on every competitor. Some data will be unobtainable. Intelligent guesses may be needed and a certain risk level must be accepted. Plan responses to moves by a competitor. For example, if company X rolls out product Z before us, we will accelerate roll out of our first product without features A and B.

MARKETING PROGRAMS



Figure 17 The 4 Ps

The mix of product, pricing, place or distribution channels, and promotional programs – the 4 Ps – is the basis of a marketing program and it applies to advanced technology – Figure 17. First determine the product's specific **Positioning**. Then determine pricing, distribution (place), and promotion – the specific mix of marketing tactics under the company's control. Positioning is intensively studied presently. If the positioning can be supported, then its strong specific advantage must be reflected in the other components of the marketing mix: price, place, and promotion.

POSITIONING

Ultimately, Positioning is based on the small finite number of sustainable competitive advantages of a company. But often it will be based on non-technical factors such as benefits, features, how it is used (which may not be in the manner originally designed for and intended), and how it matches up against other products.

Technology Positioning is difficult—customers cannot easily distinguish among good-better-best performance due to the increasing number and frequency of new offerings. Positioning strategies ensure that differences identified earlier (see section [KEY FEATURES TO MATCH AND AREAS OF DIFFERENTIATION](#)) among the new product and the competing products are distinct in the customer's mind.

Creating an effective positioning statement is very similar to creating an elevator speech, which may well be one and the same for the Start-Up. Statements are simple, direct, easy to understand (high school level is the rule), and phrased in terms of product features. The needs of the targeted segment must be conveyed by 1-3 *customer* benefits. As positioning deals with customer perceptions, statements about the product's features must be credible, as many business customers are innately skeptical and wary of hype. Differentiation is key – the product must be distinguishable from competitors' products and so must the message. For innovative high-technology products, this often equates to either a high performance value due to its technical differentiation, or a cost advantage value – providing equivalent performance to existing products at lower cost.

A generic template for a 2-3 line positioning statement is as follows.

GENERIC TEMPLATE FOR POSITIONING STATEMENT

For [*target segment*], the [*concept/product/service*] is [*make most important claim*] because [*single most important support of claim*]. Unlike [*competitors*], the [*feature*] helps/performs/does [*benefit*]. Additionally, [*feature #2*] will [*benefit #2*].

More is needed beyond this brief statement, as investors and interested others will immediately ask more substantial questions. To organize thoughts, a table similar to Table 8 may be compiled. Claims are specific, Talking Points are main messages, and Proof Points may be test results, third party statements, case studies, reference designs, etc. As is usual for high tech products, **quantitative** information will be most effective in support of claims.

Table 8 Positioning the Product				
Positioning Statement	<i>From Above Template for Positioning Statement</i>			
Claims	High Reliability	High Data Rate	Compatible with ABC Standards	Easy to Use
Talking Points	3 Nines	Not less than 100 Mbps	IEEE 123 Std.	Set up < ½ day
Proof Points	Tests at 4 different locations & climatology over 6 months	Field tests on <i>date at location</i>	See Reference Design White Paper	Customer xxx witnessed set up; see report #2.2.2007
				Replacement parts available in 24 hrs.

Perceptual Mapping

The only thing that matters is the potential buyers' views of the product. Views are relative, with respect to the position and product of competitors. Most work in this area relates to acquiring and analyzing data from consumers, but intangibles are also important to B-to-B industrial product sales. Perceptual data describe the product *as perceived by customers* in the target segment. Preference data indicate customer preferences for one product over another.

Perceptual data do not describe the product's attributes; they describe customers' *perceptions* of the attributes. Perceptual Mapping uses varied statistical techniques (cluster, factor, and discriminant analyses) or multi-dimensional scaling to plot interrelationships of products. The analysis can overtake the importance of getting good data – more effort should be devoted to acquiring good data than on the analyses.

Obtain data through product testing, customer interviews, and the use of prototypes. Beta testing (the software release cycle is pre-alpha, alpha, beta, release candidate, gold) performed under non-disclosure agreements is frequently used to determine user response and debug new software. Testing by a sample of the targeted customer using a low cost or free prototype validates (or invalidates) the positioning of many hardware products.

General market surveys may be used but are known to be inaccurate by comparison to direct buyer interviews. If direct interaction is not possible, intelligent guesses based on available data might be used; however, this is risky as it often becomes self-validating.

One simple analysis method uses attribute ratings. This works well when hands on data can be acquired from potential customers for the new product as well as the competing products. Figure 18 illustrates this method. Five attributes and three companies are selected for rating. After accumulating the data, the attributes are ranked from top to bottom on a scale of importance. Then a company's product is rated for each attribute on a scale of performance within that attribute.

Most analyses techniques mentioned above are fairly sophisticated but using these techniques does not substantially aid interpretation and often obscures main drivers. Simple schemes can extract the rating of the attributes as well as the performance of the products. More important is how to "locate" the new product on the map.

From the Figure, the new company decided to position its product based primarily on Ease of Set Up and longer Battery Life, as the buyers perceived these two as the most important attributes. Compared to the two competitors it was easy to improve Field Service, thus was added.

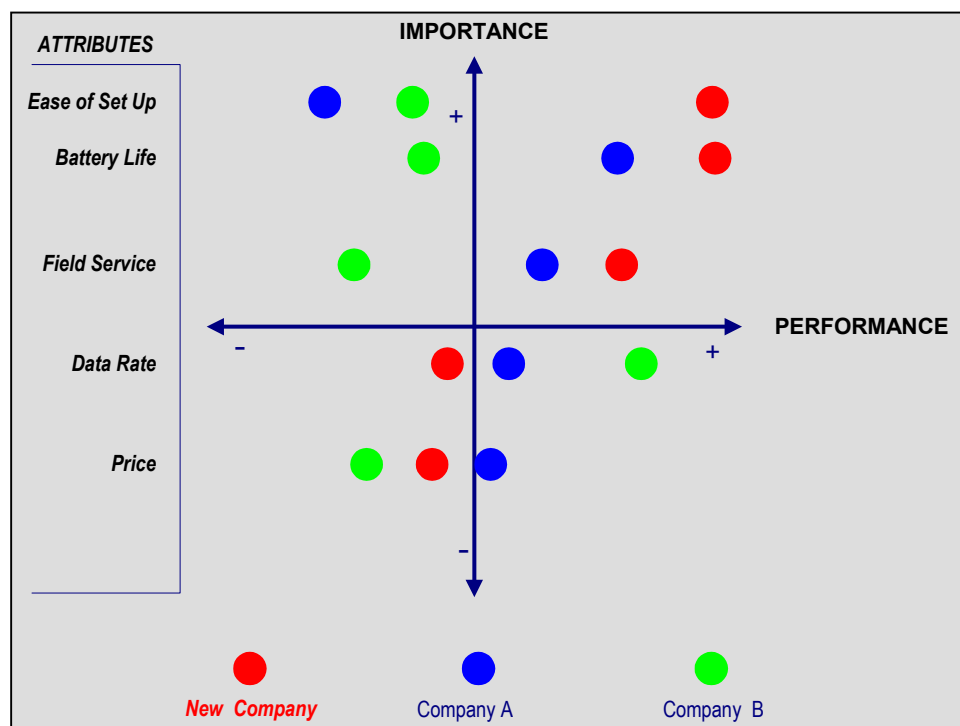


Figure 18 A Simplified Perceptual Map

Mapping aids the process of positioning through visualization of the market's competitive structure as perceived by the customer.

FEATURES VS. BENEFITS

This is a simple table to construct. The Products(s) are listed with corresponding Features and Benefits for each Product, Table 9. This table is useful for overviews/presentations and to describe succinctly what your product is and does it in a meaningful yet direct way.

Table 9 Example of Features Vs. Benefits

		<i>Item</i>	FEATURE	BENEFIT
Release: 1Q08	Product A	1	Weight < 2 pounds	Easy to carry
		2	Size = 6"(L) x 10"(W) x 1"(H)	Fits in briefcase
		3	Battery life at least 10 hrs.	Operates over full work day without recharging
Release: 2Q08	Product B	1	Laser wavelength = 1500 nm	Invisible, nearly impossible to detect; improves link security
		2	Data rate = 1 GBps	Very high data rate compared to any RF terminal
		3	Ethernet compatible	Uses IEEE Standard nnnn.mm
Release: 4Q08	Product A-1	1	Weight < 1.5 pounds	Lighter than previously; easy to carry
		2	Processor speed = 1 GHz	Faster processor enables video download in less than 5 minutes
		3	Battery Life 8 hrs	Operates over typical work day without recharging

TACTICS FOR PROMOTION

According to G. Moore, the main purchasing criteria are: price, confidence in company, performance, and quality. Also, the marketing campaign should include the ultimate user, the buyer or others involved in purchasing decisions, advisor or other technically knowledgeable person who recommends solutions, distributors, and those writing for the specific industry (gurus, journalists, key bloggers).

According to Traynor (Ref: Traynor, K., and S. C. Traynor, “Marketing Approaches Used by High-Tech Firms,” **Ind. Marketing Mgt.**, Vol. 18, 1989, pp. 281–287), high tech marketers prefer the following in order of importance:

1. Sales and sales management
2. Advertising in specialized trade magazines + news releases and feature articles
3. Trade shows; including shows orchestrated by a single (usually prime) company that includes third party companies
 - a. Company planned visits arranged in conjunction with trade shows
4. Technical seminars/presentations – by scientists and engineers; white papers
5. Sales promotional materials – catalogs, product literature, brochures
6. Direct marketing
7. Packaging
8. General publications such as business magazines, newspapers – usually with a featured technology section
9. Television – not useful for B-to-B, useful for B-to-C
10. Radio – not useful for B-to-B, useful for B-to-C

A Start-Up must be very careful about using advertising wisely. General advertising costs are largely fixed and have economies of scale. The Start-Up ramps up production so initial sales have higher unit costs due to low sales volumes. Also, advertising takes time to establish branding. This portion of marketing should form as small a part of the total capitalization costs as possible as the costs are expensive (think equity) and irrecoverable.

Probably most important high tech marketing tactic is the Internet. A company Web Site will readily make available all the brochures, catalogs, literature, white papers, and journal articles for instant downloading at the prospective customer's convenience. Products might be displayed using streaming video. Interviews with key product and company personnel might be available as streaming video, audio, or as podcasts. Teleseminars or Webinars make all the sales pitches available in a very efficient manner and at low cost to a very highly targeted group of potential users, buyers, consultants, and distributors.

Since tech products demand much explanation to justify purchasing them, a Web Site is perfect for the dissemination of this type of information. Additionally, detailed tech data may be made available for the engineers, features vs. benefit overviews for the users, top-level descriptions for the merely interested. Plus, all information may be instantly updated as available. Technical people especially like the impersonal nature of acquiring basic data without having to interact face to face.

For more developed relationships, a company may make proprietary data available to its supply chain and exchange information and data regarding schedules, stock, personnel schedules, etc. Project collaboration is also important and easily implemented through a Web Site.

Public relations will be important to project an image of a company that seeks permanence and credibility – two things important for high tech customers. PR messages highlight the entire company and apparently are perceived better than pure advertising and thus more readily digestible. This is where brochures, logos, stationery, business cards, et al, aid the company image by stating and reinforcing mission statements and objectives.

If Moore's assertions about high tech product insertion are correct, then a few influential individuals at well-placed positions in the value chain may have large leverage on the product's acceptance. The traditional model is that there are elite individuals with a lot of expertise at the top of a pyramid structure exerting vast influence on product adoption (no matter what the product but especially for technology)—such people should get the most marketing attention. Influence flows from the top, down.

The WEB has accelerated buzz or viral marketing where networks are now important in spreading the word about a product. Studies suggest that the connectivity of page links on the WEB as a whole follows an inverse power law. This means that a small number of sites get a disproportionate amount of traffic, largely due to placement of pages within search engines.

A thorough study of selected WEB categories by Pennock, et al, (D. Pennock, G. Flake, S. Lawrence, E. Glover, and C. Giles, "Winners Don't Take All: Characterizing the Competition for Links on the Web," PNAS, Apr 16, 2002, Vol. 99, No. 8, pp. 5207-5211) indicated links to a site follows a lognormal distribution with a power law prevailing in the long tail. Of particular interest, the distribution for inbound links for WEB sites of scientists peaked at 8. This result appears consistent with the pyramid model, where a finite, small number of highly connected individuals have disproportionate influence.

Assuming influencers of advanced technology have web sites similar to sites of scientists, then connecting with roughly ten such sites should accelerate viral marketing of a product. These influencers would include market sector reviewers, major marketing firms with specialized interests, and editors and reviewers at trade journals. Print publications such as *Wired*, *Business 2.0*, *Fast Company*, *Red Herring* and *Red Herring Research* routinely review technology products and more importantly interview and report about Start-Up companies. This publicity is invaluable – all have Web Sites containing the same article, spreading publicity even faster. Blogs at sites may also provide some useful feedback on how a product is actually used. Often, a product is used in a way unintended by design and finding and incorporating such information aids in product improvement.

WEB marketing brings two advantages unheard of previously: extremely rapid diffusion of information plus an overall larger and more diverse audience.

SALES PROCESS

Forecasting Sales depends on the availability of data and information, the time period, and the position in the PLC. Less information will be available early in the PLC, while more data will be available later in the PLC. The Bass Method is one of the most prominent used in forecasting ([APPENDIX B](#)).

The Sales Forecast is the expected level of company sales based on its marketing plan and an assumed marketing environment. Accurate forecasts are made only in monopolistic and oligarchic segments where little changes. Established companies prepare three forecasts en route to the Sales Forecast:

- A Macroeconomic forecast = overall economic activity in the relevant economies in which a product is sold,
- An Industry forecast = overall sales in an industry based on issues influencing the Macroeconomic forecast, and
- A Company forecast based on expectations of the company's market share.

Market Demand for a product is the total volume that would be bought by a defined customer group, a defined geographical area, over a defined time period, and in a given marketing environment. A company's Market Share depends on how its products, services, prices, and brands are perceived relative to the competitors. Equality everywhere, the Market Share would depend on the size and effectiveness of a company's marketing spending relative to competitors. Thus, Company Demand for its products = (Market Demand) X (Company's Market Share). The Market Share amounts to a guess by the company's management.

For the Start-Up, the segmentation and targeting processes (see [MARKET ANALYSIS](#)) described earlier are equivalent to the forecasting method above, and customer perception was described under [PERCEPTUAL MAPPING](#). The projection of market share is a guess much as it is for the established companies. To mitigate forecast risk, the Start-Up might provide three Sales Forecasts: nominal, pessimistic, and optimistic. The pessimistic forecast accounts for slower product adoption rate, lower sales volume, and product roll out delays.

Some considerations affect tactics and operations. Some specific items to consider in Sales are:

- Logistics issues related to sourcing and supply,
- The number of units that can be supplied over a time period,
- The typical cycle between receipt of order and payment and the duration of a typical cycle,
- Existence and accuracy of any past forecasts,
- Performance of competing products in the market,
- Industry research about the speed of uptake or market penetration trends, and
- Product quality data that might affect repair/returns and reflect overall customer satisfaction with competing products.

These practical considerations affect timing, impacting forecasting, product rollout, and especially cash flow.

DISTRIBUTION CHANNELS

Distribution methods include:

- Direct (IBM)
- 2 Tier (Ingram)
- 1 Tier (CompUSA)
- Internet (Dell)
- VAR = Value Added Reseller; these are customer facing for complex products
- National Roll Ups - larger versions of VARs
- Original Equipment Manufacturers (OEM)
- System Integrators - very large companies (Boeing); first, second, and third Tiers of an integrator are quite large

Note, according to G. Moore's NICHE STRATEGY, Direct Sales and Distribution should be used for advanced tech products.

COST STRUCTURE

It is not the intent here to guide a company's financial accounting methods. Traditional accounting values inventory for financial reporting purposes. Overhead is spread over all products and applied as a usually fixed percentage to any product. Activity Based Costing allocates overhead to individual products based on the value added activities going into that product. The difference between the two methods is highlighted in per unit costs. For the Start-Up whose revenue revolves around producing a small number of products (even one) grouped about a single technology, the difference between these methods is insignificant at this early stage.

At the risk of stating the obvious, the Cost of Goods Sold (COGS) forms the basis of a product's cost structure and the selling Price adds to this a Profit. There are the practical considerations of where the products are to be made or assembled, warehousing of stock parts/supplies (or not to stock), inventory maintenance and control, logistics, and delivery. These are included in the COGS—usually as Other Direct Costs.

If it is assumed that only product sales generate revenue, then almost everything else *supports* production and is included in Overhead or G&A. For firms producing hard-core products, Marketing, Sales, Administrative functions, as well as Engineering would then be supporting functions. If engineering, maintenance, or training, etc., can be sold as services, then these are treated as separate revenue generators with Overhead plus G&A attached to them.

Sales forecasts are usually prepared top—down, and possess a large uncertainty reflecting unavailability of good data for new, innovative, and disruptive products. Cost estimation should be performed bottom—up and uncertainty should be minimized. The technology readiness level was already assessed and an estimate of the additional funds devoted to development was obtained (see [TECHNOLOGY READINESS](#)). This amount goes to Sunk Costs. With proper planning, the remaining costs required for all labor, material, Overhead and G&A, etc., should be determined to at least 25% accuracy (see H. Kerzner, **Project Management**, Ninth Ed., 2006, Wiley & Sons, pp. 542-545).

PRICING

Pricing methods are:

- Cost plus a standard markup,
- Breakeven analysis with a target profit,
- Going rate,
- Skimming,
- Negotiated,
- Psychological, and
- Value-optimized pricing.

For the Start-Up lacking market credibility and a name brand product, a value-optimized scheme will not work. Psychological pricing generally is more effective for B-to-C sales rather than B-to-B technology sales.

Cost plus a markup should be familiar to any company used to government contracting. Generally, government contract negotiators prefer a Cost Plus Fixed Fee (CPFF) contract for Phase II SBIRs. This means the profit is determined by applying a percentage to the total cost including labor and ODC and including overhead and G&A. For non-government products, the fee should be greater than the Federally mandated limit of 12%.

Generally a breakeven analysis should be performed by the Start-Up so that the company understands its cost structure basis, though this method might not be useful to structure pricing. Good technology products should be able to command higher prices. [For an Excel template for Breakeven Analysis see: Service Core of Retired Executives (SCORE) Web Site (at www.score.org/template_gallery.html) or Harvard Business School (<http://hbswk.hbs.edu/archive/1262.html>) or Microsoft's Office Templates Web Site.]

The simplest thing to do is to use a “going rate” assuming the going rate is known versus the products offered by the competition. If the Start-Up's products are sufficiently different it may be possible to gain a higher than normal price—especially if the product is truly disruptive. If the product will be sold in any quantity, there will be a trade off of sales volume to gain market share, versus revenue growth and profit return. Lowering the price does not automatically lead to customer acceptance of high tech products.

If the product is really unique and other companies have not produced a similar product, it may be possible to charge a higher price initially in an effort to recapture investment costs and drive adoption. As competitors release comparable products, the price is lowered to retain market share. This “Skimming scheme is very often used by first movers of a new product whether incumbent or entrant.

With the negotiated method, prices are set B-to-B based on the quantities purchased. This might be possible for the entrant company that has established a relationship with a larger buyer in advance.

An important consideration is the actual payment schedule. The generally accepted 30-day payment schedule has stretched over the years affecting cash flow and credit. Customer account management must *provoke* prompt billing and collection.

With the COGS established and a pricing structure set for each product, established companies add budget for the actual product development and basically the process stops here with a funding budget. Funding comes from debt, equity, possibly from suppliers, and contracts.

For the Start-Up, financial figures, including sales forecasts, flow into the financial section of the Business Plan for funding.

OVERALL RELEASE SCHEDULE

An overall master schedule should be included that encompasses a 3-5 year duration with more detail in the first two years.

For multiple versions of a product—Version 1, Version 1.2, Version 2.0—Marketing Themes should be developed to go along with the release schedule. Not everything can or should be included in the first version of a product – see [APPENDIX C](#), requirements types.

CONCLUDING REMARKS

An MRD may form the basis of the marketing and sales section of the business plan written for funding, as input to an operational business plan, and as the input to a Product Requirements Document for new product development.

For the investment business plan, there was an emphasis on strategy for high tech Start-Ups seeking funding from investors for the first time. As the company matures and grows and new projects are rolled out, they too must be funded. The financial strategy may change as options open up to a combination of debt, equity, and (hopefully) profit, but the ROI formula is the same.

Marketing requires a combination of good data plus analyses, followed by formulation of a strategy and tactics. Useful analyses, strategy, and tactics are in this E-Book. Nothing was stated about data sources. Data collection is highly specific to the targeted sector and time consuming and must be factored into the cost of a new product.

Finding meaningful and unbiased data is difficult. Market research tests, industry expert opinions, focus groups, and judgments of the founder have little impact on forecast accuracy; the most important method is direct contact with existing and potential customers (D. Hall, J. Stamp, **Meaningful Marketing**, 2003, Brain Brew Books, pp 82-83 and growthink, **Market Research in the 21st Century**, available from: www.growthink.com/Research/MarketResearch.html) [Interestingly, they both suggest a canonical number of 50 potential buyers.] Accurate forecasting and good decision-making must include statistical analysis, beyond the scope of this E-Book.

As with almost all processes, a form of feedback must be included so that the effectiveness of the selected marketing tactics may be measured. For example, as technology products are complex to explain, repetition is usually necessary for a buyer to fully grasp the product's value and performance. Then a metric may be the number of repetitions before a sale is made. The messages, methods, or media may need to change or a change of strategy may be necessary.

The best testing plus feedback method seems to be: try a scheme quickly, for low cost, on a small (but significant) scale, measure the results, analyze, change as necessary, incorporate positive results into the next scheme—repeat.

APPENDIX A OUTLINE FOR MRD

EXECUTIVE SUMMARY

BUSINESS CASE

VALUE PROPOSITION

BUSINESS JUSTIFICATION

PRODUCT CONCEPT

MARKET ANALYSIS

COMPETITIVE ENVIRONMENT

COMPETITION

STRENGTHS, WEAKNESSES, OPPORTUNITIES, THREATS (SWOT)

TECHNOLOGY READINESS

KEY FEATURES TO MATCH AND AREAS OF DIFFERENTIATION

MARKET ATTRACTIVENESS & COMPETITIVE STRENGTH FACTORS

STRATEGIES FOR HIGH TECH

PRODUCT LIFECYCLE

BLUE OCEAN STRATEGY

NICHE STRATEGY

HYBRID & BOOTSTRAP STRATEGIES

OPPORTUNITY STRATEGY

FAST INNOVATION STRATEGY

REVERSE MERGER

POSITION WITHIN SUPPLY CHAIN

RISKS

MARKET REQUIREMENTS

CUSTOMER CATEGORIES

CUSTOMER NEEDS & FEATURES

USE SCENARIOS

REQUIREMENTS, MILESTONES, LABOR AND BOM

PRODUCT REQUIREMENTS

MARKETING STRATEGY

COMPETITION STRATEGY

MARKETING PROGRAMS

POSITIONING

Perceptual Mapping

FEATURES VS. BENEFITS

TACTICS FOR PROMOTION

SALES PROCESS

DISTRIBUTION CHANNELS

COST STRUCTURE

PRICING

OVERALL RELEASE SCHEDULE

APPENDIX B BASS DIFFUSION MODEL

The Bass Model is important to FORECASTING new product adoption rates and has become one of the most influential results in all of marketing (D. Chandrasekaran & G. Tellis, 2005, “Diffusion of New Products: A Critical Review of Models, Drivers, and Findings,” **Review of Marketing**, Chapter 2. pp. 47-49). The model describes new product adoption as a take up process between users and potential users. The original Bass model has widespread appeal because it is simple and fits data well, performs better than more complex models, and enables intuitive interpretations using 3 parameters.

For a total population of adopters, m , the time for each in the population to adopt is a random variable with distribution function $F(t)$ and density $f(t)$.

The rate of adoption is:

$$n(t) = mf(t) = m \left[\frac{p(p+q)^2 e^{-(p+q)t}}{(p + qe^{-(p+q)t})^2} \right].$$

The rate of cumulative adoption is:

$$N(t) = mF(t) = m \left[\frac{1 - e^{-(p+q)t}}{1 + \frac{q}{p} e^{-(p+q)t}} \right].$$

The coefficient of innovation is p , related to an external influence or advertising effect and q is the coefficient of imitation, an internal influence or word of mouth effect. It has been found that the average value for p is about 0.03 and is relatively stable and the average value for q is 0.4 with substantial variation (J. Hauser, G. Tellis, A. Griffin, Nov-Dec 2006, “Research on Innovation: A Review and Agenda for Marketing Science,” **Marketing Science**, Vol. 25., No.6, pp. 687-717).

The rate of adoption, $n(t)$, has a maximum (peak) at:
$$t_{peak} = \frac{1}{(p+q)} \ln(q/p)$$

and the magnitude at the peak is:
$$magnitude = \frac{m(p+q)^2}{4q}.$$

The cumulative plot of sales over time of the product life cycle is S-shaped, and appears to hold for successive generations of the product. The rate of adoption resembles a

normal distribution. The ratio p/q is increasing over (real calendar) time, indicating a faster rate of diffusion of new products.

Arbitrary Examples for these two equations are shown in Figure B. The total population m is 10,000; p and q are 0.03 and 0.4, respectively. Note how the new adoption rate model closely resembles the normal distribution model of G. Moore ([NICHE STRATEGY](#)). The peak occurs at 6.0 time units and equates to 1,156 adopters.

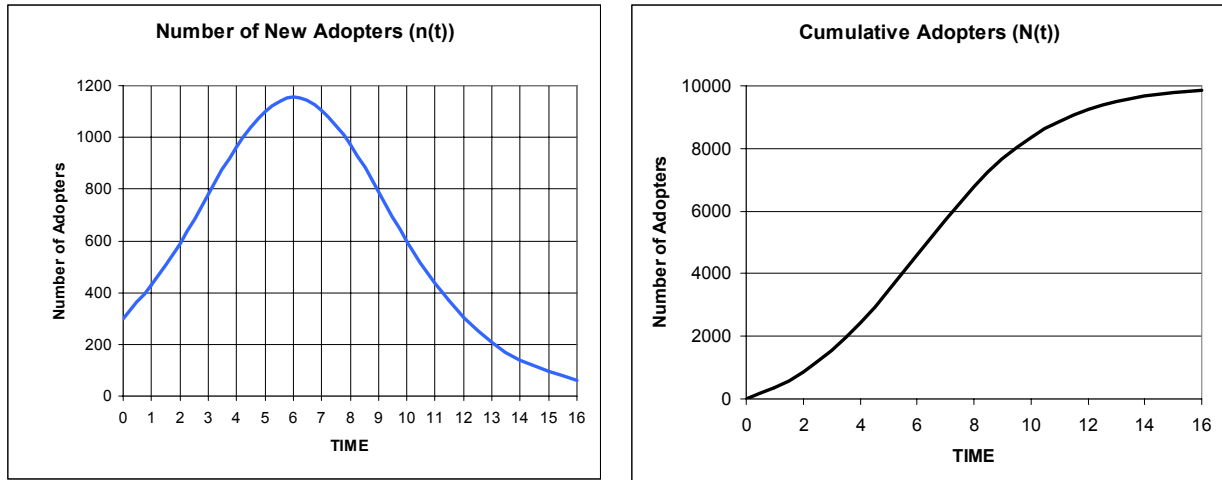


Figure B Rate of New Adopters (L) and Cumulative Adaptation Rate (R)

Knowing the total potential number of users, m , and assuming values for p and q , one can forecast the peak point in time between the early and late adopters of the technology adoption cycle. There is intensive research still ongoing regarding what values to use for p and q , breaking these values down for different categories of products and using historical data when available.

APPENDIX C SAMPLE REQUIREMENTS TABLE

Table C Requirements Table

Marketing Requirements									
ID	Type	Problem	Functional Requirement	User Affected	Reference to Use Scenarios	Reference to Case Examples	Source	Company Requirements	Reference
1		Brief description of first problem	Capability that must be obtained so that <i>USER</i> fulfills goals	USER Name	Scenario 1	Case A	Contact Person	Internal Standards; Additions	
1.1									
1.1.1									
2		Problem 2							

Use Scenario

How the problem occurs
How solution is used
Examples of instance or situation

Case Examples

Completely shows all functionality
Usually used in software - useful for describing all products
Describes sequence, process, main features
Use a graphic to indicate what exactly will be provided

Type	Code
Required	R
Desirable	D
Future	F
Not Implemented	N

PRODUCT CONTRACT

This defines the product design task and specs, and expectations for the alpha prototype. The Product Requirements Document adds detail and furthers development.

Product Description	Hand held test instrument for optical terminal testing
Intended Users	Field Installers
Market	Tier 1 Telcos

Customer Need	Product Attributes	Engineering Specifications
Transportable	Lightweight	Total weight < 1.5 pounds
	Battery powered	Total power consumption < 500 mW
Hand Held	Compact	Max size: 4" x 6" x 2"

Figure C Product Contract Sample

APPENDIX D SAMPLE ROADMAP

Following is a twelve-month summary tying individual Business and Product Development schedules together and relating them to overall company milestones and major decision gates. Gates are major review and decision-making events usually lasting 1-3 days. Decisions are usually of the “go” or “no go” variety.

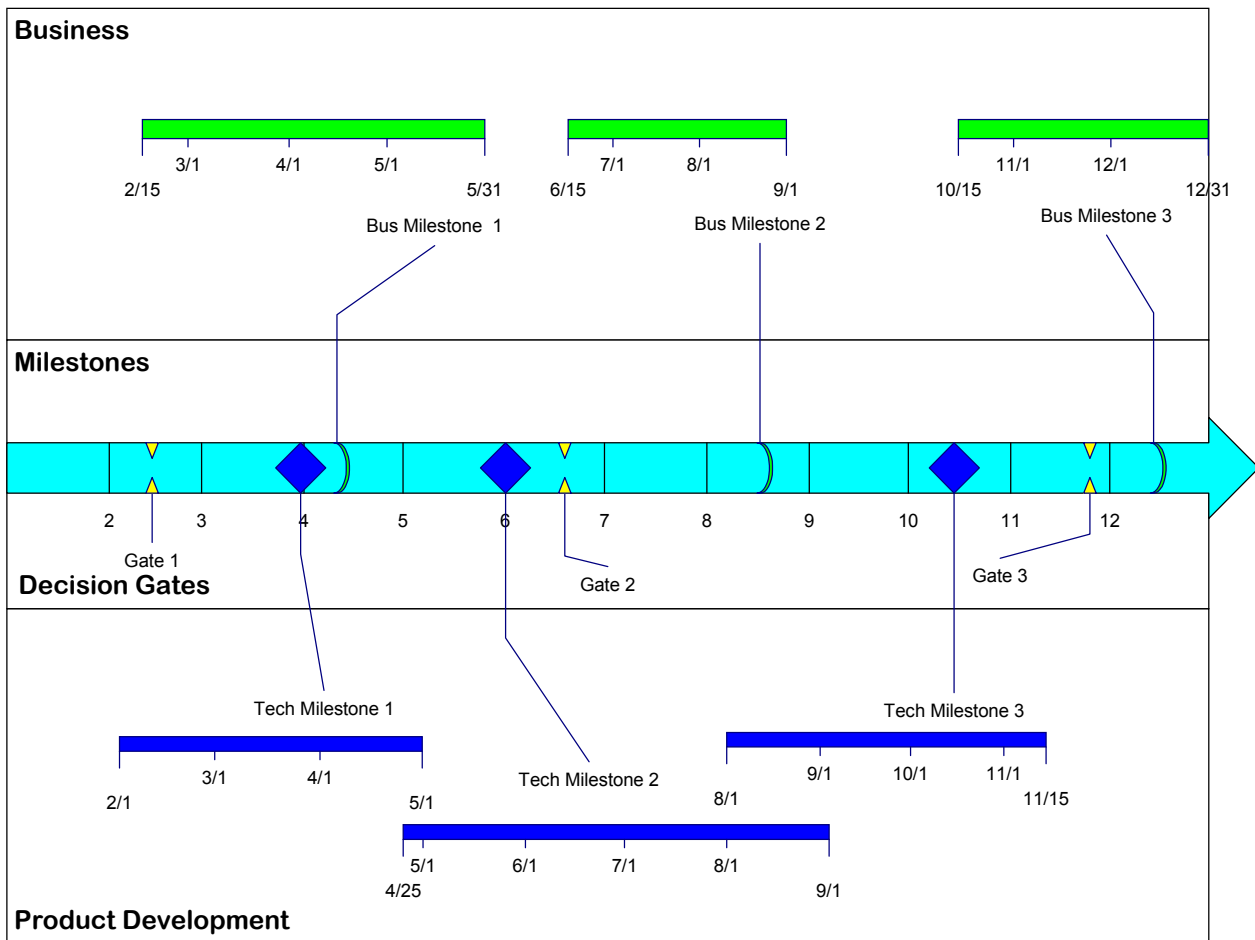


Figure D Sample Roadmap

APPENDIX E RETURN ON INVESTMENT

For an established company useful financial measures might include Internal Rate of Return (IRR), Return on Sales (ROS), and Return on Assets (ROA). IRR depends upon making accurate projections of cash flows. ROS and ROA depend on estimating Net Operating Profit After Taxes (NOPAT)—the Start-Up will not realize profits initially. Estimates would be projected over a 5-year period—the typical time for investors to see a positive return. These measures are not as useful for a Start-Up seeking funding, as external investors are only interested in how much may be returned on *their* investment.

Companies are financed through a combination of debt and equity and the Weighted Average Cost of Capital (WACC) indicates how much this composite capital costs. The WACC is: $WACC = (E/K) y + (D/K) b (1 - t_c)$, where E is the total equity (common and preferred stock and equivalents), D is the total debt, $K = E + D$, t_c is the company's tax rate, y is the expected return on equity, and b is the expected return on debt. The weighting factors are E/K and D/K. As debt is tax deductible, b discounted by the company's tax rate.

The cost of debt (b) may be determined from the yield on publicly traded bonds. The cost of common equity (y) may be determined from the Capital Asset Pricing Model, which is: $K_c = R_f + \text{Beta} (K_m - R_f)$, where R_f is the return for a risk free investment, K_m is the return on a market benchmark, and Beta is a risk factor. See Table E-1 for an example.

Table E-1 Example WACC Calculation		
Parameter	Value	Comments
R_f	9.0%	U.S. Government Bonds & Treasury Bill rate of return
Beta	2.0	The highest Beta of the stock market is 1.80 for the Air Transport sector (gold is lowest at 0.36); 2.0 reflects added risk of a Start-Up
K_m	14.0%	S&P Index rate of return
K_c	19.0%	Cost of Capital, by calculation of $K_c = R_f + \text{Beta} (K_m - R_f)$
E	\$40 M	Assume all equity is common equity
D	\$0 M	Assume no capitalization through debt
K	\$40 M	$K = E + D$
y	19.0%	$y = K_c$
b	9.0%	Use prevailing bond rate
t_c	35%	Assumed rate—use actual corporate tax rate
WACC	19.0%	WACC by calculation of $(E/K) y + (D/K) b (1 - t_c)$

Assume the company gets to an IPO in 5 years, with some numbers as indicated in Table E-2. The CAPM derived Cost of Capital at 19% used as an investment interest rate compounded over 5 years yields 238.6% $[(1 + 19\%)^5]$. The \$40M equity invested returns 319% over the same period.

Table E-2 Some Numbers for Fictitious IPO	
Shares outstanding	10,000,000
Price/share	\$ 15
Total Value	\$ 150,000,000
Equity (%) of investor	85%
Equity (\$) of investor	\$ 127,500,000
Return on Investment	319%

Gross assumptions were as follows. A single investor provided all capital at the beginning of a five-year period and the company assumed no debt. Round numbers were used. For simplicity, all stock was assumed to be common stock over the period (not just at IPO). The investor was an institutional investor capable of achieving the returns assumed in Table E-1. Well managed companies retain

15%-20% of their value at IPO (John Nesheim, **High Tech Start-Up**, The Free Press, 2000, p. 170), poorly managed companies might retain 5% or even less—15% was assumed. The valuation is typical for the company to achieve sizeable market share; for a new market, the overall total might be \$500M.

Table E-3 compares ROI for various investment vehicles. Multiple studies from Stanford, Harvard, Venture Economics, et al, have found that **Venture Capitalists are expected to produce an ROI of at least 25% per year** (John Nesheim, **High Tech Start-Up**, The Free Press, 2000, p. 170). The expected 5-year compounded return is 300%. The average gain of 41 tech related IPOs from 1 Sep 2006 to 20 Feb 2007 was 35.8% according to *Red Herring*, Vol.4, No.8 (5 Mar 07), p. 40.

Assume the company is established to the point where debt may be substituted for some equity. A new project lasting 1 year requires \$500K and will be financed with \$200K of equity and \$300K of debt. Beta is adjusted downward to 1.5. Table E-4 summarizes the numbers.

Table E-3 ROI COMPARISON	
INDEX (1977-1987)	ROI
Venture Capital	22.0%
S&P	14.3%
Corporate Bonds	9.8%
U.S. Treasury Bills	9.0%
U.S. Government Bonds	9.0%
U.S. Inflation	7.8%
Sotheby's Art Market Index	15.2%
Forbes' Top 20 Mutual Funds	23.9%
Source: John Nesheim, High Tech Start-Up , The Free Press, 2000, p. 180	

Assume that after one year, the NOPAT attributed to this product alone is \$750K. The Economic Value Added (EVA) is: $\text{NOPAT} - \text{WACC} \times (\text{Capital Employed}) = \$750\text{K} - 10.1\% \times (\$500\text{K}) = \$700\text{K}$. EVA is often used as a measure of ROI for individual projects within a company.

Table E-4 Example Calculation of EVA		
Parameter	Value	Comments
R_f	9.0%	U.S. Gov't Bonds & Treasury Bills
Beta	1.5	Lower than previously
K_m	14.0%	S&P Index rate of return
K_c	16.5%	$K_c = R_f + \text{Beta} (K_m - R_f)$
E	\$200 K	
D	\$300 K	
K	\$500 K	$K = E + D$
y	16.5%	$y = K_c$
b	9.0%	Use prevailing Bank loan rate
t_c	35%	Assumed—use corporate tax rate
WACC	10.1%	$\text{WACC} = (E/K) y + (D/K) b (1 - t_c)$
NOPAT	\$750 K	
EVA	\$700 K	$\text{EVA} = \text{NOPAT} - \text{WACC} \times K$

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