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Immersion & Iteration: Leading Edge Approaches for Early Stage Product Planning

“Delivering Breakthrough Products”

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Rochester Institute of Technology

Master of Science in Product Development

Capstone Research Project

November 14, 2007



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Immersion & Iteration: Leading Edge Approaches for Early Stage Product Planning

Delivering Breakthrough Products

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The roots of education are bitter, but the fruit is sweet. ~Aristotle

In Italia per la generazione del vino rosso sacred Chianti

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LEADING FOREIGN APPROACHES FOR EARLY
STATE Product Planning

Name of author: John Rahill, Chris Bragg, Mike Pond
Degree: MS
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Executive Summary

Developing and delivering products that truly delight customers is surprisingly more of a unique occurrence than most would believe. Amongst the vast array of mediocre products reside a few elite products that customers truly seek out to acquire beyond anything else offered in the marketplace—these products are truly “breakthrough” products. Breakthrough in that they provide customer benefits that address the unmet and unspoken wants and needs of the customer. Breakthrough products deliver value in a manner that excites the customer by the almost intuitive way these products resonate with their real world requirements. From the developers’ perspective, breakthrough products define markets, steal market share and deliver better profit margins than incremental products that only provide sustaining business results.

Uncovering the specific requirements that drive breakthrough products is a daunting product planning task in today’s fast moving, competitive, and high-tech global marketplace. Both B2C and B2B product development organizations are tasked with uncovering customer requirements that will catapult their firms ahead of the pack in a privileged position as the market leader. History suggests however that the path to breakthrough products is less traveled and reserved for only a few companies that have a unique way of delivering repeat successes. Why is it that the traditional product planning processes have not been successful at producing breakthrough products? This question is at the core of the following

research project; thorough investigation of the obstacles in the traditional product planning process that hamper the conceptualization and development of breakthrough products will be discussed.

The traditional product planning process is a complex process of stages and gates that is often handicapped by a varied degree of commitment, understanding and participation from cross-functional teams that don't always perceive the value of all the hurdles and processes. There are many companies who excel in the regimented processes of the various stages and gates involved in the traditional product planning process. These companies have successfully delivered incremental products that meet customer needs. These companies have a solid business plan with a steady customer base that delivers sustaining business results. Following the traditional product planning and development process with precision usually delivers steady business growth at or slightly above industry growth rates.

This research project shows that a solid execution of the traditional process can only yield what is referred to as "incremental" product development at best. For many companies, product development disconnects are as fundamental as their inability to consistently follow a process. Yet the problem with delivering breakthrough products goes beyond the traditional planning process. There must be something more. Why is it that the market leaders seem to consistently deliver breakthrough products? Are these market leaders doing something different that the rest of the pack?

The answer is that breakthrough products require a different product planning approach than the traditional product planning process which is somewhat serial in nature. The traditional product planning process is structured to be more of one-time-through the process approach, or “pipeline” that has limited commitment to iteration prototyping and usually much too limited engagement with the target customer. Multiple studies have shown that firms are ineffective at capturing and interpreting VOC and reflecting true customer needs in their new products.

The author’s conducted primary research with several north eastern companies as well as benchmarked several companies through secondary research in efforts to uncover the process keys to delivering breakthrough products. Through this research effort and references from industry experts such as Cooper, Christensen, von Hippel and Ulwick, this project validated that companies who deliver breakthrough products engage in more elaborate activities during the early stages of the product planning process. These companies have much more intimate immersion with the target customers, and build prototypes and iterate more frequently back through the planning process throughout all stages of development.

Companies that deliver breakthrough products have an uncanny way of discovering what customer really want and need. The ability that these successful product development companies have to uncover needs, wants and desired outcomes is grounded in a passion for understanding, learning and immersing their product development teams in all facets of the customer experience. By

comprehensive immersion, these leading edge companies are able to better formulate the total customer experience and interpret that experience into specifications that delight the target customer.

The direct association between more comprehensive immersion, prototypes, and iteration provided the author's with insights to develop a unique product planning process that is tailored specifically for breakthrough products. This "new" product planning process for breakthrough products is presented in this research project as an alternate process approach that can overlay the traditional product development process for product initiatives that are focused at breakthrough vs. incremental efforts.

Both consumer and commercial customers vote with their wallets by acquiring products that intercept their spoken and unspoken requirements most effectively. The object of this research project is to better understand the approaches followed by successful companies who consistently deliver breakthrough products and synthesize those approaches into a new product planning process model that can be better understood and followed by companies wishing to plan, develop and deliver breakthrough products.

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Chapter 1: Project Overview

Introduction

New product development is considered the “lifeblood” of any company, driving increased revenues, market share, and brand recognition. But new competition, a global marketplace, new technologies and rapidly changing customer needs have created a marketplace that makes it difficult to succeed. Yet firms that deliver just one breakthrough product or service can alter the future of the company; leading to new products, product families or even create a whole new industry. A breakthrough product is defined as a product that not only meets a customer’s unmet wants and needs but also delights the customer in a way that creates an emotional connection and loyal adoption versus the competition.

However, trying to produce a breakthrough product or service is very challenging. Benchmark studies have shown that a high percentage (30-40%) of new product ventures fail. The major reasons cited for failure are marketing or customer related; the poor execution of the early stage in the product planning process, lack of customer-based ideas and the inability to understand the job the customer needs to get done. These tasks are part of a traditional product planning process that many companies have incorporated in their work flow. It is this process that presents a number of problems for companies that wish to deliver breakthrough products.

Problem Statement

Companies that use the traditional planning process use a variety of techniques to capture customer wants and needs. These needs are commonly referred to as “Voice of the Customer” or VOC. The VOC produces product concepts that are mapped to functional requirements via the “Quality Function Deployment” method or QFD. The product development community then uses these requirements to create a product or service for the customer. While this structured process is clearly vital for continued market growth, it presents three problems for firms that want to develop breakthrough products.

1. The traditional product planning process is rarely executed well
2. The tradition product planning process when executed well often delivers only incremental product improvements at best
3. Even if done well, traditional product planning does not have the process capability to deliver breakthrough products

Research Objective, Scope, Methodology

This research paper will assess the strengths and weaknesses of the three traditional product planning problems stated above compared to best-practice industry examples. The focus will be on the early stages of process where the VOC’s are being collected and interpreted. The examples will show that when the traditional product planning process is done correctly, the process typically yields incremental product improvement that the customer describes relative to their

existing product, not necessarily a product that is breakthrough or one that ultimately delights the customer.

In order to substantiate these problems, several companies affiliated with the MPD program will be interviewed to understand their early phases of the traditional product planning process. An evaluation will be performed to formulate conclusions about the effectiveness of their approaches.

This research paper will also introduce secondary research examples that provide evidence and validation of companies that have expanded the traditional product planning process with new techniques that deliver breakthrough products that resonate with customers.

Finally, this report will analyze the processes used to deliver these breakthrough products to determine the unique methodologies these firms have in place. The results will be synthesized, providing insight for the research team to develop a new product planning model. This model will be further substantiated by comparing “best practices” from industry consultants and breakthrough product examples whose success can be attributed to a new approach to product planning methods.

Value Added to Knowledge Base

The value of this report will be to provide additional capability to the traditional product planning process. The knowledge gained enhances a company’s ability to

obtain and interpret the unmet wants and needs of a customer, resulting in breakthrough products. To accomplish this, the research paper will...

- Provide an independent study with companies affiliated with the MPD program, which will validate that the traditional product planning process is a barrier to breakthrough product development.
- Provide a detailed model that enables companies to recognize and interpret a customers unmet and unspoken needs. This model will then feed into the ideation phase of the traditional product planning process. (Immersion and Iteration model).

Chapter 2: Background Research

For today's rapidly changing market needs, the traditional planning process may not be good enough. More needs to be done to determine the *complete set* of customer requirements since the traditional planning process addresses only the needs that customers know that they have and can articulate. Christensen, Anthony, Berstell, and Nitterhouse (2007) noted that the root cause that innovation is so failure ridden is not that outcomes are unpredictable, but rather that the fundamental paradigms of marketing we follow for market segmentation, building brands and understanding customers are broken. The traditional product planning process provides a predictable methodology for stepping through a process from concept to launch yet does not provide the tools, rigor or emphasis surrounding the customer's experience that is essential to delivering great products. Cooper (2005) stated that "the traditional process is marginal at best."

Traditional Product Planning Process

In his book "Product Planning Essentials," Kahn (2001) noted product planning can be characterized as the two processes of product development and product management. Product development represents the "up front" process, where products are conceived, developed, produced, and tested. These activities occur prior to a formal offering in the marketplace (termed launch). Product management represents the "back end" process, where the product is

commercialized, sustained, and eventually withdrawn. This includes launch endeavors as well as activities that occur after launch. Within these processes are a series of stages, phases, gates and events that include exploration of new ideas, screening to achieve a prioritized list of potential products, concept testing, business case analysis, advanced design and development, testing to ensure customer needs are met, and finally product launch.

The tremendous cost of research and development and the unpredictable nature of new product development initiatives have driven most product development companies to pursue some form of standardized approach to developing and delivering new products to the market. Top companies know that the marketplace is a battle ground that shows no mercy to the companies that are unable to provide the very best in products and services. Moreover, global competition has increased over the years making it more difficult to differentiate one's product from the competition. Companies are spending large amounts of their profit margins on research and development in efforts to come up with the next big thing.

Companies can no longer expect that a new product concept going through the development process will be successful. The unpredictable nature of new product development drove many companies to pursue some form of standardized approach to developing and delivering new products to the market. A high level of emphasis has been directed to change the simplistic, basic processes of yesterday to a more sophisticated regimented process of today. It is this closely

controlled process that the authors of this paper are calling the Traditional Product Planning Process (T3P).

Phases and Gates of Product Planning

Over the past two decades the traditional product planning process has evolved into a very systematic, highly structured and regimented process designed to evaluate a multitude of inputs to the product definition. This process entails several important “phases” and “gates” that flow in sequential order to manage the development, delivery and refinement of new products. There is a checkpoint or review after each phase where the product is tested against a set of criteria specific to that phase. This check process is to weed-out any product that will not be viable in the marketplace. The goal is to evaluate the “many ideas” a company has with a set of customer requirements so that only the best, worth-while new product ideas are developed by the company. In other words, focus the company’s scarce resources only on the ideas that have the greatest probability to be successful in the marketplace. This concept selection process can be thought of as a funnel going through the production pipeline (*Figure 2.1*).



Figure 2.1 Model of Product Planning Pipeline

(Graphic from Applied Marketing Science Inc.)

Top performing companies clearly document their traditional product planning process to provide a common systematic path from concept to launch such that all parties involved have specific roles, responsibilities and deliverables.

There are many forms of the traditional product planning process. Text books such as *Effective Innovation* by Clausing & Fey (2004) and *New Product Management* by Crawford & DiBenedetto (2005) state the process flow from start to finish while describing, in detail, what each phase consists of. A high level summary of the major phases is offered below.

- Phase 1 – Product Concept / Definition / Strategy
- Phase 2 – Concept Generation
- Phase 3 – Concept Selection / Evaluation
- Phase 4 – Product Development / Robustness
- Phase 5 – Technology Transfer / Launch

Most companies take a traditional product planning process and modify it to fit their culture, industry and workflow. They also tailor the sorting requirements to match the type of product they are producing along with adding their own best-practices. All this tailoring is done to increase the likelihood of launching a successful product. In fact, some firms believe that their unique and customized processes provide them a competitive advantage. All these modifications lead to numerous variations of the process, making the “traditional product planning process” difficult to define and compare at a detail level. Still, even though the

process may vary significantly from company to company, overall most follow a similar phase gate approach that brings a concept to launch.

Two formal processes we reviewed to gain insight on the details of T3P were Xerox's Time To Market (TTM) and Kodak's KECP. Since the scope of this paper is focused on the gathering and interpretation of Voice of the Customer (VOC) only the first three phases are reviewed in detail.

Xerox uses a six-step phase approach with the first phase being front-end product planning and strategy (*Figure 2.2*). In this phase Xerox puts a lot of effort in reviewing eleven key factors that define the boundaries of the product/service before a project proposal is released. From there VOC's are translated to engineering requirements via the widely used Quality Function Deployment (QFD) method. QFD, also known as the House of Quality (HOQ) ties product/service design decisions directly to customer wants and needs, i.e. the Voice of the Customer (VOC). At this point the product flows through design, development, and demonstration to launch. A more detailed view of the Xerox TTM process is provided in *Appendix 2*.

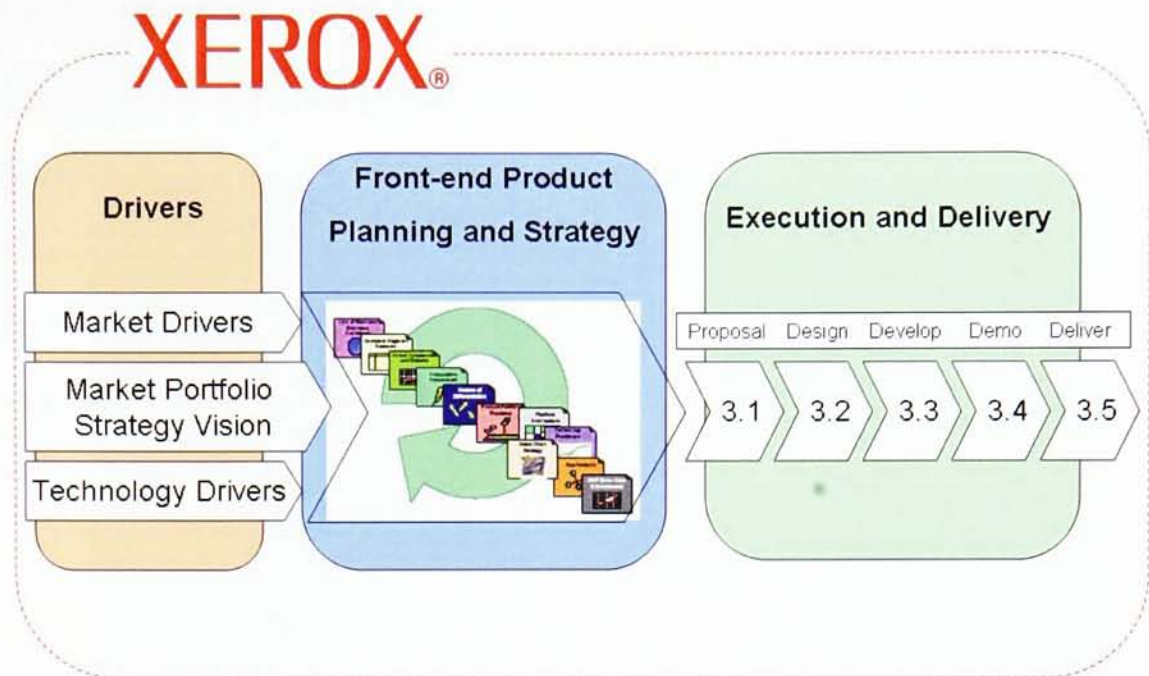


Figure 2.2 Xerox Overview of the Time-To-Market Process

In comparison, Kodak uses an eight step phase approach as seen in *Figure 2.3*.

Instead of having one phase, like Xerox, Kodak has three phases in the front-end before the product design starts. Kodak also has more phase reviews in the deliver/launch phase. A more detailed view of the Kodak KECP process is provided in *Appendix 3*.

Clearly, how the company views the importance of a particular step within the process will determine how many phase reviews they will have.

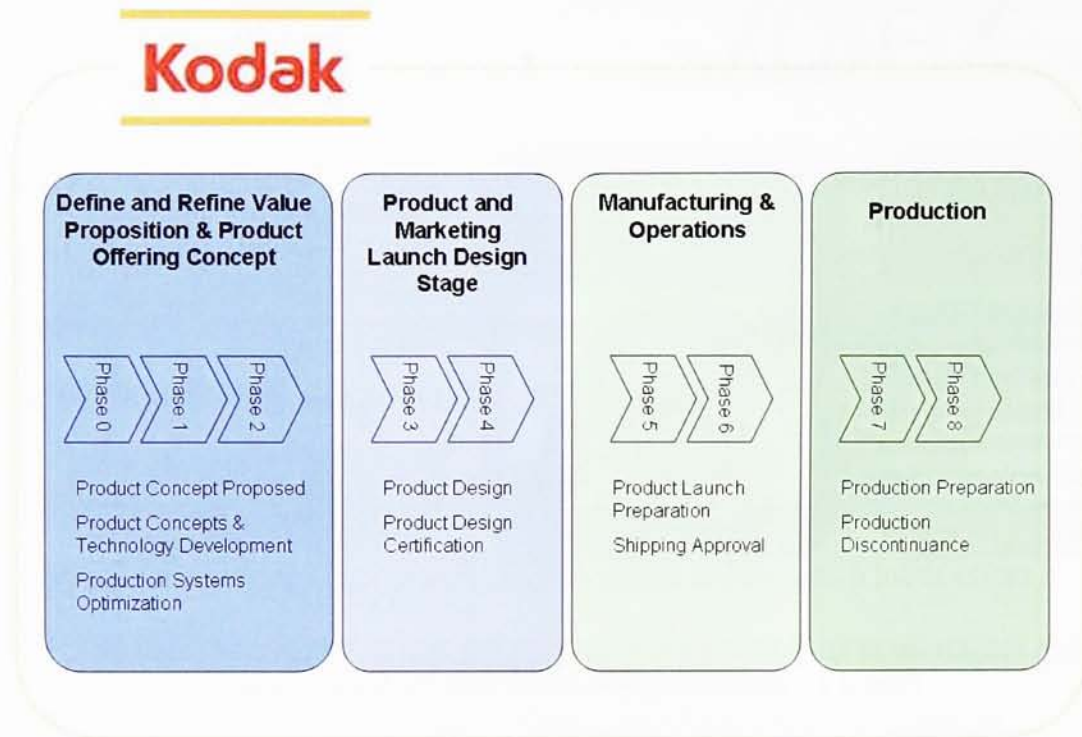


Figure 2.3 Kodak Overview of the KECP Process

This traditional product planning process is essential to companies in sustaining current product but it has some inherent flaws when it comes to producing a breakthrough product. This is partly because the information used to create the breakthrough product comes from the customer. The point is, according to Ulwick (2002), customers should not be trusted to come up with solutions. They are not the experts when it comes to the innovation process. The problems associated with the traditional product planning process will be discussed in greater detail in the following sections.

Industry Accepted Model

A synthesized view of the traditional product planning model (*Figure 2.4*), incorporates the concepts of Xerox, Kodak, McGrath, Crawford & DiBenedetto, Kahn, Clausing and Frey. The focus of our project will be on components of the first three phases, most notably competitive assessment, gathering VOC, translation of VOC into customer requirements, business and marketing plans, and refining and confirming customer expectations.

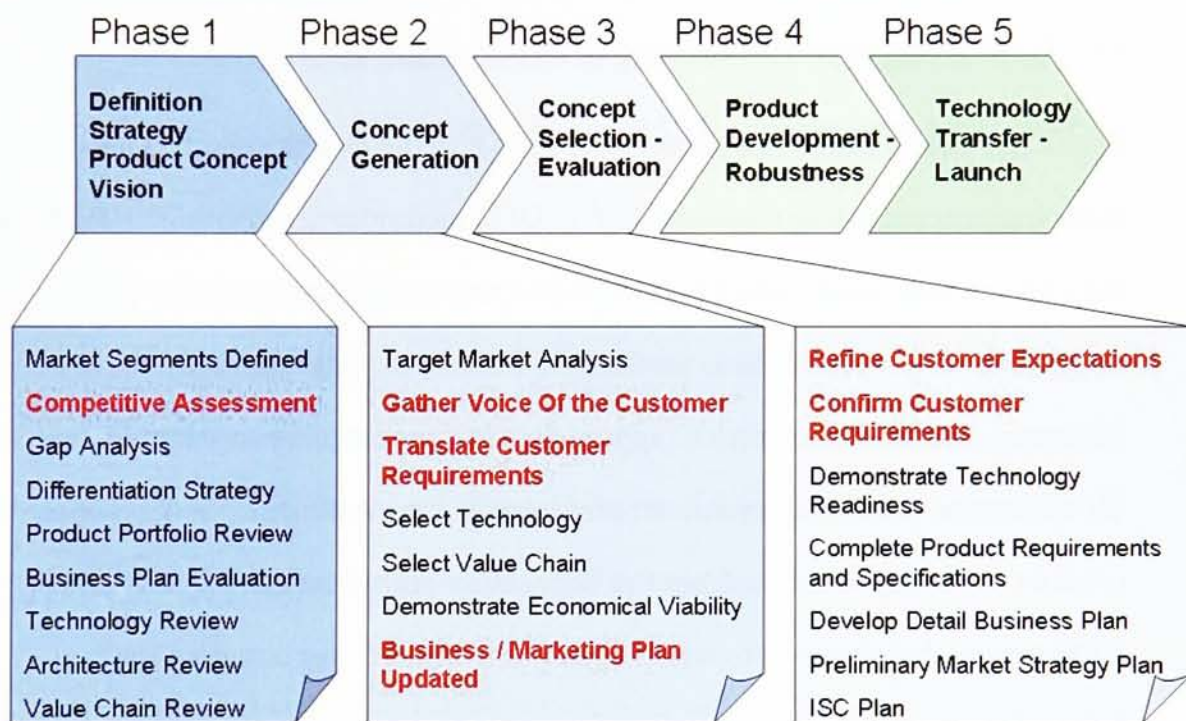


Figure 2.4 Traditional Product Planning Model

In the next section we will discuss three key hypotheses the traditional planning process presents for firms involved in new product development. These hypotheses will be used in conjunction with data from the American Productivity and Quality Center (APQC) and industry consultant Robert Cooper. The APQC benchmark data will be used to determine the quality of executing key activities

in the product development process. These activities include; the VOC and market inputs, product superiority, product development portfolios, working with customers throughout the development process, and working with lead-users. Focusing on these key areas will provide insight into how companies gather VOC needs, define requirements, and interact with customers. The report will provide examples of each problem, validate the examples with benchmarking data, and summarize its key findings.

H1: Traditional Product Planning is Rarely Done Well

For nearly two decades companies have relied on the traditional product planning process, using traditional VOC/QFD methodology to guide new product innovation. Yet, new product failure rates are still high and breakthrough innovations are still rare. This section will discuss Cooper's view on the execution of "recommended best practice" approaches to product planning, input from Neal (2002) on the areas that have been problematic for the market research phase of product planning, and data from the Booz-Allen-Hamilton Global Innovation 1000 survey that shows companies spend less on R&D, yet out-pace their industries across a wide-range of performance metrics.

Cooper (2005) showed that for every seven new product ideas, about four enter development, 1.5 is launched and only one succeeds. Of the initiatives that do succeed, only a few are truly innovative. The analysis will show that firms are ineffective at capturing and interpreting customer requirements and reflecting true customer needs in their new products.

Cooper also investigated why some businesses are better at new product development than others. Cooper (2005) uses the term “best performers” to describe firms that consistently win the war on product innovation. The names of these firms will sound familiar: companies such as Proctor & Gamble, 3M, Apple, GE, Johnson & Johnson, and Kraft Foods. Those firms not viewed as winners are firms that introduce extensions or incremental improvements of existing products, where profit and growth from innovation are smaller than breakthrough products. Through the APQC studies, best performing businesses were selected based on their performance on metrics including success rate, failure rate, on time, on schedule, etc. (*Figure 2.5*), for projects that entered the development phase.

The top 20% of firms (for each metric) were defined as the “best performer,” the bottom 20% were defined as the “worst performer,” and those in the middle of the pack were defined as “average.” Consider the percent of firms meeting profit, sales and market share objectives. The fact that the average values for all three are about 55% means that almost 45% fail to meet objectives.

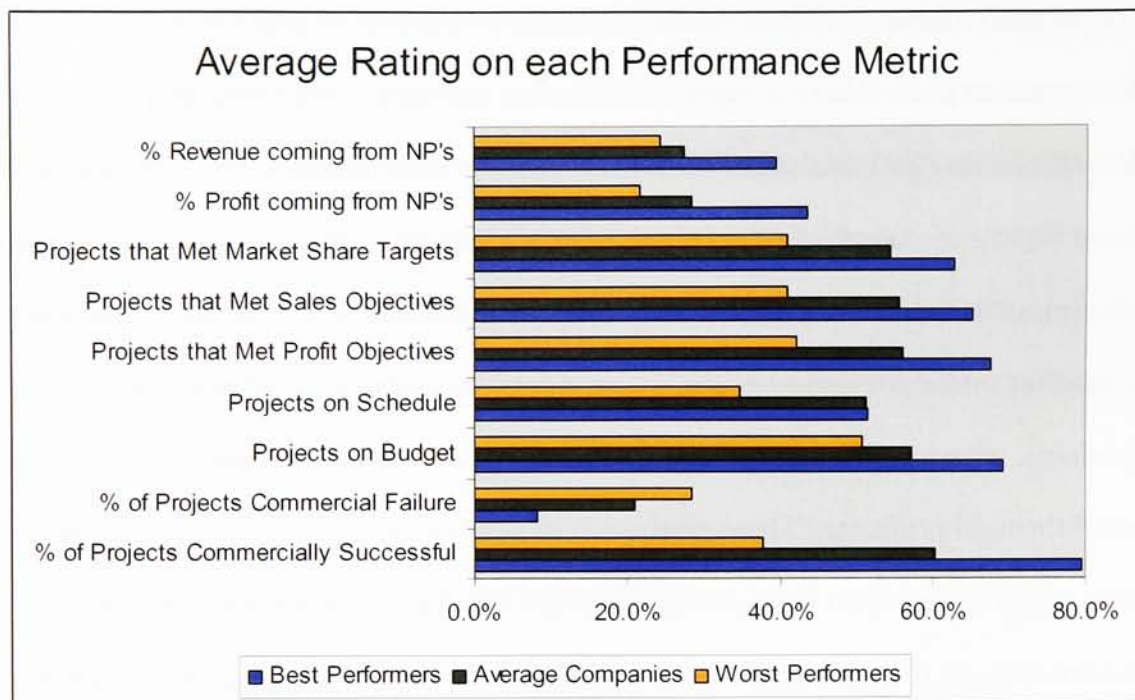


Figure 2.5 APQC Performance Metrics

Next consider the distribution of the results: the top performers achieved a 50% increase in performance over the worst performers. Also note the gap between best and worst performers for percent of profit from new products (43.6% vs 21.6%). These gaps suggest that many businesses have a long way to go to be considered best performers.

For all metrics, the best performers score higher than the worst. By comparing best to worst, firms can identify best practices as a basis for benchmarking studies. We used Cooper's benchmark data to highlight problems with the traditional product planning process and as a benchmark for our interviews.

Cooper (2005) noted that while product development is often thought of as a technical or engineering activity, the fact is that business and marketing activities

frequently kill products. The data in *Figure 2.6* from Cooper's (2005) book on Product Leadership shows that only 19% of average businesses excel at idea generation. For this key activity, only 38% of the best performers (and 11.5% of the poor performers) handle the job proficiently.

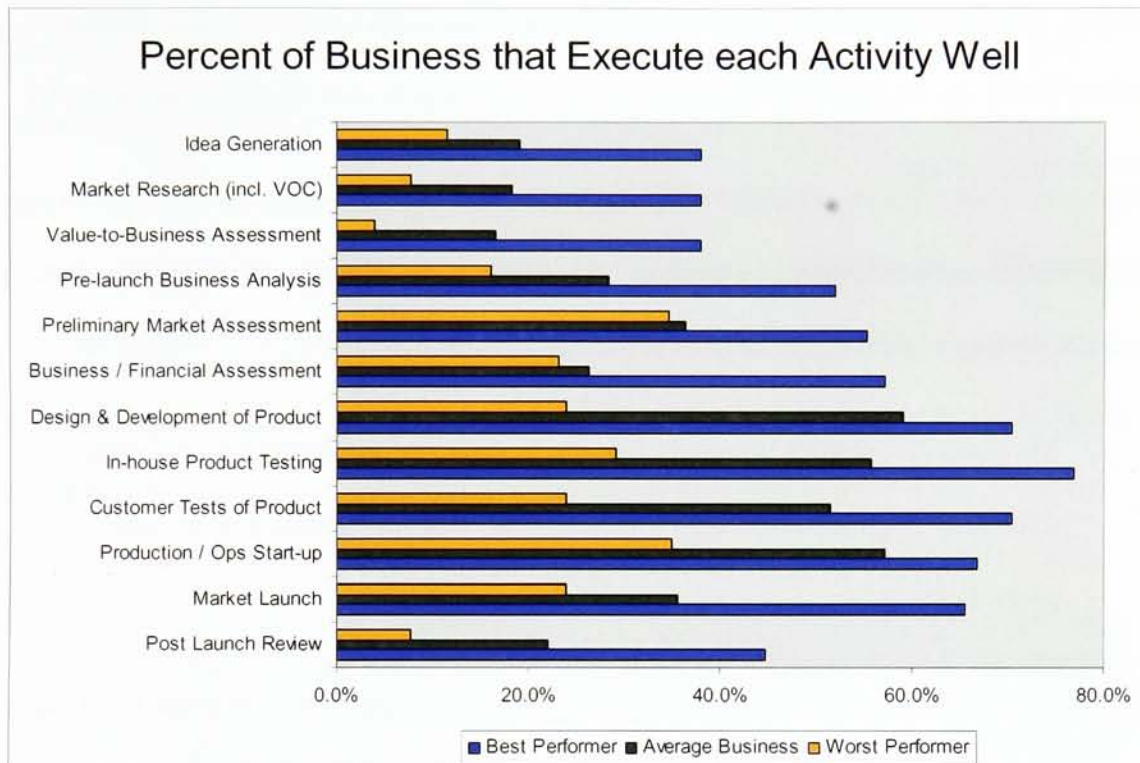


Figure 2.6 Quality of Execution – Impact on Performance

The data also shows that only 18.3% of the average businesses execute the market research/VOC planning stages of the product development process properly. On top of that only 37.9% of the best performers execute this phase well. By contrast, the technical work on these projects has much higher ratings. The three best activities are technical development, in-house product testing, and production start-up. Clearly the front end of the project is executed more poorly than the back end. Only 26.6% of businesses on average execute the front-end tasks well,

while 42.3% of the back-end activities are well executed. All three of the top rated activities occur in the back-end of the process, while the three worst, Idea Generation, Market Research, and Value-to-Business, occur in the front-end part of the process where products are defined. Also, Cooper referenced Crawford (1979), who has undertaken perhaps the most thorough review of new product failure rates, as saying 35% of new products fail largely due to poor execution in the planning stage.

Neal (2002) noted there were two key areas that have been problematic for the market research phase of traditional product planning:

1. Marketing research is poorly funded, where some companies consider spending on market research an expense, not an investment in risk reduction.
2. Companies are too often rushed to get new products out that are the result of poor planning or weak strategies.

Conventional wisdom often views R&D as a predictable black box that automatically translates ideas into successful new products. Such wisdom also holds that strategies that focus on increasing R&D spends will likely maintain innovative growth. Evidence contrary to these notions is the studies conducted by Booz-Allen-Hamilton (2006) on the Global Innovative 1000 firms. These companies might not develop the highest number of products or services, but they consistently reap the greatest financial return from every dollar they invest in R&D. The key finding of these studies was:

1. Less than 10 % of companies are high leverage innovators

Only 94 of the Global Innovation 1000 companies achieved significantly better performance per R&D dollar over a sustained five-year period

These innovators spend (as a percentage of sales) about 44% of what the other 906 Global Innovation 1000 members spend on R&D. But they consistently outperform the median in their industry for such variables as sales growth, gross margin percentage, gross profit growth, operating margin percentage, operating income growth, total shareholder return, and market capitalization growth as show in *Figure 2.7* below. These results range from 20% better in Average Gross Margin to six times better for Market Capitalization Growth.

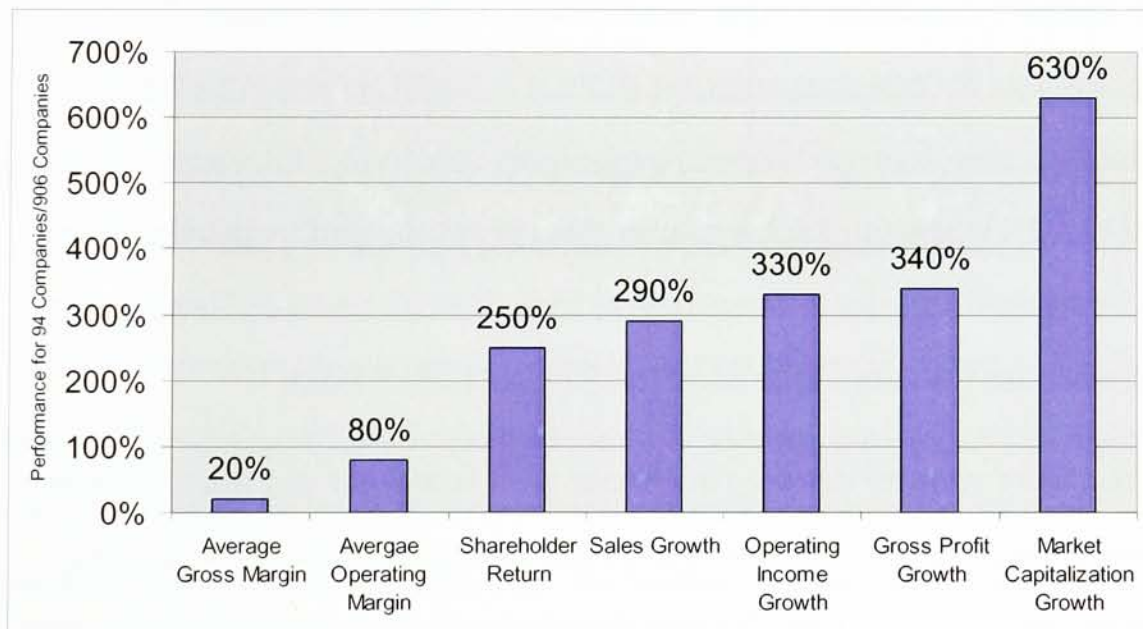


Figure 2.7 High-Leverage Innovators Performance

These high-leverage innovators and companies with the best overall performance distinguish themselves not by the money they spend, but by the capabilities they demonstrate in ideation, project selection, development and commercialization.

H2: Traditional Product Planning Done Well Only Generates Incremental Results

Companies have difficulty executing the traditional product planning process, as previously noted. During the mid-90's, growth was coming through changes to existing products, where the demands and rewards for incremental improvement spurred companies to focus on current products. Cooper (2007) stated that if product innovation were easy, half the companies in the U.S. and Europe would be incredibly wealthy and others would not be doing so well. Coopers data showed that the best companies see 47.6% of annual sales and 49% of annual profits coming from new product development. Nationally, U.S. companies spend about 4.9% of sales on R&D, a number that has not changed for decades. What have changed are sales revenues returns from these investments. New product revenues have dropped from 32.6% in 1990 to 28.0% in 2004.

The major reason for this drop in revenue is the failure of many firms to invest in breakthrough projects. Why is this? Cooper (2007) noted the major issue was investment by project type. The data showed that the best performing companies have higher value projects in their development pipelines, and a much better mix of projects. The portfolio breakdown in *Table 2.1* reveals the following:

1. The best performers have twice as many true innovations in their pipeline (17.1%) than do the worst performers (8.5%).
2. The average business in the mid-90's had a higher proportion of innovations (20.4%) than today's best performers.
3. Almost half the projects in the worst performers portfolios are small projects; tweaks, modifications, and extensions (46.5%), almost 2X more than the best performers.

Development Project Type	Best Performers 2004	Worst Performers 2004	Average Performers 1990
New to the world innovation	17.1%	8.5%	20.4%
New product lines	31.1	23.0	38.7
Additions to existing product lines	25.8	22.0	20.5
Improvement & modifications to existing products	26.0	46.4	20.4
Total	100.0	100.0	100.0

Table 2.1 Percentage of Projects in the Development Portfolio

What are the causes for this portfolio shift in the past 15 years? Cooper's (2005) studies identified established roadblocks such as reducing time-to-market, urgent customer request and making the quarter-by-quarter. However, the biggest roadblock was the lack of breakthrough, innovative, creative, game-changing ideas in the firms' pipeline.

Even if these roadblocks are removed, why are companies investing along these lines of project type? Cooper (2005) stated that "me too" offerings are the rule

rather than the exception of many firms' new product efforts, and too often, companies assume that product features and functionality are the same as customer benefits, when in fact they may be of little value to the customer. The three most common scenarios associated with poor performance are:

1. Copycat projects that yield boring, undifferentiated products
2. Extensions, modifications, and minor improvements that is easy and often urgently needed to keep the product line "fresh."
3. Technology-driven projects, where the technical community decides what the customer wants (technology push)

In *Figure 2.8*, Cooper's (2005) data shows that even the best companies who follow the traditional product planning process are superior in meeting customer needs only 58% of the time – on average a 40-42% failure rate.

The key data points showed that while 60% of the average performer's main benefits are important to the customer, only 34.3% of the average performers offer new and unique benefits, 38.8% of the average performers are superior to the competition in meeting customer needs, and 40.6% of the average performers have superior quality than their competition. The numbers for the average businesses are not results your firm would be proud of.

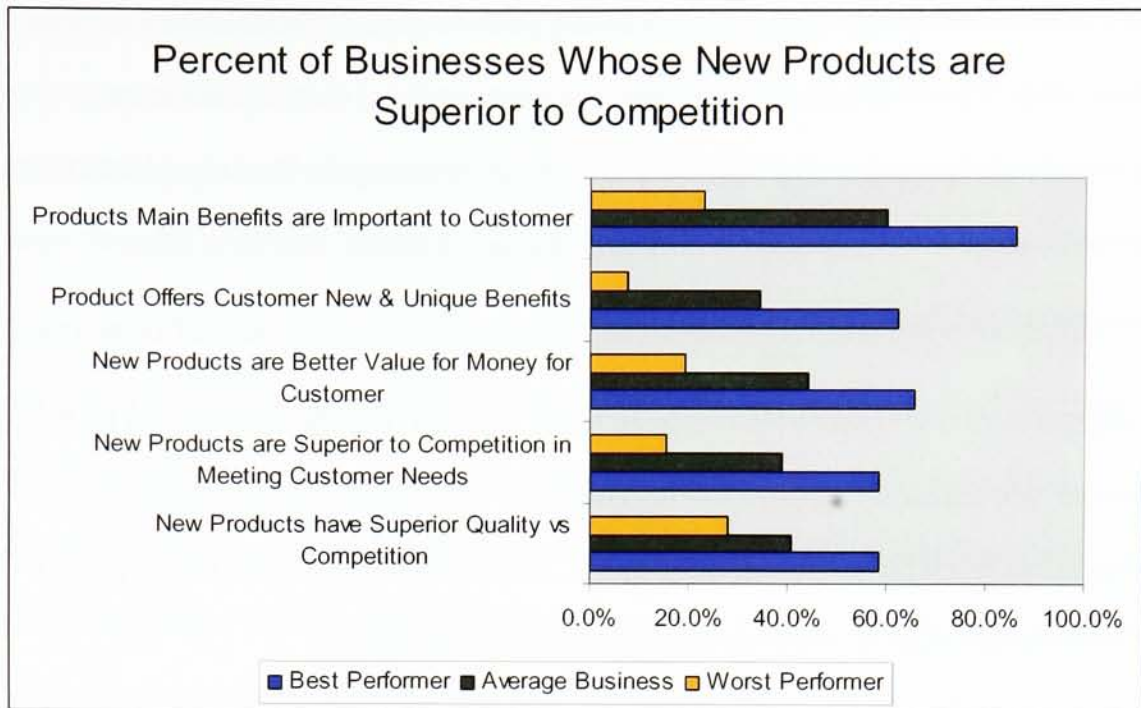


Figure 2.8 New Product Superiority – Impact on Performance

As a result of investing this way, firms are spending R&D money to produce projects that are not capturing intended market share (poor product performance). This is a bankruptcy scenario, where firms have made the same level of R&D spending for well over ten years, for a lower return on investment, resulting in incremental projects that just aren't delivering value to customers.

There are two major reasons why the traditional planning model produces the results shown above. First, the model focuses on short term incremental product improvements because that is what company's want and it is what their strategies tell them to do – it is built into the firms' corporate culture. Investment by project type directly ties in to the short term quarter-by-quarter growth Wall Street expects. Secondly, incremental product improvements are all that customers can

describe – their knowledge is relevant only to the current products they have in their shop. This one-two punch is a self-reinforcing loop that will not break unless firm's have the wherewithal and courage to recognize that a problem exists. Before a patient with chronic illness can be made healthy, they first must recognize they have problem.

Unless a firm can create breakthrough ideas, the trend in the data shown by Cooper will continue because the organization will not have breakthrough projects to work on (no ideas, no projects, and no senior management support). It takes immersion to come up with game changing ideas.

H3: Even if Done Well, Traditional Product Planning Does Not Have the Process Capability to Deliver Breakthrough Products

Confusion can permeate the product development process because the difficulty in understanding customer's needs is often a costly and inexact process. Even when customers know what they want, they cannot communicate or transfer that knowledge clearly or completely. Consequently, the customer offers requirements in a language that is familiar to them; unfortunately, that "language" is not particularly harmonized with the creation of breakthrough products.

Additionally, companies continue to define "requirements" as any kind of customer input; wants, needs, benefits, solutions, ideas, desires, demands, specifications, etc. If you want to develop breakthrough products, following the traditional product planning process is just not good enough because the

traditional process does not have the process capability to collect the type of requirements that create breakthrough products, and costs of failure in the traditional process are high. Ulwick (2005) noted that new product failures cost more than \$100 billion dollars to US corporations a year.

There is additional proof that the traditional product planning process itself does not have the process capability to produce breakthrough products, and that fine tuning it won't work either. Thomke and von Hippel (2002, pg 6) stated that product development "is often difficult because the needed information (what the customer wants) resides with the customer and the solution or information (how to satisfy those needs) lies with the manufacturer. Traditionally, the onus has been with the manufacturer to collect the needed information through various means, including market research and information gathered from the field. The process can be costly and time-consuming because customer needs are often complex, subtle, and fast changing. Frequently, customers don't fully understand their needs until they try out prototypes to explore what does, and doesn't work."

The traditional product development process can be a long drawn-out churn of trial and error between the product manufacturer and the customer. Sometimes the manufacturer develops a prototype based on information from the customer that does not produce breakthrough concepts. The customer and manufacturer iterate back forth between flaws, software bugs and corrections. Following the traditional model, this cycle repeats itself until the customer is satisfied often adding significant cost and time to the development process. How can developers

shorten the cycle? What is missing in the planning process between a company that delivers good products and one that delivers breakthrough products?

One factor stands out above all others in the traditional product planning process; ironically, it is the inputs from the customer that is not reliable as the sole source for breakthrough product development. When companies gather customer requirements they do not know what types of inputs they need to obtain from the customer. Nor can the customer describe the “unexpected” or “delight” features that make a product great because the customer’s reference point is the performance of the current product. Yet there are new approaches that have been developed that could expedite the product development process.

Thomke and von Hippel created a customer-as-innovator approach where the manufacturer or product developer supplies the customer with tools so that the customer can design and develop the application-specific part of the product on their own. This does not eliminate the need to determine how the product should work; rather it makes product development better and faster for two reasons.

First, firms can bypass the expensive and painful mistake-prone process to understand the customer needs in detail. Second, the trial-and-error cycles that unavoidably occur during product development can move much faster because the iterations will be performed solely by the customer. But developing the right tool kit for customers is hardly a simple matter.

Specifically, tool kits must provide four important capabilities. First they must enable customers to complete a series of design cycles followed by determining

what does and doesn't work. This is similar to computer simulation where customers can try out different scenarios without having to manufacture the product. Second, tool kits must be user-friendly – such that customers do not need to undergo extensive training in order to use the tool kit. Third, the kits must contain useful components and modules that have been pre-tested and debugged in order to save customers from re-inventing the wheel. Lastly, these kits must contain information about the capabilities and limitations of the process to ensure the customer's design will be something the supplier can produce. There is also hard data that supports the lack of process capability in the current product development process.

Cooper (2005) noted that there are five marketing best practices identified in their APQC benchmarking study, as shown in *Figure 2.9* Cooper's data shows that for the "average business" only 11.4% use Market Research, 17.3% study Buyers' Behavior and only 26.3% maintain the customer learning experience beyond the initial VOC effort. A closer look at the data shows only 15.4% of the worst performers work closely with customer's, hardly 12.0% work with lead or innovative customers, and 0% of worst performers define products from market research.

Cooper (2005, pg 179) noted the major reason for these poor grades was the failure by firms to "adopt a strong market orientation in product innovation, an unwillingness to undertake the needed market assessment, and leaving the customers out of the product development spell disaster. It's like a broken record: Poor market research, inadequate market analysis; weak market studies, test

markets, and market launch; and inadequate resources devoted to marketing activities are common weaknesses found in virtually every study of why new products fail.” The data and commentary from Cooper ties us back to Thomke and von Hippel.

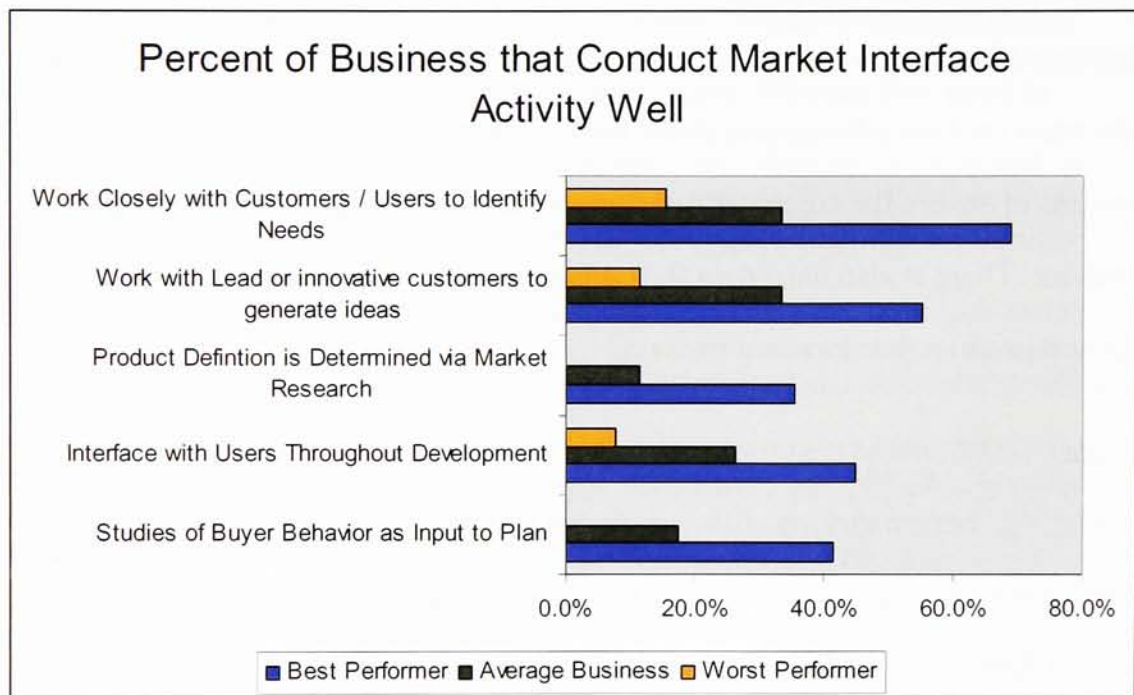


Figure 2.9 VOC and Market inputs – Impact on Performance

The Cooper input shows few product developers work closely with customers, and Thomke re-affirms that the traditional product development is a long and costly process of trial and error. Also, few companies work with lead user because the tool kit needed to develop new products requires complicated, robust engineering practices. Lastly, of the worst performers – nobody defines a product through market research. How can you build a successful new product without doing your up front homework? The bottom line is most companies don't

want to afford the time and expense to deliver breakthrough products, in fact the traditional process tells them not to.

Market research as a key tool to help define the product throughout the development cycle may be a costly, lengthy, and iterative process, but continued customer contact is essential for breakthrough product development in the market.

Our key summary of the problems facing the traditional product development process are the following:

1. Over the last 15 years companies are spending the same amount of sales on R&D (4.9%) for a smaller return on their investment.
2. The traditional product development process focuses on incremental results driven by the need for short term profits (Wall Street effect).
3. The lack of breakthrough, game-changing ideas in the firm's product development pipeline. It is here that the team will provide a new model, applying immersion that is used as an input to the traditional product development process to help generate breakthrough products.

In the next section we will discuss interviews with local firms such as Xerox, Kodak, Corning, Direct Mail Holding and Johnson and Johnson that validate the problems with the traditional product process. This will be followed, in subsequent chapters, by a review of the different styles of immersion and

secondary case research of highly innovative companies that have applied this approach.

Chapter 3: Primary Research – Assessing Product Planning Processes

Introduction

In order to validate Coopers' claims stated earlier the research team performed interviews with local companies affiliated with the MPD program. The target interviewees were people whose roles and responsibilities involved collecting and interpreting VOC's.

A questionnaire was created to specifically focus on three key areas in the product development process: "voice of the customer / market inputs", "product definition", and "product performance against competitive products."

The questions in "voice of the customer / market inputs" section are directed at how well companies obtain customers needs through close interaction with the customer, work with innovative users, marketing actions, market studies, customer tests, field trials and studies of customer buying behavior.

The questions in "product definition" section are pointed at defining the target market, the concept, benefits, features, specs, requirements and positioning of the product early in the development cycle. Also how well companies ensure these definitions are defined before product development begins.

The questions in the last section “product performance against competitive products” are to define the products ability to meet the customers needs and how it compares to the competition and its’ unique customer value.

Focusing the study on these three key areas will provide a close insight into how the local companies gather VOC’s and define requirements for products to meet those needs. In addition, it will also enable a second validation of the data Cooper collected. The questionnaire was supplied in advance to the interviewees to allow sometime to digest the information. Then during the course of the interview the questionnaire was completed.

Additionally as part of a separate independent study the authors put together an electronic survey with the same questions and sent it out to a larger group within Kodak and Xerox for comparison. The range of people surveyed was also increased to include not just marketing people but project managers and engineers. The decision was to include this information in this research paper to better support the study.

There were a total of 34 respondents for both the survey and the interview questionnaire with the majority of them being in the market area.

The companies interviewed are as follows:

CORNING **Corning Incorporated** is an American manufacturer of glass, ceramics and related materials, primarily for industrial and scientific applications. The headquarters is located in the city of Corning, New York and

employs about 25,000 people worldwide with annual revenue as of 2006 of \$5.17 billion.



Direct Mail Holding, LLC (DMH) is a full service direct mail company that mails over 1.5 billion pieces annually through serving the fundraising, financial, healthcare, publishing and consumer products markets. Direct Mail Holdings is a company that was built through acquisition. It includes Alaniz LLC in Iowa, Focus Direct in Texas, Mail America in Virginia, International Data Management in Ohio, and Creative Mailing and Marketing in Oklahoma and California, Diamondback Direct in Maryland and Shanghai, China. The privately held company's revenues now exceed \$140 million annually and it employs more than 1200 people.



Space Systems Division (SSD) is a leader in remote sensing, command and control systems, satellite communications, tactical warning/attack assessment, and space launch services. Headquartered in Rochester, New York, SSD provides commercial and government customer's high performance, best value remote sensing products and services. The business leverages corporate resources and employs over 2,600 people worldwide.



Eastman Kodak Company is an American multinational public company which produces photographic materials and equipment. Long known for its wide range of photographic film products, Kodak has focused in recent years on three primary markets: digital photography, health imaging, and consumer and commercial printing. The Rochester, NY based company employs

51,100 (2005) and is the world's foremost imaging innovator with sales of \$10.7 billion in 2006.



Ortho Clinical Diagnostics is a Johnson &

Johnson company. They are a leading provider of

high-value diagnostic products and services for the global health care community.

Ortho Clinical Diagnostics corporate offices are in Raritan, New Jersey, while

their main research facility is in Rochester, New York. The business has two

major segments: Transfusion Medicine which is involved in screening human

blood, and Clinical Laboratories, which does a variety of chemical testing.



Sensis Corporation is a global provider of sensors,

information processing and simulation and modeling that

advance human security, safety and health. The Syracuse, NY based company has

offices across the world, and technology deployed in more than 25 countries

across five continents, the privately-held company offers innovative solutions for

air defense, air traffic control, airline and airport operations management, and

data integration and distribution.



Xerox Corporation is a global document management

company, which manufactures and sells a range of color printers, black-and-

white printers, multifunction systems, photo copiers, digital production printing

presses, and related consulting services and supplies. Xerox is headquartered in

Stamford, Connecticut, though its largest population of employees is based in and

around Rochester, New York employing ~53,700 (2006) with an annual revenue of \$15.9 billion USD (2006)

Analysis

The data from the questionnaire has been tabulated and displayed in graphical form below. A copy of the questionnaire and all the interview notes can be found in *Appendix I* of this report.

VOC and Market Input

The data in *Figure 3.1* shows that all scores are very low (<15%) for the 'always' category. This indicates that the current processes the companies are performing are not being carried out efficiently. This result is surprising since the companies surveyed have been using their product planning process for almost two decades. One would expect their answers to be rated much higher. For example, question #1, working closely with customers to identify needs and problems is rated 45.7% for "often" and 40.0% for "sometimes." A company striving to be a best performer should have the highest percentages in the "always" category, not "often" or "sometimes." This performance would be unacceptable if this were a manufacturing firm or more so a financial one.

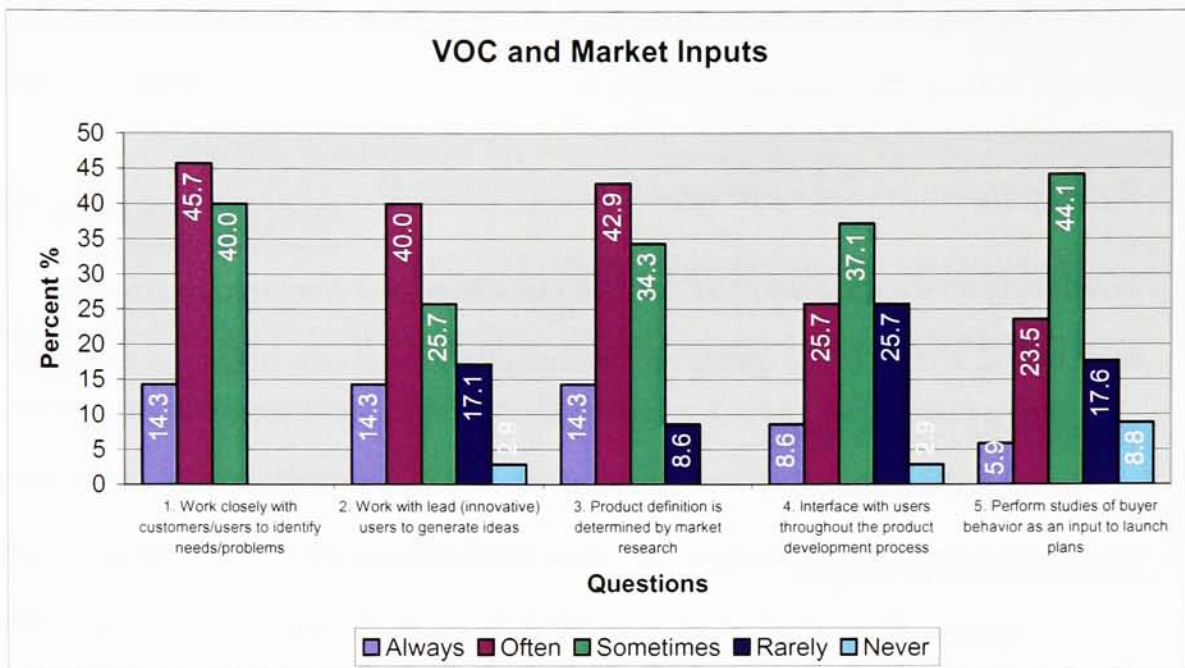


Figure 3.1 VOC and Market Inputs – Questionnaire Results

Additionally, two important results can be seen from the responses to question four, interfacing with users throughout the entire product planning process, and five, performing studies of buyer behavior as an input to launch plans. These metrics are crucial in today's competitive markets, yet the response for both of these questions show distributions that is weighted toward the 'sometimes' category. This indicates these metrics are performed less often, or seem unimportant to the respondents. The reason companies exist, is to provide a product or service to a customer. If the company is not including the customer during the entire product planning process, there is a strong probability that the customer will not be delighted with the end product. This may sound trivial but the data here is confirming this is the case.

Another interesting comment was captured during the interviews. Almost every company indicated the importance of spending more time in the customers' environments to observe and learn. This is a beneficial activity that would bring developers closer to the customers unmentioned needs. But these types of activities didn't happen as often as the firms would like due to internal barriers such as time & money to perform the studies and that there was a higher emphasis on maintaining the scheduled plan for delivering their short term needs.

Product Definition

The data from *Figure 3.2* show two strong responses for product definition: 1) the defined product requirements, features and specs, and 2) the contract between project team and management. While the defined product requirements scored high (always=50.0%), the data also shows that product definition was not as stable (always=5.9%). This data is somewhat contradicting, in that the stability of a product should be directly related to the requirements, features, and specs. The results from the survey show a large gap in these metrics, and almost every firm had a war story of how the definition of their product changes during the development process. From our discussions during these interviews, most firms have defined requirements and features going into the design and development phase. However, because firms do not maintain interactions with customers throughout development, e.g. prototypes, customers' identify late breaking needs and the product intent and therefore its stability changes.

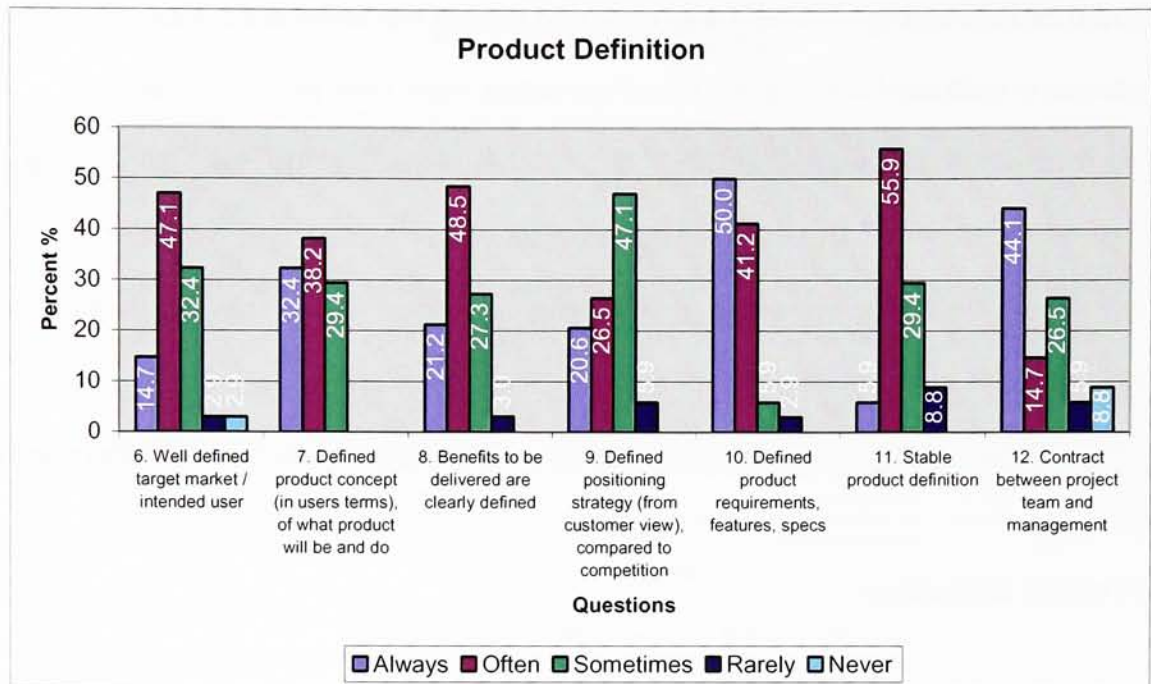


Figure 3.2 Product Definition – Questionnaire Results

Still, the majority of the metrics are far below what one would expect for a mature process. For example 47.1% of the respondents indicated 'sometimes' when defining positioning strategy from the customers point of view. Even worse, respondents said only 14.7% of the time the target market was well defined for the intended user. This makes it very difficult for developers to deliver a product that delights a customer when the target market is not clearly defined. It's like the sails of the ship are functioning properly but there is no one at the helm to steer it.

Product Performance Compared to the Competition

Figure 3.3 indicates the respondents feel their final products are less than stellar compared to the competition. While the respondents chose 'often' most frequently, 'often' is just not good enough when it comes to growing the company

organically, especially firms that are trying to win the innovation war and become best performers.

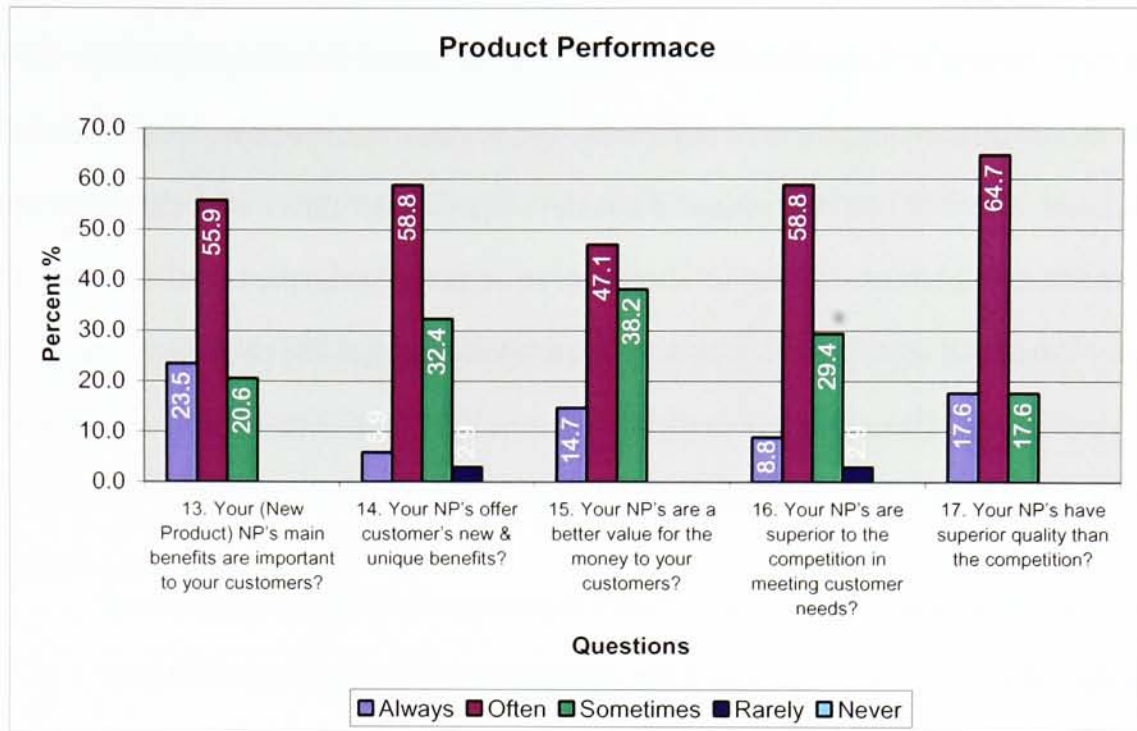


Figure 3.3 Product Performance Compared to the Competition – Questionnaire Results

To be competitive in today's market a company has to be on top of their game at all times. Any product or service that is unable to differentiate itself from the competition is a drain on the company's resources. Company's must be focused and driven to deliver the best products or service that resonate with customers.

Proof of H1

The traditional product planning process, being a mature process, should be a structured, well executed, robust process that delivers excellence throughout the company. Instead, the data tells us that the process is much less. The interviews

revealed that Kodak, Xerox, ITT and J&J Ortho-Clinical Diagnostics have structured product planning processes. While DHM and Sensis have similar processes, they are less structured and more free flowing especially in the early phases. This difference seems to be a result of the size of the company but is beneficial by allowing them to react more quickly to the customer needs. It also removes layers of management and lets developers work closer with the direct customer. Regardless of how structured or unstructured the processes are the data from both the interviews and the survey indicate that the process is not executed well. These results mirror the benchmark APQC data, and lend support to our hypotheses and examples from Cooper.

Why is the traditional planning process so poorly executed within so many companies? According to Cooper the proper resources are not provided to support the process, where firms are more focused on short term copycat project and product extensions. Additionally, the time required to acquire early stage customer feedback are short-circuited to speed products or services to market. The focus is on the details of the plan created by the traditional process, which does not include in-depth customer/developer interactions.

The data collected and analyzed by the authors supports the findings of Cooper noted earlier in this report:

H1: The Traditional Product Planning Process is RARELY done well.

Proof of H2

The next step is to prove that even if the traditional product planning process is done well it will only yield incremental improvements at best. The approach taken to do this was to first score all the companies who participated. This was achieved by adding the respondent's answers for each question. The 'always' response, which is the desired state had a value 5 assigned to it while the 'never' response, which is the less desired state had a value of 1. The other possible responses, rarely, sometimes and often had incremental values of 2, 3 and 4. With 17 total questions the best score possible is 85. The results can be see in *figure 3.4* below.

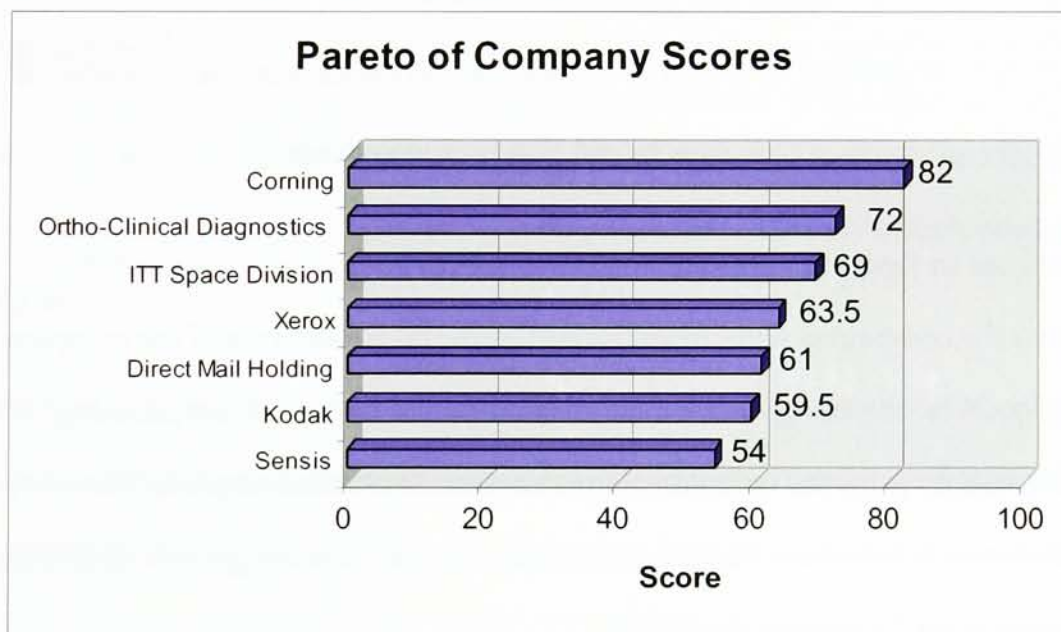


Figure 3.4 Pareto of Company Scores

Now that the scores are establish a ranking comparison can be made between each company. The next logical step was to compare these scores to the respective

companies compound annual growth rate [CAGR]. The CAGR was calculated from each company's annual reports over a span of 5 years. The expectation is that the higher the companies score the better the CAGR will be. This relationship can be seen in *figure 3.5*.

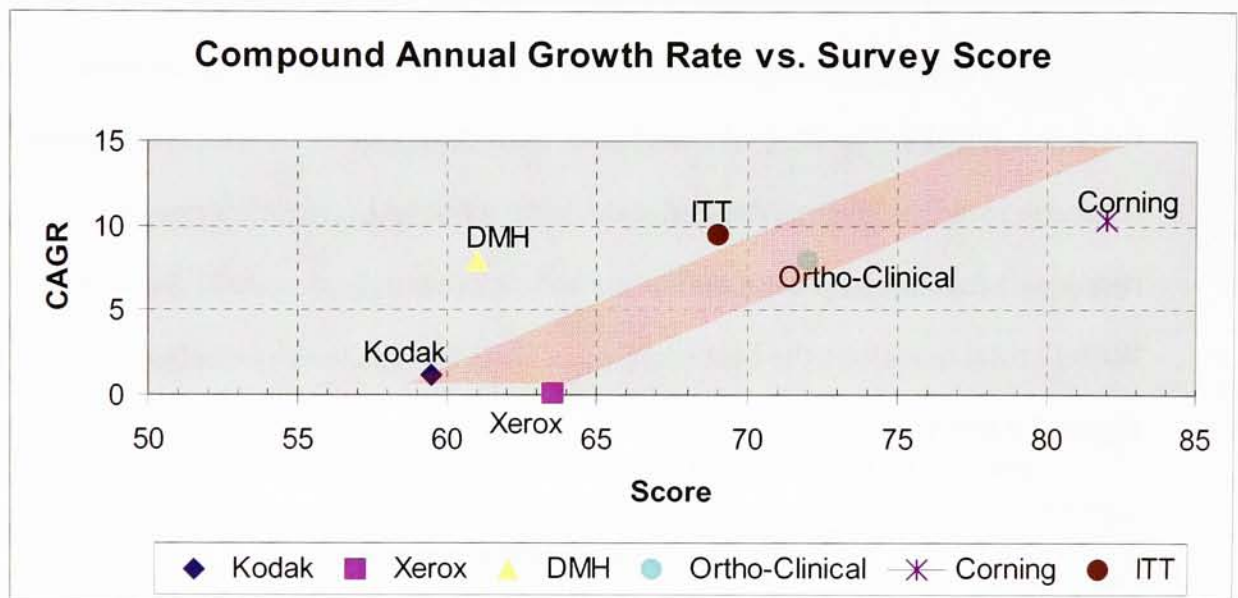


Figure 3.5 CAGR vs. Survey Score

The red bar in *figure 3.5* does highlight that there is a positive relationship between the companies score from the survey to the growth rate of the company. This is good in validating that companies that perform the product planning process well do grow the company. However this result is incomplete. The question now is how does this growth compare to the industry growth rate? This comparison can be seen in *figure 3.6*.

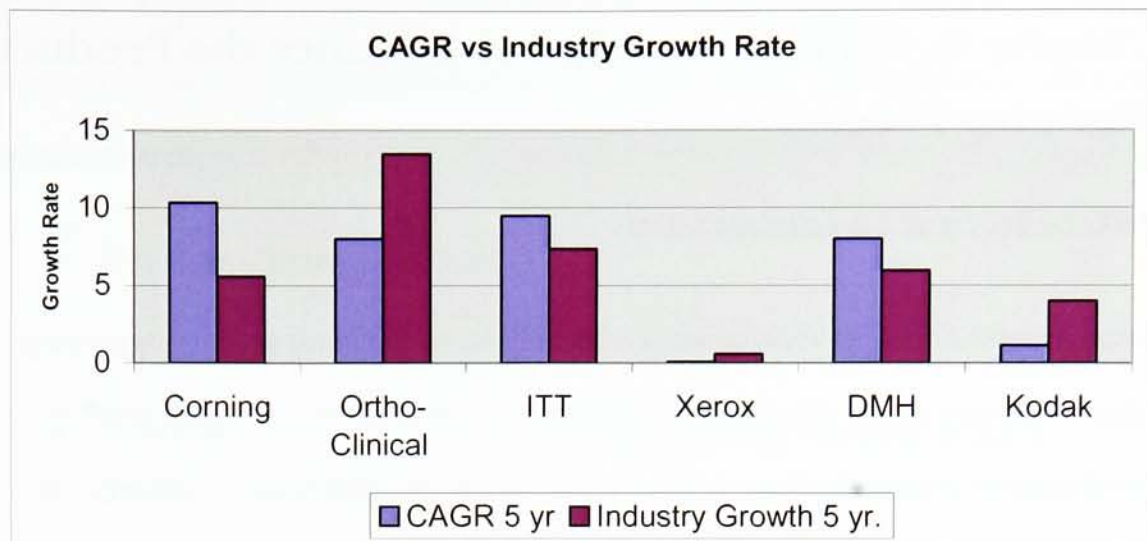


Figure 3.6 CAGR vs. Industry Growth Rate

This comparison shows that the companies that had a high survey score and a high CAGR did not necessarily out perform the industry growth rate. This could indicate that...

H2: the traditional product planning process if done well can only produce incremental improvements at best...eluding the desired breakthrough products and service.

This research paper does not have enough imperial data to fully support this hypothesis but there is plenty of secondary research discussed in this paper that supports this.

In the next chapter there will be some techniques revealed from secondary source research to help enhance the product planning process in efforts to deliver breakthrough products.

Chapter 4: Using Immersion to Enhance the Product Planning Process

Introduction to Immersion

Companies that deliver truly great products have an uncanny way of discovering what customers really need and want. The ability that these successful product development companies have to uncover needs, wants and desired outcomes is grounded in a passion for understanding and learning all facets of the customer experience. By comprehensive immersion, these leading-edge companies are able to better formulate the total customer experience and translate that experience into specifications and ultimately products that delight the target customer.

To become immersed in a customer's environment, product development teams must find the best approach to becoming exposed to enough detail of their customers processes, that they can feel the flow of the activities that need to be performed. Simply said, product development teams need to become immersed in the customers' situation, "walking in their shoes" and "feeling their pain/frustration" as things go wrong and their "excitement" when things go right.

Leading edge companies that deliver blockbuster products have incorporated immersion into their product planning and product development process and have the successful results to prove it. In the next section several breakthrough products will be reviewed with the unique immersion approach and key parameters incorporated as part of each firms early stage product planning

process. As part of the summary we will compare and contrast these immersion approaches and the key parameters used by these firms. The company's and their products are:

- Hill-Rom – Acute Care Beds
- Apple - iPhone
- Pratt& Whitney – Network-based order tracking; Manufacturing & Engineering communication system
- Steelcase –Interactive display for doctor-patient communication
- 3M – Lead Users
- OnStar – Telematic Services

Secondary Research

Hill-Rom's Rise as Bed Supplier for Acute Care Hospitals:

From 1980-1990, Hill-Rom, a medical equipment supplier whose primary market was hospital and nursing home beds, held equal market share with three competitors. Christensen (1999) noted that replacing manual for electric beds neared 100% in acute care hospitals, while nursing home bed care was still growing and the trend was expected to continue for several decades due to demographic trends.

In conflict with this trend, a strategy audit by a major consulting firm indicated Hill-Rom had an opportunity to make significant changes in their product feature and support services to establish a dominant position in the electric bed market

for acute care hospitals. Based on this audit, Hill-Rom decided to strengthen its position in the low-growth electrical bed market and exit the higher-growth nursing home bed business. In order to ensure their new strategy succeeded, Hill-Rom needed to strengthen their processes for new product development.

Traditionally, Hill-Rom obtained new product ideas from three sources: its own market research; ideas generated directly from customers; and concepts developed internally by their marketing and engineering staffs. Hill-Rom gave its market research team a unique challenge: rather than segmenting the market into small, medium and large hospitals, market research had to find out *how the hospitals made money* and understand that process more deeply than the hospitals themselves. Hill-Rom deployed market researchers as hospital orderlies who accompanied nurses as they cared for patients. Their objective was to understand exactly how patients and nurses used hospitals beds, and how nurses, doctors and patients interacted around them.

Hill-Rom channeled the flow of information coming into the company by setting up product management teams comprised of members from sales, marketing, engineering, service, and purchasing. Each team member was responsible for collecting inputs to their product from people within their functional group. This allowed Hill-Rom to piece together a comprehensive view of the activities that could improve hospitals profitability.

Two important insights emerged from these meetings. First, researchers noted that when patients tilted the heads of the bed, the bed moved away from the wall.

The researchers also noted that more digital communication devices could be located on the wall behind the patient's bed. These observations showed that it was important to keep the critical care beds close to the wall. The team responded by developing a retractable bed where the foot of the bed moved in as the head was raised – keeping the bed and the patient close to the wall.

A second idea that stemmed from these meetings was that nurses were spending too much of their time on tasks unrelated to nursing. This included solving television problems, picking up items patients had dropped on the floor, dialing phone numbers for patients, and turning room lights on and off. Hill-Rom developed a communication system (*Figure 4.1*) built into the bed that integrated nurse calls, and unrelated activities all within easy reach of the patient.

This fully integrated easy-to-use system includes touch-screen technology, nurse-patient communication, staff locating and management reports. Christensen (2007)



Figure 4.1 Hill-Rom COMLinX Communication System

noted that by adding feature and functions to their beds, Hill-Rom differentiated its product that helped hospitals make more money.

The immersion technique used by Hill-Rom, described above, is called work-practice modeling (*Figure 4.2*), a form of ethnographic research, to understand how patients, nurses and doctors used hospital beds. This technique collects in-

depth analysis of key operations desired in a product and records all unmet wants and needs. Hill-Rom quickly integrated these customer insights into prototypes customers could evaluate. As feedback came in, prototypes were revised and frequently second and third trials were conducted before the design was finalized.

The job these prototypes performed was independent of any one customer, providing a consistent design for all acute care hospitals. Hill-Rom discovered that utilizing a cross-platform perspective to collect data led to developing a product that performed its job and made the hospitals more profitable.

The gross margins for Hill-Rom's bed market were projected to be 40%. As of March, 2007, Hill-Rom's trailing twelve-month revenue (Goldman Sachs 2007 Healthcare Conference) was \$1.3 billion, and its trailing three-year compound annual growth rate (CAGR) was 6.2%. The revenue from its acute care market segment accounted for 68% of its total revenue (Acute care, Post acute care, International & Surgical).

Apple and the iPhone:

Since Steve Jobs returned to Apple in 1997, Apple has reeled off a line of consumer-electronic hits: the candy-colored iMac, titanium laptops, iTunes software, iPod music players and now its newest breakthrough product the iPhone. But Jobs is not acting alone. Apple has consistently ranked as one of the world's top innovation firms, owing its success to the vision and passion shared by Jobs, chief designer Jonathan Ive, and their design team. Ive (BusinessWeek,

September, 2006) noted the team thrives on competition and has a sense of looking to be wrong; they're curious, with a sense of exploration, and are eager to be wrong, because that's when they've discovered something new. The design team works closely with engineers, marketers, and outside manufacturing firms who actually build their products. And if they don't get it right, they try again until they do. So what's so unique about the iPhone?

The iPhone's front panel has only one mechanical button. The thin surface has a touch-screen that displays the buttons, keys or icons that are relevant to the user. If music is desired, the iPhone shows album covers; when writing e-mail, a small keyboard; when a call comes in, the caller's ID from the address book. And as a final appeal to simplicity and ease of use, Apple uses a multi-touch technology that lets your fingers scroll, drag, rotate, and resize the images on display. In keeping with the iPod, the design team was able to figure out how to put a layer of clear plastic over the black core, giving the iPhone (*Figure 4.2*) a sense of depth and texture. Their pioneering work in injection molding is part science, art, and trial and error.

The team understands the production process so well, that toolmakers and suppliers from Asia prefer to work with them. That passion is also found in their customers, who swear allegiance almost religiously. If you own an iPod – your favorite tune and piece of mind are moments away. But are there lessons Apple could



Figure 4.2 Apple iPhone

teach other companies to help them succeed?

Apple's strength is not in cooking up newly innovated ideas (Lessons from Apple, Economist, June 2007) . Its real skill is stitching together its own ideas with other technologies from outside the firm, and then wrapping them into a stylish design. The iPod was assembled from off-the-shelf parts and Apple's distinctive easy-to-use system of controls. Apple (BusinessWeek, June 2007) orchestrates and integrates technologies and is not afraid to bring in new ideas from outside firms, but always adds its own twist. This approach, known as "network innovation", is not limited to electronics. It has also been embraced by companies such as Procter & Gamble, and several drugs giants, all of which have realized the power of admitting that not all good ideas start at home. Network innovation involves cultivating contacts with start-ups and academic researchers, constantly scouting for new ideas and ensuring that engineers do not fall prey to "not invented here" syndrome, which values in-house ideas over those from outside firms.

Apple also stresses the importance of designing new products around the needs of the user, not technology for its own sake. Some firms end up with products designed by engineers for engineers, and the products don't draw mainstream buyers. The iPod was not the first digital-music player, but it was the first to make downloading and organizing music so easy. Similarly, the iPhone was not the first mobile phone to incorporate a music-player, web browser or e-mail, but it was the first to use the same operating system and web browser used in Apple's computers. Also, it has visual voicemail – saving users from listening to all their messages before finding the important ones. Apple has stamped ease-of-use on

its products from the first Macintosh computer - as if it were as product itself.

But listening to customers can be dangerous.

The iPod was ridiculed when it was launched in 2001, but as of October 2007, the iPod had sold over 190 million units worldwide, making it the best-selling digital music-player in history. So, sometimes you need to ignore what the market says and trust the product and the core values of the firm.

The last lesson from Apple is to fail wisely. The Macintosh was born from an earlier failure, and the iPhone was a response to an earlier failure produced in conjunction with Motorola. Both times, Apple learned from its mistakes and tried again.

Apple applied their tried and true method of ethnographic studies with engineers, marketers and Asian manufacturers, coupled with extensive prototyping and application of their ease-of-use forte to generate a breakthrough design for cell phones. This follows in the tradition of successful stylish consumer products made by Apple that help existing customers, who were previously underserved through new products and services, get jobs done.

The iPhone went on sale in June 2007, with 4GB Phones costing \$499, and 8GB phones costing \$599. The 4GB phones are now on their way out and the 8GB cost has dropped to \$399 in time for Christmas sales season. Apple's goal is to sell 10 million iPhones, capturing only 1% of the market. Yet the iPhone could become a big family product with continued product lines just as with the iPod. And 10

million phones with an estimated \$200 profit per phone, provides quite a successful start.

Figure 4.4 shows Apple used an ethnographic approach to interact with engineers, marketers and manufacturing versus the primary customer contact used by Hill-Rom. However, the serial process remains the same; collecting a set of defined metrics, validating the metrics were correct, creating a scorecard which feeds the ideation stage, and building prototypes. This process continued to loop until the desired needs were met.

Pratt & Whitney:

Pratt & Whitney (P&W), the manufacturing division of the government jet engine division of United Technologies, is an in-house design and manufacturing shop that produces machined parts for new jet engines. Manufacturing catered mostly to P&W engineers, who took their business to outside suppliers as a cost competitive move in the mid-1990s. Ulwick (2005) provided a detailed view of the methods P&W used to bring this business back and increase customer satisfaction. In 1994, management felt that a multimillion-dollar shop floor logistical control system would generate new value for their customers. They thought this was the source of their competitor's strength but before making a large financial investment, they needed to confirm their instincts were correct.

P&W immersed themselves in their customers' environment, collecting 85 metrics engineers used to measure vendors' success. Next, P&W conducted a

customer survey to capture the importance of these metrics and degree to which these metrics were satisfied by P&W and its key competitor. P&W then used Ulwick's opportunity algorithm that determines the best opportunities from "what customers want a new product or service to do for them that is not satisfied by existing products or services." Companies ask their customers to quantify on a scale of one to ten the importance of what this new product or service will do for them, and the degree to which they are currently satisfied. The algorithm is as follows:

$$[\text{Importance} + (\text{Importance} - \text{Satisfaction})] = \text{Opportunity}$$

The interviews focused on the results the P&W engineers wanted to achieve in doing their jobs, not the features they'd like to see. The data (*Table 4.1*) showed the top opportunities had time factors as a key component and the shop floor logistical control system might not be the source of their competitor's strength. Minimizing the impact to design change had the highest level of importance (9.0), yet it already achieved a moderate level of satisfaction (6.0). Minimizing time to change part tolerances was also rated high in importance (8.9), but it had the second highest level of satisfaction (5.4). Minimizing the time to obtain order status ranked third in level of importance (8.8), but the "gap" (Importance-Satisfaction) had the highest value of 4.4. Placing a scoring methodology on the results of an ethnographic study quantifies the gaps between what is important and customer satisfaction, prioritizing customer needs.

Desired Result:	Importance	Satisfaction	Opportunity
Minimize time it takes to obtain status on order	8.8	4.4	13.2
Minimize the time it takes to change part tolerances	8.9	5.4	12.3
Minimize the impact to design change on schedule delivery	9.0	6.0	11.9
Minimize turnaround time on priority orders	6.3	2.5	10.1

Table 4.1 Pratt & Whitney Opportunity Scores

P&W used the data from the survey to create a results-based customer scorecard to make three separate evaluations. First, they quantified the value being delivered by their existing product and their key competitor. This provided a benchmark to measure the value of a logistical control system. The scorecard showed P&W's existing service delivered 48.3% of the desired value, while their competitor's delivered 53.4%. In addition, a new logistic control system would only deliver 49.8% of the desired value, a 3% improvement versus the 10% desired by management. Second, the data also showed the competition was significantly better at minimizing turnaround time on priority orders and the time required to obtain status on an order. Lastly, while the control system would improve their ability to minimize idle manufacturing time, this was an unimportant value to the customer. With this new data, P&W management rejected the plan to invest in a shop floor logistical control system.

The P&W team then held a two-day ideation session to devise a solution that would deliver over 60% of the desired value. *Table 4.2* shows the key ideas and

features the team felt would deliver optimum results and the highest added value to the customer.

Desired Result:	Idea/Feature	Added Value
Minimize time it takes to obtain status on order	Centralized, customer accessible, order tracking system that is updated in real time	51.8%
Minimize time it takes to change part tolerances	Communication system enabling mfg. and engineering to confer in real time, non-conformances identified and fixed quickly	55.0%
Minimize impact to design change on schedule delivery	Cross-training of workers for improved workflow	57.8%
Minimize turnaround time on priority orders	Fixed pricing and pooling of a percentage of profits into an overrun "bucket"	60.3%
Minimize cost overruns	Fixed pricing and pooling of a percentage of profits into an overrun "bucket"	62.5%

Table 4.2 Ideas Generated by Pratt & Whitney Team

The solutions were: a customer-accessible, networked-based tracking system that provided order status in minutes rather than hours; a communication system between manufacturing and engineering that would reduce tolerance change time from 48 hours to two; and elimination of cost overruns where possible by moving away from cost-plus contracts to a fixed order pricing method. This ideation methodology was followed for each of the top opportunities. These ideas were projected to improve customer value by over 66%, approximately 38% higher than the company's existing offering and 25% above their competitor.

P&W used immersion to collect customer metrics, differentiate importance from level of satisfaction, and create a scorecard. They then held in-depth ideation sessions to determine their customer's most important needs. Knowing the job that needed to be done – understanding the situation that caused the purchase

and emotional factors such as frustration or anger – was fundamental in understanding what their customers needed. P&W used the understanding of the job that drove success & profitability for their customer as the basis for generating new ideas.

One year after implementation, customer satisfaction had increased 35%, and in less than two years P&W regained their lost market share and captured an additional 5% of the market. P&W used this same methodology to improve their advanced composite material testing service, reducing their cost of testing from \$4 million to \$435,000 and reduce cycle time from two years to six months. Through immersion P&W was able to “live their customer’s lives” by spending extensive quality time with their customers in order to extract the relevant requirements. Only through immersion can firms understand the latent needs that customers are unable to articulate.

Pratt & Whitney used in-depth interviews and surveys as immersions tools to build a breakthrough product. P&W collected a set of defined metrics, validated the metrics were correct, created a scorecard which fed the ideation stage, and built prototypes. The assumption made here is that the network-based tracking system and communication system provided were software products that typically develop over several iterations. This process continues to loop until the desired needs are met.

Steelcase:

Hackett (2007), CEO of Steelcase, a global office furniture leader, noted that his firm sometimes made the same mistake as most companies: R&D groups feuded over fundamental ideas; misunderstanding arose over design and capital investment; and Steelcase put all their energy into the execution phase of product development before the team had thoroughly considered and understood all of the variables surrounding their idea. They had set themselves up for what Harvard professor Max Bazerman calls “bounded awareness.”

Bazerman (2006) noted that cognitive blinders prevent people from seeking, seeing, using, or sharing highly relevant, accessible and readily perceivable information during the decision-making process. Since most innovation comes from being able to ask the right questions, Hackett implemented a critical thinking course at Steelcase to teach managers how to balance doing with thinking. The course includes the phases of “Think,” “Point of View,” “Plan Implementation,” and “Implementation.” The course in “Think” includes:

- **Ponder** – Consider the problem deeply, compare thoughts with team members, and listen open-mindedly. Question and challenge collegially
- **Query** - Make sure the team spends time to ask the right questions.
- **Read and Research** – Divide the topic among team members, read, research, compare notes, educate one another, and look for patterns
- **Network** – Tap into the company’s network to talk to the smartest people in the world to verify patterns
- **Document** – Write down what you discover, summarizing the research, conclusions, and recommended options.

It is during the “Think” phase that Hackett noted “it is only by **immersing** ourselves in all of the available knowledge about a customer’s settings that we could begin to see subtle patterns that could help the company develop a breakthrough product.” This requires team members to do what a good investigative journalist does – read journal articles, research reports, competitive intelligence, and books, according to their skill sets, interests and networks. The notion is to know more than anyone else who is thinking about the same issue.

While the info gathering phase of “Think” appears time consuming, it prevents controversy, second guessing, recrimination, and finger-pointing and actually saves time in the end. The “Point of View” phase is viewed as a concrete conviction that is more believable after a thorough “Think” phase, where the chosen option is less controversial. Consider the case of a Steelcase team that was trying to determine how the firm could expand beyond providing desks, chairs and padded walls for Doctor’s offices and into the clinical side of patient examination rooms.

Steelcase could have used industry experts to help answer questions about basic industry trends, to single out the strongest influencers in buying decisions, and to identify the competition. But an outsider would not have generated the kind of insights needed. Only by immersing themselves in the available knowledge about focused health care settings could they begin to see patterns that could help develop a breakthrough product. For over two years, the team conducted ethnographic research at leading health facilities like Ascension Health, Intermountain Healthcare, Kaiser Permanente, Massachusetts General, Mayo

Clinic and other top Integrated Delivery Networks (IDNs). It investigated the causes and cures of medical errors, impacts to the way surgery lights are hung in the operating room, staff-to-patient ratios, population shifts, medical purchasing processes, and medicine delivery protocols. The team then networked with external researchers (Institute for the Future) to determine if they could confirm the patterns they were seeing in how medical professionals and patients interacted. Experts concurred that the doctor-patient interaction could be enhanced through Steelcase PolyVision digital interactive white boards (*Figure 4.3*), which could display patient information and allow the doctor or the patient to add footnotes to the information, and retrieve it later over the Internet.

Steelcase then held discussions to review the options generated to ensure the variables for each option were considered thoroughly. The team decided Steelcase could move deeper into the healthcare market by expanding their effort in work areas they already serve (doctor and nurses stations), and expand their

efforts into new and different areas including patient's rooms, examination rooms, and café lounges. Steelcase used work practice modeling, employing a 3-phased approach of asking, observing and experience, to determine the customer's critical success factors through first-hand experience, and used



**Figure 4.3 PolyVision
Interactive Display**

prototypes to repeat the process (ask/observe/experience) to achieve optimal performance for the customer.

In less than one year, Steelcase's new business and brand called Nurture (healthcare environment), sold to a number of large hospitals, outpatient centers and clinics. Customer feedback showed Steelcase was providing the kind of clinical environment customers have been hoping for, using results-based design to define a new way of thinking about healthcare furnishings. The Nurture product line has earned the Premier healthcare alliance 2007 "Pinnacle Award" (Malcolm Baldrige National Quality Award) for supplier performance that was awarded to 13 suppliers out of 720 eligible contracted suppliers who have consistently achieved 2006 scorecard ratings of 95 percent or higher.

3M - Lead Users

The lead user methodology was implemented at 3M's Medical-Surgical Markets Division by Eric von Hippel, Stefan Thomke, and Mary Sonnack (1999) who created a four-stage planning process using lead users to make recommendations for new products that had not existed before. The lead-user process typically starts by forming a cross-disciplinary team from sales, marketing and technology. One member serves as project lead and each team member spend 15-20 hr /week on the project until its completion. This high level of concentration promotes creativity and sustains the projects momentum. Projects proceed through four phases where each phase can vary in length. For planning purposes, teams should

plan on four to six weeks for each phase, and up to six months for the project duration. The following is the process they developed:

- Lay the Foundation: Identify target market, type and level of innovation desired by key stakeholders, who must be on board early in the process.
- Determine the trends: Talk to experts in the field, people who have a broad view of emerging technologies, and search for applied patents.
- Identify Lead Users: Network to identify/learn from lead-edge users. Collect information that identifies innovative ideas that might contribute to breakthrough products. Shape product ideas to assess the business case.
- Develop Breakthroughs: Host two-three day workshop with several lead users, marketing, developers, and the lead team. Work in small groups & then as a combined team to design concepts that fits company's needs.

After the workshop is completed, the project team sharpens the concepts, determines if target market needs are met, and presents its recommendations to senior management. By using this process, a firm will have concrete evidence that explains why customers would be willing to pay for this product or service.

This approach was used by 3M to develop new thin surgical adhesive backed films that adhere to the patient's skin during surgery. Surgeons cut directly through these films during an operation, and the films isolate the area being operated on from sources of infection. However, this did not protect the patient from infections from catheter tubes or medical equipment used during the

procedure, and the team realized it did not know enough about the needs of surgeons and hospitals in developing countries.

The team then traveled to hospitals in India, Indonesia, Malaysia and Korea, and believed a crisis was developing in the hospitals of developing countries because doctors there were relying on cheap antibiotics to prevent the spread of infection. The team redefined their goal: a cheaper, more effective way to prevent infections from spreading that does not depend on antibiotics or thin surgical films.

The team then contacted innovative users at leading veterinary hospitals and professional make-up artists, to learn how to operate in dirty environments and apply materials that do not irritate the skin and can easily be removed. A lead-user workshop was held that generated concepts for two new product lines and a radical approach to infection control. The first recommendation was for an economy line of surgical films made from existing technology but would not be a breakthrough product, yet could be used in cost-conscious developing countries.

The second recommendation was for a “skin doctor” line of handheld devices that could layer antimicrobial substances onto a patient’s skin during an operation and vacuum up blood and other liquids during surgery. The skin-doctor line could also be developed from existing 3M technology, and thus would not be a breakthrough product, but would offer surgeons a new infection prevention tool.

The third proposal was for an “armor” line of products that coated catheters and tubes with antimicrobial protection. These products could also be created using existing 3M technology, but was a breakthrough product because it would allow

3M to enter into the \$2 billion market aimed at controlling blood-borne, urinary track, and respiratory infections. 3M used a lead-user approach to immersion by identifying their target market, talking with experts in the fields to determine trends, networked to identify lead-users, and held two-day workshops with lead-users to identify breakthrough products.

In addition to finding concepts for new product lines, the team identified a revolutionary approach to infection control. But developing these competencies, products, and services would also require management to change their strategical approach to innovation. 3M's strategy until this point had been a once-size-fits-all mentality, where every patient would receive the same level of prevention from infection. However, during the project, the team found that some patients have greater risk for infection than others and doctors wanted a way to treat patients according to their needs.

The team proposed a strategic change and persuaded management to move towards a lead-user methodology. One of the products that evolved from this effort was 3M™ Steri-Strip™ surgical skin closures (*Figure 4.4*).

This is a non-invasive adhesive skin closure device for primary closure of low-tension lacerations and surgical incisions. The product is designed for fast application with precise



Figure 4.4 3M™ Steri-Strips™

wound edge alignment and good cosmetic results. 3M has implemented the lead-user methodology in 10% of its divisions, and revenues increased at a CAGR of 4.6% between 2000 and 2004. The operating profit was \$4,578 million in 2003 (increase of 23.3%), and net profit was \$2,990 million (increase of 24.4%). 3M's Health Care segment (incl. medical and surgical supplies) account for 21% of 3M's revenues. The division recorded revenues of \$4,230 million in fiscal year 2004, an increase of 5.9% over 2003.

OnStar

OnStar was founded in 1995 as a collaborative effort among GM, EDS and Hughes Electronic Corp (Koudal, Lee, Peleg, Rajwat, and Wang, 2004). Each of the companies brought its own area of expertise into the venture - GM brought vehicle design, vehicle distribution, integration, sales, service, and financing; EDS had knowledge of system development, information management, and customer service technologies; while Hughes excelled in communications and satellite technology and vehicle electronics. At the end of its first year in operation, OnStar had only 1,100 subscribers. Ten years later, more than 2 million customers' used OnStar and it was recognized worldwide as the leading telematics provider. Forrester Research (Forrester Report, June 2001) defines telematics as "devices that wirelessly connect vehicles to customized information and services to deliver four main benefits to consumers: safety and security, hands-free connectivity, mobile access information, and entertainment."

The cornerstones of OnStar's initial offering were safety and security where the system had to be simple, reliable, and easy to use. Services were accessed through a three-button console on the rear-view mirror, utilizing the notion of "no driver distraction." The OnStar, emergency and answer/end call buttons each connected the user to an advisor, where voice recognition kept drivers eyes on the road. The base plan, installed at the factory, included emergency services, accident assist, roadside assistance, remote door unlock, air bag deployment notification, and stolen vehicle tracking.



Figure 4.5 OnStar Console

If a crash occurred, the system placed an emergency call if the air bags were deployed. The call relayed the vehicles location, and the phone number of a local emergency facility appeared on the advisors screen. If the car was stolen, the owner could initiate remote tracking where OnStar would contact local law enforcement authorities and locate the vehicle using GPS technology.

OnStar also provides customers with 24-hour connection to services such as navigation, diagnostic services, and personal assistance for booking hotel rooms, airline services and ordering flowers. Another key service was wireless phone service. By 2003, two-years after launch, OnStar had sold more than 200 million wireless minutes, demonstrating the increasing value customers placed on making and receiving hands-free calls while driving their vehicle. With millions of customer interactions, OnStar provides a better understanding of customer

insight to improve design for future products and services that more closely meet customer needs. An example of this is the extended use of advisors.

To adhere to their “no driver distraction” philosophy, OnStar built the Virtual Advisor (VA) with the goal of providing in-car, eyes-on-the-road, and hands-on-the-wheel access to personal information. The VA could recognize the subscriber’s voice, read e-mail, news, sports scores, stock quotes, or local weather simply by voice commands. A testament to the quality and usability of its service happened during the August 2003 blackout of the Northeastern United States. OnStar was able to maintain service to most of its customers even though call centers received an increase of calls from drivers affected by the blackout.

Through remote diagnostic service, car manufacturers could also reduce their number of recalls and warranty costs. For example, before OnStar a faulty engine controller may have been undetected for up to 15 months. In contrast, with a sophisticated set of sensors installed, once a problem was detected the information could be transferred to an OEM who could fix the problem quickly. Additionally, the new acceleration-by-wire technology was designated for use in the upcoming fuel-cell powered cars. This two-way communication methodology also provided opportunities for other industries.

GM’s safety first approach was expected to save the insurance industry billions of dollars due to lower auto crash fraud & claim settlements as well as lower auto theft losses. GMAC utilized OnStar’s in-vehicle safety and security system to offer subscribers premium discounts, in addition to the discounts given vehicles

already equipped with the OnStar system – discounts up to 20%. The service-based model GM employed that utilized different car models and package options would not only be beneficial to GM but to alliances with other car manufacturers.

Developing alliances with other car manufacturers was expected to create a larger install base for OnStar and strengthen its brand image. While executives worried about diminishing their competitive advantage of product differentiation, the project team's analysis showed they could reap greater benefits if the service were extended beyond GM. The high cost of the telematics business as well as lack of experience presented a barrier to entry for many auto makers. Thus, OnStar formed alliances with Acura, Audi, Isuzu, Lexus, Subaru, and Volkswagen.

In support of these alliances, surveys showed 79% of customers were concerned if they had an accident on the road and were unable to get help, while 86% said OnStar gave them peace of mind if family members had problems on the road, and 85% said OnStar's automatic notification of airbag deploying was the most important feature. With OnStar's alliances established, the target renewal rate of 56%, close to its 60% target, ensured the product was a sure-fire hit.

Rick Wagoner, President and CEO of GM, said "We got in the game without complete certainty; we learned, we made changes, learned a little more, and spent a little more. We learned to invest more out of confidence that something makes sense rather than studying it to death. Financial modeling gave us a pretty good idea of how big our opportunity was, and the business model gave us flexibility to make investments quarter-by-quarter, as we learned about the

business. If we didn't like what we saw we could slam on the brakes, if it looked good we put our foot on the accelerator."

OnStar is in the process of moving its technology platform from Web services to Service-Oriented Architecture (SOA). Many of the software business rules that make OnStar tick are embedded in applications. To increase efficiencies and speed processing times, the plan is to remove redundant code and insert a business layer. The migration to SOA, in part, is to prepare for the increase in business. OnStar is a wholly-owned subsidiary of General Motors Corp., whose plan is to install the service in all its vehicles by the end of 2007.

Summary:

Our observations and comparisons across Hill-Rom, Apple, Pratt & Whitney, Steelcase, 3M and OnStar show a consistent process of customer immersion and ethnographic research combined with customer based metrics and prototyping to bring breakthrough products to market. These firms believe it is more important for their own product developers, versus third-party suppliers, to understand the unstated desires and cultural practices that surround the use of their products. External suppliers fail to inform developers what customers really do. Ethnography links what people say to what they do – avoiding the pitfalls that come from relying on self-reported external data. It is worth noting that ethnographic studies do not have to be 12-24 month activities.

Business ethnographic studies can target a sub-segment of a customer's problem, spending weeks of time, or multiple days over several weeks to collect

information that generates ideas and concepts for short term gains. But, only through customer immersion can firms understand the hidden needs that customers are unable to articulate.

Lead-users methodology is also an extension of ethnographic research as developers spend time in the field talking to experts, and network to identify/learn from lead-edge users. The collected information identifies innovative ideas that might contribute to breakthrough products and requires an understanding of the customer, their environment, their situation, and their needs prior to implementing its particular style. One of the key reasons most successful products are developed by people who have “lived the customer’s life,” is the insight gained that comes from living with and understanding customer’s problem. This is also the organizing concept behind the lead-user methodology.

While ethnography appears costly and time consuming, highly successful companies use this approach to prevent controversy, second guessing, recrimination and finger-pointing. These companies actually spend less time and money on the more costly development through launch phases of the product development process. In contrast, companies that cut early stage funding are likely to spend more time and resources in the development phase, iterating and upgrading on more costly, fully integrated products.

Co-evolution as in the case of OnStar is another form of immersion, where products are placed in the field and developers work with customers to enhance the products offering. With the move to SOA architecture, OnStar can more efficiently offer services customers truly desire. Thus immersion can be viewed as

the rich and fertile soil that firms use to plant their approaches to understanding what their customers need. Each approach may require different skill sets, resources, commitment and nurturing for growth. In the next chapter we will provide a detailed review of the approaches to immersion including; ethnography, interview and surveys, lead-users, alpha labs, co-evolution, and virtual reality.

Chapter 5: Product Planning Approaches to Immersion

The breakthrough products developed by the leading edge companies discussed above were widely adopted because these companies engaged in a variety of immersion approaches to insure that these products resonate with the target customer in terms of fulfilling unmet needs and wants. Commitment by the product planning teams to engage thoroughly in various immersion approaches is essential to truly uncovering requirements that will delight customers and reach beyond the norm to deliver breakthrough products. Immersion approaches can vary a great deal depending on the target market segment and the specific product line. Moreover, some immersion approaches lend themselves to consumer applications and some to commercial applications. In an effort to better comprehend the various immersion approaches and later consider a process that can be used to augment the traditional planning process, the following model attempts to classify immersion approaches in two main categories.

Immersion approaches are provided by developers to bring customer input into the planning community with insights into how they experience products and accomplish work. Immersion approaches provide specific activities, initiatives and techniques that engage the customer and tap into their tacit knowledge, which is often overlooked in traditional product planning or VOC/QFD approaches. Product planners can benefit tremendously from the product

planning process if they can become immersed in the details of how customers' perform their work.

These approaches can also be categorized as either being "Pulled" by the developer from the customer, or "Pushed" by the developer onto the customer.

Figure 5.1 provides a graphic representation of this model.

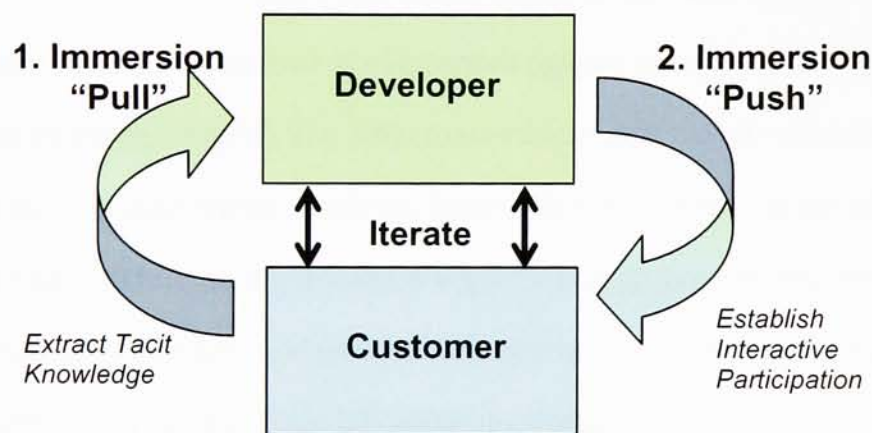


Figure 5.1 Immersion Categories

1. Immersion approaches can be categorized as PULL activities where product development companies "pull" information from customers using a variety of ethnographic immersion techniques including; Interviews/Surveys, Work Practice Modeling and Lead-User Engagements.
2. Immersion approaches can also be categorized as PUSH activities where product development teams "push" information, prototypes and feedback tools to the customer through various immersion approaches to establish a natural feedback mechanism and communication dialog with the development company. In this case, immersion approaches like; Virtual Reality, Alpha Labs and Co-evolution are used.

Immersion “Pull” Approaches:

Immersion “Pull” Extract Tacit Knowledge
Ethnographic Studies
Interviews and Surveys
Work Practice Modeling
Lead-User Engagements

Immersion “pull” approaches involve techniques that are orchestrated by the developer and extended to the customers as a vehicle for them to interact with the product planning and development community. Both consumer and

commercial customers are more familiar than the development community with the idiosyncrasies of the day-to-day functions that allow work to be performed (“work” is used to describe the use of any product for a specific functional activity). Customers have the experiential or tacit knowledge gained while routinely performing work using certain products; they understand how work is currently performed and the obstacles associated with that work process. Customers are aware of unmet wants and needs yet have difficulty describing those needs in a manner that can be directly applicable to new product development and specifically the feature content of breakthrough products.

Immersion “pull” approaches uncover the difficult-to-extract information and unspoken requirements that define the user experience and their environment while performing work. The section to follow identifies several immersion pull approaches that have been successfully adopted by development companies to extract valuable tacit knowledge from the customer.

Ethnographic Studies:

Ethnographic studies present varying degrees of qualitative and quantitative descriptions of human social phenomena, based on fieldwork. Ethnography presents the results of a holistic research method founded on the idea that a system's properties cannot necessarily be accurately understood independently of each other. Social and cultural anthropology were based largely on ethnographic research, which provides an account of a particular culture, society, or community. The fieldwork can range from a brief targeted session to studies that involve spending a year or more in another society, living with the local people and learning about their ways of life. Ethnographers are participant observers. They take part in events they study because it helps with understanding local behavior and thought.

For product planning purposes, ethnographic studies can provide tremendous insight into the customer environment and allow product planners to experience the customers' world first-hand and document how work is accomplished. Bringing ethnographic studies to the customer is a time-consuming and rigorous process that requires commitment from the customer and from the product development team, including a unique set of skills and processes for extracting the valuable information and synthesizing it for use in the product planning process. Product planners need to identify appropriate customer sites where they can integrate this approach into their environment and not disrupt the natural flow of producing work or cause a noticeably obtrusive activity that hampers the

natural immersion process. Ethnographers camp out with customers; spend lengthy time at their workplace, home or social setting. They watch and study people produce work using a product or several products; they try to understand their system and work flow; they look for innovative opportunities to make the work flow more fluidly or reduce steps. They also look for adjacent activity that might be comprehended in the current work process. Below are 10 ethnographic techniques that can be used independently or in cooperation with each other to become more immersed in the customers' scenario.

Ethnographic Techniques:

1. Direct, first-hand observation of daily behavior. This can include participant observation.
2. Conversation with different levels of formality. This can involve small talk to long interviews.
3. The genealogical method. This is a set of procedures by which ethnographers discover and record connections of kinship, descent and marriage using diagrams and symbols.
4. Detailed work with key consultants about particular areas of community life.
5. In-depth interviewing.
6. Discovery of local beliefs and perceptions.
7. Problem-oriented research.
8. Longitudinal research. This is continuous long-term study of an area or site.
9. Team research.
10. Case studies.

Christensen, et al (2007) noted that when a job a customer needs done is known, conventional tools such as interviews and surveys are good enough to get the job done. The real objective however, is to understand the situation, not the customer. An example shared in the article was when a fast-food company resolved to improve the sales of its milkshakes. First the company used traditional segment methods by profiling the customers likely to buy a milkshake. Then they invited customers who fit the profile to evaluate the product. The product improvements feedback they received from customers had no impact on sales.

Next the firm applied business ethnography, documenting what products were purchased and when, whether the purchaser was alone or in a group and whether they drank the milkshake on premises or to go. The data showed that 40% of the milkshakes were purchased in the morning as take-out orders. When customers were asked what "job" they were trying to accomplish, most replied they had a long commute and needed something to keep their stomachs full until noon. By understanding the real need for milkshakes, the firm knew which ingredients would do a better job and which were irrelevant. The result was thicker shakes with chunks of frozen fruit to make the drink more exciting. These changes led to increased sales and the firm stole market share from other breakfast markets in the region.

The lesson learned was that there is an inherent problem focusing on customer needs, that is, customers need different things at different times. In contrast, the situation or job that needs to be performed is more stable than the product because it exists independent from the customer, and its success causes the

purchase to occur. Understanding the situation that leads to the purchase will likely yield insight into the customer's emotional factors such as frustration, anger, or pain. In order to provide a set of functional, emotional, and common experiences required to get the work done, the situation, and not the customer, needs to be the fundamental unit of analysis. Situational case analysis tracks down the whole story behind the specific events that get jobs done. By analyzing 20-25 cases, a summary can be derived that describes the job the customers were trying to get done when they "hired the product."

Three key ethnographic techniques are explored further as each provides a unique and relevant approach to immersion that can fortify the product planning process. Specifically, the use of interview and surveys, work practice modeling and lead user engagements will be explored with a focus on the direct application of these ethnographic immersion approaches to product planning.

Interviews and Surveys:

At the fundamental level interviews and surveys are immersion approaches that present a "pull" opportunity for communication exchange with the customer. Interviews are valuable face-to-face sessions that provide the product planning team with real-time response to questions and an opportunity for customers to express themselves in an open dialog. Interview sessions can bring to the surface emotional feelings about a particular work process and the specific product(s) involved in that process as well as pain-points, unmet wants and unmet needs. Interviews can be conducted with a single customer one-on-one or in a group

setting. Group setting interview sessions like “focus groups” and “customer councils” can provide more generalized feedback yet often become a sessions where the most dominate opinion prevails and individuals who are not decided on certain issues can follow the consensus of the group rather than search internally for their own feeling and responses.

The key to conducting a good interview and walking away with valuable product planning information is to make sure that secondary research concerning the customer, the industry and the specific work process is completed prior to the interview. It is also important to generate questions in advance of the interview and to provide those questions and discussion topics to the customer being interviewed prior to the interview session. The developer needs to define the goals for the interview and whether multiple people from cross-functional disciplines should participate in the session. Using an interview guide that includes indirect and inferential questions helps customers articulate their needs, likes, dislikes, and desires. A walk-through the customer facility to see proper use, abuse and misuse of the product and work process first hand is also very helpful.

Cooper (2007) showed that after the Smart Pump™ 2000 failure, Gould Pumps technical, sales, and marketing teams took extensive VOC training, undertook in-depth interviews at multiple customer accounts and went on walk-throughs of facilities where Gould pumps were used. Their key findings indicated that maintenance was an issue, but not the overriding issue. The major pain point was that pumps 1) often used high horsepower, 2) ran constantly, and (3) consumed large quantities of power. The teams also observed that customers placed flow

valves in half-closed positions in order to control flow. The solution was a simpler version of the original Smart Pump with sensors to measure demand and supply, a microprocessor, and a variable speed drive. The new Smart Pump™ became the flow controller for the system and generated a payback in less than one year from power savings. The new Smart Pump™ was a huge success, but only after VOC immersion, more specifically; in-depth interviews, discussions with the customers and observation at customer sites through walk-through visits.

The purpose of surveys is to collect information about customers to describe, compare, or explain their knowledge, feelings, values and behavior. Surveys typically take the form of self-administered questionnaires and interviews. Self-administered questionnaires can be completed by hand (paper-and-pencil or touch-screen) or by computer (on- or offline). Survey data are used by product planners, evaluators, researchers and policy leaders in diverse fields, including business, health, social welfare and politics.

Surveyors must decide on the survey's overall purpose and specific questions. They also need to know who and how many people will be contacted (sampling) and when and how often the survey will take place (design). Surveyors must process, analyze and interpret data. To choose among survey types (self-administered questionnaires or interviews) or methods of administration (mail, telephone or computer), you need to select one that will produce credible and accurate results and for which you have the resources.

The intentions and methods of surveys fall on a continuum. Some surveys can be far-reaching, others very simple and basic, yet all methods must be scientific and

generate some quantifiable result that can be analyzed and interpreted. Surveys can be developed in a printed form or electronically using web survey tools such as SurveyMonkey.com and Surveys Pimp amongst others. Care should be taken with the survey design and the metrics established in rating the survey so that the survey is easy to fill out and delivers meaningful data that can be extrapolated from the results and/or has some link to other company or industry benchmarks.

When conducting a survey the following stages should be followed to ensure successful Survey results (Wai-Ching Leung, University East Anglia, UK, 2007)

Stages of conducting a survey:

Survey Scope:

- Clarify the purpose(s) of the survey
- Define the study population
- Sampling and estimating the sample size

Survey Design:

- Decide what information to collect
- Decide how to measure the information

Survey Analysis:

- Collect the data
- Record, analyze, and interpret the data

American Express actively conducts surveys with a variety of specific customer segments to help shape the thought leadership and strategic direction of various services they offer. By becoming immersed in customer responses via surveys American Express is able to better understand specific target populations. A recent survey of Boomer and Gen Y Entrepreneurs offers an interesting look at how Gen Y and Boomers view risk.

For American Express and many other companies, electronic surveys can provide a great way to leverage this very connected world by “pulling” these web-based surveys from specific targeted customer segments with a connected form of immersion that can probe very specific questions.

The author’s conducted a product planning survey for Kodak and Xerox as part of a separate independent study. This survey was designed with product planning, program management and product professionals in mind to uncover insights and provide a self-assessment about the product concept phase of the product development process. The survey design was tailored to leverage data from Cooper so that the results could be compared to other existing industry studies. This information was used to help expose Kodak to specific process improvements to the concept development stages of the KECP product development process. The team used Survey Monkey and conducted the surveys electronically on-line. The survey and the graphic results are provided in *Appendix I* for reference.

Work Practice Modeling:

Work Practice Modeling (WPM) is an ethnographic immersion approach that is focused on understanding the various ways in which people actually interact with technologies in order to accomplish their work. WPM is a “naturalistic” study and recording of human behavior; naturally occurring behavior and natural habits in natural environments. Work practice modeling for product development applications is targeted at understanding how work gets done (“work” is

previously defined as any “job” a customer has “hired” a product to do). On-site and open-ended interviews and workflow analysis designed to go where work takes place and gain a better understanding of how people think about their work and how they think they do their work.

The key to success with work practice modeling is to observe and document vs. trying to suggest, change or create bias in the process while discovering what people do and how they feel about what they do. WPM seeks to capture the tacit knowledge by witnessing what people know but can't tell you—unspoken requirements. WPM professionals look to understand the details associated with a specific “job”, contingencies and trouble areas that may arise. Special attention is made to uncover and understand workarounds; how people compensate for design and system weaknesses, as potential areas for improvement.

Work Practice Modeling Steps (Sprague and Woolfe, 2007):

1. Document the work processes
 - Identify the specific steps of the process and the activities, inputs and output of each step
2. Video/audio tape record the work process
 - Video/audio recording provides opportunities for in-depth analysis of specific functions by slowing down the process
3. Participate in the work, by doing whenever possible
 - For many jobs – know is doing, understanding the issues by walking in the users shoes provides better insights to requirements
4. Uncover the distinction between process and practice

- Deciphering between authorized descriptions of work (process) and what people know how to do but don't think to talk about (practice)
5. Make the workflow visible
 - Document, diagram, model and illustrate the workflow in a manner that everyone can become aware of the activities in a visual way
 6. Co-design of possible solution scenarios
 - Incorporate insights from the "users" into the solution and engage the user in the definition of a solution that solves their problem – they know best when the problem is solved
 7. Co-development of solution prototypes
 - Iterate with the user community beyond the problem solving stage to prototypes and other immersion approaches like co-evolution that incorporates user feedback and ideas throughout the prototype process to ensure a complete and thorough solution

Ulwick (2002) noted that outcome or results-based requirements generate a users perspective on the underlying activities associated with an intended product or service. Ulwick used work practice modeling to look at each step in an operation to uncover the input, activity and output of each step. This approach illuminates the work that needs to be completed and provides the product planning team with insights to unmet needs and areas to enhance the workflow.

Ulwick suggests that this method provides a new way to think of the innovation and product planning processes. The method involves three key beliefs that provide more direct immersion with the customer:

1. Customers buy products and services to help them get jobs done.

2. Customers use a set of metrics (performance measures; time, cost, etc.) to judge how well a job is getting done and how a product performs.
3. These customer metrics make possible the systematic and predictable creation of breakthrough products and services.

Thorough understanding of real customer needs requires immersion in the customer's use or context of existing products through some type of ethnographic study. But how do you determine which product to invest in and where the ideas should come from?

By combining Christensen's "situation" as the fundamental unit of analysis, with Ulwick's Opportunity Algorithm, a new planning model can be used to gather the unspoken, unarticulated needs of the customer, formulate requirements, and rank the product initiatives according to the best opportunities available.

For example, Cordis, a medical device manufacturer located in Florida, conducted in-depth interviews with cardiologists, nurses, and laboratory personnel to comprehend their situations and the inherent jobs they needed to get done. The interviews focused on the results these professionals wanted to achieve in doing their jobs, not on what features they'd like to see. Next they used Ulwick's algorithm to help determine the level of importance, degree of satisfaction, and market-opportunities. The data are shown below (*Table 5.1*).

Desired Result:	Importance	Satisfaction	Opportunity
Minimize restenosis (reoccurrence of blockage)	9.5	3.2	15.8

Minimize the force required to cross the lesion with a balloon	8.3	4.2	12.4
Minimize the amount of damage inadvertently caused to vessel when putting guide wire in place	9.5	7.5	11.5
Minimize the time to place balloon across lesion	9.1	8.4	9.8
Minimize the time it takes to complete the procedure	5.1	1.0	9.2

Table 5.1 Cordis' Angioplasty Balloon Opportunity Scores

The algorithm showed that restenosis had the highest level of importance, and it had the second lowest score when it came to the degree of satisfaction. This combination produced the highest opportunity for all possible ideas. Minimizing the amount of damage to blood vessels also scored the highest for level of importance, but it already held a high degree of satisfaction. Minimizing the force required to cross a lesion and minimizing the time required for the procedure both had “gaps” (Importance-Satisfaction) of 4.1. However, the algorithm points correctly to the force required to cross a lesion as the higher opportunity due to its higher rating for importance. Understanding the situation involved in getting the customer’s job done helps firms focus and weed out non-important results. Placing a scoring methodology on the results of an ethnographic study is important to quantify the gaps between customer satisfaction and importance and helps prioritize customer needs.

Lead User Engagements:

Lead User is a term developed by Eric von Hippel in 1986. His definition for lead user has two key aspects:

1. Lead users face needs that will be general in a marketplace – but face them months or years before the bulk of that marketplace encounters them, and
2. Lead users are positioned to benefit significantly by obtaining a solution to those needs.

In other words, Lead Users of a product currently experience needs still unknown to the public and who also benefit greatly if they obtain a solution to these needs.

Eric von Hippel believes that there is considerable benefit in becoming immersed and familiar with lead users. von Hippel and Stefan Thomke followed a fundamentally different approach to traditional VOC/QFD product planning by designing programs that collected information about both needs and solutions from the leading edges of a company's target market and from markets that face similar problems in a more extreme form. von Hippel and Thomke observed that "true" lead users are rare. To track them down most efficiently, project teams use telephone interviews to network their way into contact with experts on the leading edge of the target market. Networking is effective because people with a serious interest in any topic tend to know of others who know even more about the topic than they do – people who are further up the "pyramid of expertise".

The lead user immersion team conducts interviews about various problems and opportunities, and then asks for referrals for someone who has even more relevant knowledge. The next step is to continue networking until lead users are

found in markets and fields that face similar problems but in different and often extreme forms. It is this small group of lead users that are highly-influential and can help immersion teams discover truly novel solutions to important needs that are emerging in the target market.

Next we will discuss a variety of immersion “push” approaches that developers can provide to customers so information can be easily pushed back to the developer in a fluid process that provide customer input to the concept development and planning process in a context where customers generate input in their terms using developer tools.

Immersion “Push” Approaches:

Immersion “Push” Establish Interactive Participation
Virtual Reality
Alpha Labs
Co-evolution

Immersion “push” approaches provide customers an unobtrusive method for engaging more directly with the developer. Customers are busy with their businesses – doing what they need to get their work

done. Whether a consumer or commercial customer, all customers experience times when a particular product does not meet a specific need or the customer uncovers a new requirement that may expand the value of a product. Push approaches provide a path for customers to express their issues as the problem is encountered. They also provide a communication link where new product enhancements ideas can be expressed, prototyped or experienced. Push

approaches establish an interactive participation from the customer to the developer in an approach that makes the exchange easy and a fluid aspect of doing their job. This direct-feed from the customer through these approaches flows to the product planning and development teams, and can be directly applicable to new product development and specifically the feature content of breakthrough products.

Product planners can benefit tremendously by the fluid nature of immersion “pull” techniques and how they can pull direct customer feedback from the products as they are being used. Immersion pull approaches are also valuable when customer are engaged directly through a developer sponsored alpha lab, or a virtual reality session that emulates a new product or work process.

All the immersion “pull” approaches are complimentary to the immersion “push” approaches and can be used in combination with each other. In the next section we will explore three specific immersion “push” approaches that prove beneficial to the product planning and concept development of breakthrough products.

Virtual Reality:

Dr. Klaus Peter Beier from the University of Michigan Virtual Reality Laboratory stated that “the term 'Virtual Reality' (VR) was initially coined by Jaron Lanier, founder of VPL Research (1989). Other related terms include 'Artificial Reality' (Myron Krueger, 1970s), 'Cyberspace' (William Gibson, 1984), and, more recently, 'Virtual Worlds' and 'Virtual Environments' (1990's).

Today, 'Virtual Reality' is used in a variety of ways and often in a confusing and misleading manner. Originally, the term referred to 'Immersive Virtual Reality.' In immersive VR, the user becomes fully immersed in an artificial, three-dimensional world that is completely generated by a computer."

Today there are varying degrees of immersion regarding virtual reality depending on the application. Virtual reality and simulations allow customers to experience a new product concept and the environment more thoroughly allowing them to become more immersed in the future vision of the product and think more about the complete implications of the product to their lives. Experiments with this approach, although costly, provide relevant and real-time feedback to the product planning teams.

As the technologies of virtual reality evolve, the applications of VR become very extensive. It is assumed that VR will reshape the interface between people and information technology by offering new ways for the communication of information, the visualization of processes, and the creative expression of ideas.

Note that a virtual environment can represent any three-dimensional world that is either real or abstract. This includes real systems like buildings, landscapes, underwater shipwrecks, spacecrafts, archaeological excavation sites, human anatomy, sculptures, crime scene reconstructions, solar systems, and so on. Of special interest is the visual and sensual representation of abstract systems like magnetic fields, turbulent flow structures, molecular models, mathematical systems, auditorium acoustics, stock market behavior, population densities, information flows, and any other conceivable system including artistic and

creative work of abstract nature. These virtual worlds can be animated, interactive, shared, and can expose behavior and functionality

Useful applications of VR include training in a variety of areas (military, medical, equipment operation, etc.), education, design evaluation (virtual prototyping), architectural walk-through, human factors and ergonomic studies, simulation of assembly sequences and maintenance tasks, assistance for the handicapped, study and treatment of phobias (e.g., fear of height), entertainment, and much more.

In time the experimental and computer-game roots of VR will converge with the commercial applications as product planners can use VR as an immersion approach to pull feedback and responses from customers in future scenarios that could only previously be conceptualized, not experienced. This convergence of game and commercial applications for VR has already been gaining ground as the viral nature of the web has extend the use of Avatar's for some commercial applications. At some commercial web sites customers can become a character and explore the world of VR as intended by sponsoring web site.

Using Avatars for product planning purposes:

An avatar is an Internet user's representation of him or herself, whether in the form of a three-dimensional model used in computer games, a two-dimensional icon (picture) used on Internet forums and other communities, or a text construct found on early systems. The term "avatar" can also refer to the personality connected with the screen name, or handle, of an Internet user.

The latest use of avatars in instant messaging is dominated by dynamic avatars.

The user chooses an avatar that represents him/her while chatting and, through the use of text-to-speech technology, enables the avatar to talk the text being used at the chat window. Another form of use for this kind of avatar is for video chats/calls. Some services, such as Skype (through some external plug-ins) allow users to use talking avatars during video calls, replacing the image from the user's camera with an animated, talking avatar.

The growing use of avatars and VR provides a rich landscape for product planners and developers of the future to deliver an immersion experience where the developer can pull valuable product planning information from the users VR experience back into the product planning process.

Alpha Labs:

Leading-edge companies establish collaborative environments (usually a web site), for customers to have access to early prototypes so they can participate in using, testing and incorporating new software into the many ways that customers do their work. The content of most Alpha Labs is largely directed to future rather than existing products that might take a standard Beta Test path through lead users to the general market. Alpha labs are intended to expose customers and co-developers to early product concepts that may have some basic functionality yet are far from finalized in features and capability. Developers that provide customers and partners with an alpha lab environment are “pushing” new experimental technology in the direction of innovative customer in the hope that

the customer will become immersed into a specific module or function and provide valuable insights into how to tune this feature for wider scale adoption. In the case of development partners – alpha labs provide a green field of opportunity to build complementary products and services that help fill the gaps for a specific use.

An example of an alpha lab is IBM's alphaWorks web site (www.alphaworks.ibm.com), which posts prototype software programs allowing customers and developers to download a 90-day free evaluation license of various software, evaluate it and provide feedback. alphaWorks was created in 1996 with the goal of unveiling some of the many innovative Research & Development projects from IBM development labs around the world. In those early days, the alphaWorks Web site made available a few technologies for users to evaluate. Little did IBM know the impact that these complimentary downloads would have on both IBM and the technical community. For IBM's researchers, alphaWorks became the channel for reaching an early adopter audience that is instrumental in shaping the future technology landscape. For developers, it was a chance to get their hands on alpha code with which they could experiment in order to create their own innovations. Community adoption of alphaWorks technologies brought success to many areas, including the foundation and creation of standards in Java, XML, and Web services.

IBM has branched into several other alpha lab collaboration efforts such as ThinkPlace. ThinkPlace is a Web application for facilitating innovation through idea generation, collaboration, and refinement. ThinkPlace is unlike a suggestion

box; when used within a company, it shares ideas within the entire company. By providing a common place for sharing, refining, and recognizing ideas, ThinkPlace encourages all employees to innovate and to collaborate on further improvement of the ideas. Even if employees don't have an idea to post, they can look around, collaborate, rate others' ideas, or find ideas for their own use. ThinkPlace also invites suggestions for improvements.

IBM has also developed Many Eyes, a service that combines information visualization with social software, enabling collaborative visualization by groups of users. The service presents a set of interactive visualizations that provide insight into a variety of topics, varying from cereal nutrition data to fertility rates of countries worldwide. In addition, visitors are able to upload new data sets and create their own visualizations. Through the creation of new visualizations, discussion forums, and the addition of new data sets, visitors to Many Eyes can do more than merely look at data: They can truly collaborate around it. Users can point out interesting findings, share possible explanations, ask questions, and contribute new information to the site. The result is a process of social data analysis that goes beyond mere visualization: Also provided are additional context and explanations, faster access to interesting findings, and the ability to share visualizations with colleagues.

Thousands of developers and customers have posted valuable ideas and unique issues that have proven to be a great source of innovation for IBM. Xerox also has developed an alpha lab called AlphaAvenue for similar use.

Alpha labs are a successful approach to immersion that allows certain lead-edge customers to communicate with the development community and for the development community to get timely feedback on various initiatives. Product planning and concept development professional can use the feedback and adoption rate of certain solutions to better predict how the product might perform in a wider audience. Alpha labs also help to connect customer with developer in a fluid way that often generates breakthrough ideas that neither the customer nor the developer would come up with on their own. The only issue with alpha labs is that there is a large cost associated with the running of the lab and processing of the various requests – alpha labs that are under funded tend to backfire and rather than be engaging experiences for customer and partners become a negative experience where questions are unanswered and customers are frustrated.

Co-evolution:

Leading-edge developers are taking advantage of a more connected marketplace and the latest web-based tools to develop products with iterative development in mind – by designing the user experience to be equipped with a real-time communications link into the development environment. Some developers provide a very “active” link where customers communicate directly with the development community live, in chat sessions or using voice-over-IP communications. Other developers provide a “passive” link where communication is sent in background behind the scenes automatically reporting

on a software problem for example. All of these co-evolution immersion approaches are deployed using the latest Web Services in a Services Oriented Architecture (SOA) that provides a platform designed to support such interactive session in a bidirectional manner without any noticeable effect to performance.

Co-evolution provides a very fluid vehicle for customers to become connected with developers and developers to become more immersed with customers in a real-time basis sharing feedback and issues on unmet wants and needs of the product.

GM OnStar product discussed earlier in this paper has evolved as a better product due to the direct feedback of customers using the system to communicate issues back to GM product planning and development teams. In the late 1990's, onboard electronic communications systems (Telematics) could give drivers maps to their destination, inform them about shops in the area, help police find lost or stolen vehicles, enable hands-free calling, and collect and interpret engine diagnostic data. Christensen (2007) discussed General Motors creation of OnStar as an in-vehicle safety and security system that was flexible and configurable with a minimum fixed cost. OnStar's marketers paid close attention to the circumstances their customers were in when they signed up and used the service. A few years later, a major job for OnStar became clear. People wanted emergency access to an operator and peace of mind in the event on an accident. By focusing on doing this job, OnStar became a highly profitable, rapidly growing and differentiated service that GM provides to millions of customers today.

Microsoft has for several years incorporated a real-time interface from Windows users into the development environment. Users send a direct message when they encounter a Windows problem and document that problem with specific feedback. The use of this embedded feedback technology has allowed Microsoft to more quickly resolve software problems and release software at early stages in development since this co-evolution communications vehicle has been established.

Immersion Approaches Summary:

The various immersion approaches presented above provide a view into the popular techniques that companies have successfully incorporated into their product planning processes in efforts to develop breakthrough products. The table below provides a summary of these immersion approaches.

Immersion “Pull” Extract Tacit Knowledge	Immersion “Push” Establish Interactive Participation
Ethnographic Studies	Virtual Reality
Interviews and Surveys	Alpha Labs
Work Practice Modeling	Co-evolution
Lead-User Engagements	

Table 5.2 Immersion Approaches

In the next chapter we will present a process overlay for the traditional product planning process that incorporates the immersion approaches upfront prior to the product concept stage when developing breakthrough products is the goal.

Incorporating vital strategic planning activities and immersion approaches into the planning process and establishing an iterative/prototyping culture will drive the required level of customer participation necessary to deliver breakthrough products. The following product planning process is design to pull together the concepts of immersion and iteration discussed in this research project into a process that can be linked with the traditional product planning and development process to form a new alternative process tailored specifically for breakthrough product initiatives.

Chapter 6: Immersion and Iteration process for Breakthrough Products.

The traditional product planning process (T3P) as stated previously in this research project is a well establish process that is suited for delivering incremental products. The third hypothesis states that process capability of the T3P is not tailored to a more comprehensive understanding of the customer, their environment and the unspoken—hard to articulate, wants and needs that when met, positively delight the customer and cause viral levels of adoption.

H3: Even if Done Well, the Traditional Product Planning Process Does Not Have the Process Capability to Deliver “Breakthrough Products”

The primary and secondary research discussed in this project suggests that more is needed in the front-end of the T3P to recognize and describe requirements that drive breakthrough products. The research further suggests that adding some type(s) of immersion approaches to the T3P will greatly expand the probability of a successful breakthrough product. This is not to say that breakthrough products do not occur with the T3P – only that it is less probable that a breakthrough will occur if immersion and iteration are not incorporated into the product planning process.

If immersion and iteration are an essential element of the planning processes that yields breakthrough products – then more detailed insights and processes need to be explored to incorporate immersion and iteration into the T3P model.

This will ensure that the process can be understood and replicated when considering breakthrough product initiatives. The T3P process can be modified for breakthrough initiatives by replacing the first stage gate “Phase 1: Definition, Strategy, Product Concept” with two new phases; “Phase 1a: High-Level Strategy Stage” and “Phase 1b: Customer Immersion and Iteration Stage”. The addition of phase 1a and 1b to the T3P now provides a model that incorporates immersion – Traditional Product Planning Process with Immersion (T3Pi). The diagram below illustrates how the optional immersion “front-end” can be overlaid on the T3P model to create a derivative that is more tailored for breakthrough initiatives. The balance of the chapter will be dedicated to introducing the T3Pi model and describing the specific steps involved in deploying the T3Pi model for breakthrough products.

Traditional Product Planning for Incremental product development

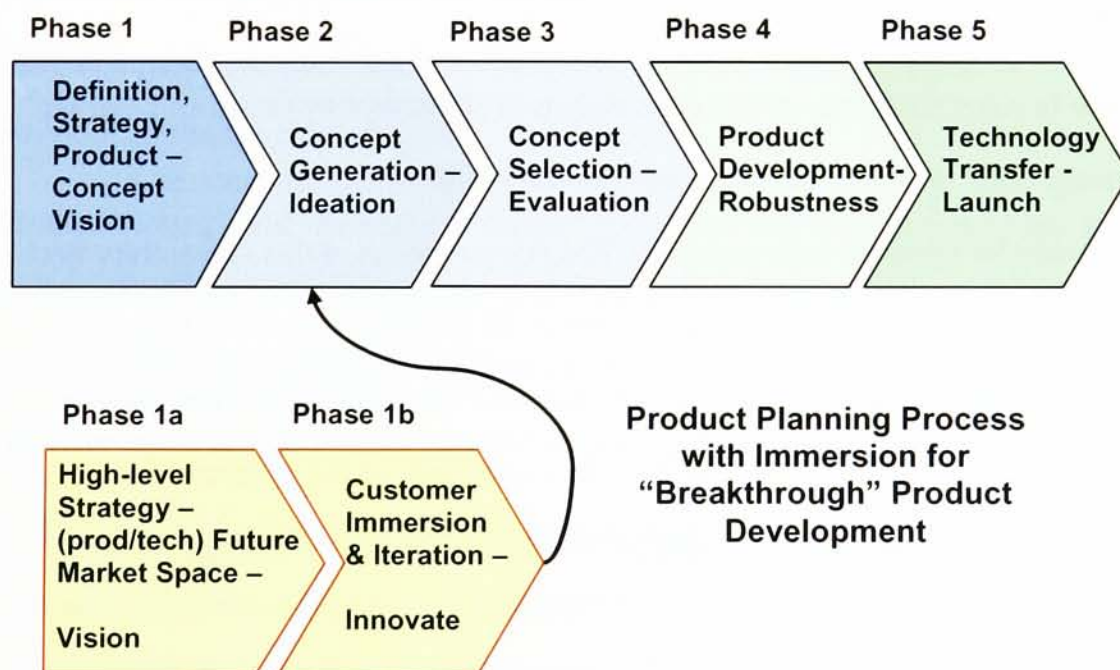


Figure 6.1 Traditional Product Planning Process with an Immersion Front-end

Tradition Product Planning with Immersion; Phase 1a:

High-level Strategy

Phase 1a

**High-level
Strategy –
(prod/tech) Future
Market Space –
Vision**

The traditional planning process moves quickly from strategy exploration to a product specific focus with assumptions that the future view of technology, products and market conditions support the ideas for the product. Some

companies perform other strategic functions in advance of the product development process that provide the strategic framework for their product developments initiatives. Efforts such as competitive benchmarking, market analysis, business model analysis, assessment of technology trends, etc. for many company are included in the company's' strategic plan or the market and strategy map for a particular division. These efforts are all very critical to the success of a product development initiative yet they need to be much more tightly linked with the product development effort and not a separate and decoupled process or activity.

Phase 1a suggests that a certain core aspects of the company vision and market strategy need to have a direct thread into the product planning process – especially for breakthrough products. The primary focus of this research project is the immersion process presented in phase 1b, yet it is essential to begin a product development effort with a complete and comprehensive view into the strategic aspects of the future market space intended for the product development initiative and to apply process discipline to the strategy process.

Michael E. Porter (1996, p78) states that, “The strategic agenda is the right place for defining a unique position, making clear trade-offs, and tightening fit. It involves the continual search for ways to reinforce and extend the company’s position. The strategic agenda demands discipline and continuity; its enemies are distraction and compromise”. Strategic success does not imply a static view – a company’s decision to embark down a new product development path must be driven by the ability to find new trade-offs and leverage new systems of complementary activities into a sustainable advantage.

Phase 1a requires a comprehensive vision of the future market space that the new product planning team will need to explore. The planning team will need to “**discover**” and “**assess**” specific aspects of the present and future businesses to determine the specific market and target customer to become more immersed with. This first phase of the immersion model is focused at macro level strategy and should be tightly connected to the overall corporate strategy and mission statement of the corporation and the specific division where the product development takes place.

Product strategy and vision are developed as a result of a multi-faceted view of the elements that affect the success and overall fit of the product. The following list provides a high-level view of the areas the product planning team will need to discover and assess to ensure they are targeted at a truly breakthrough concept.

Business/Market: The current business model and the current market conditions need to be assessed. This includes, but is not limited to; market share assessment, effect of globalization, analysis of other successful and

unsuccessful business models, and adjacencies with other markets.

Assessment of all significant trends that may affect the customer, market and/or product category require analysis as well. In-depth financial analysis is critical to understand business and market trends. Conducting a complete business analysis of products and companies who have succeeded and failed and the degree of that success and failure is of particular importance to the breakthrough product team. The business and market analysis is best built piece by piece through the entire planning process – far too often companies drive for a one-time shot at the business model, market definition and the financial plan and risk missing “discovery” information that can be learned through the planning process (Crawford/Benedetto, 2000).

Customer: In phase 1a the planning team must look at the current customer base and evaluate whether current customers are representative of their target customer base. These customers’ must demand the product at levels that will meet the revenue requirements of a breakthrough product. If the answer is no (which is often the case) – the planning team must determine what customer segmentation represents the potential to support a breakthrough product effort. This segmentation work is critical at the macro level since it will direct the specific target for the immersion efforts in phase 1 b.

Competition: New product idea generators must be aware of competitors’ activities—competitors’ new products may be an indirect source for leapfrogging incremental offerings to create breakthrough products. Competitors, however, are rarely sources for breakthrough ideas; they are

useful in benchmarking situations to see how fast technology is moving and for determining their capacity to innovate (Crawford/Benedetto, 2000). Gauging the competitions risk profile and market acceptance of new ideas can provide a feel for how aggressive new concepts might be adopted by your target customers. Understanding the competition can provide insights into the ability of competitors to retaliate to a new product offering and how long your company may enjoy a competitive advantage created by a new breakthrough product. Keeping aware of the competitive terrain, by monitoring and benchmarking trends is a critical aspect of being opportunistic and strategically relevant with new product development initiatives.

Technology: The approach for assessing technology with breakthrough products in mind is very different than the approach necessary for sustaining or incremental products. Careful planning, followed by aggressive execution, is the right formula for success in sustaining technology. But, in a disruptive situation, action must be taken before careful plans are made. Because less can be known about what markets need or how large they can become, plans must serve a very different purpose: They must be plans for learning rather than plans for implementation (Christensen, 1997). Discovery-driven planning, which requires managers to identify the assumptions upon which their business plans or aspirations are based, works well in addressing breakthrough products (Rita G. McGrath and Ian C. MacMillan, 1995).

Discovery-driven planning comes by watching how people use products, rather than by listening to what they say (Christensen, 1997). Breakthroughs often

come from unanticipated technological innovation. Therefore, maintaining a consistent effort in exploratory research with technologies that have the potential to be disruptive is foundational to creating breakthrough products.

Corning has established a complete process (Magellan), roadmap and dedicated team for long-term technology development that has horizons out beyond 10-15 years (Kirk and Mills, 2007). The Magellan “immersion” team looks to external experts, Corning scientists and technology planners to identify disruptive technologies and observe and report by screening possible “hot-spots” that provide opportunity. Once identified, more resources are applied to the specific area of study until the opportunity is validated or proved non-viable. If the technology is deemed to have potential, further drill-down immersion efforts are conducted.

Developing a formal technology team and assessment processes that identifies Technology, Form and Benefit is critical to finding breakthrough opportunities. A firm uncovers a *technology* that at some point matches with a market or customer need, in a *form* that will delight or *benefit* customers (resonating value proposition) and deliver a sustainable competitive advantage for the company (Crawford/Benedetto, 2000). Technology initiatives need to be anchored in the marketplace. “Managers confronting disruptive technologies need to get out of their laboratories and focus groups and directly create knowledge about new customers and applications through discovery-driven expeditions into the marketplace” (Christensen, 1997).

Product Portfolio: The product portfolio applies to all of the products that the enterprise has to offer. This includes the pipeline of products that are approved and in the development process. This also pertains to the architecture; characteristics of the products; subsystem concepts; flow of energy, information and material; relevant standards; supporting value-chain plans; and the modularity, miniaturization and reuse plans (Clausing, Frey 2004). Understanding the complete product portfolio and the product pipeline is essential to identifying portfolio gaps and unmet market needs. Product planning professionals need to look for product adjacencies and integration of service as opportunities to create an extend value proposition for customers.

Breakthrough product innovation does not have to be a completely new concept. The Apple iPod example stated previously in this paper is an example of a first-class integration of many existing technologies into a more holistic offering that better addressed the music needs of consumers. Golder and Tellis (1993) stated that “smart followers tend to take over”. Paying close attention to your product portfolio and market trends can provide innovative ideas for product initiatives that leverage the existing product portfolio. The key to portfolio management is the selection and prioritization of high-value projects (and killing poor ones), ensuring that there is the right balance and mix of projects in the portfolio, and balancing the limited resources against the demand to do even more projects (Cooper, 2005).

Core Competency: Developing and delivering breakthrough products requires a different mind-set and process than the traditional product

planning process for incremental product development. Leading edge companies who understand and target a portion of their business at breakthrough products establish a core competency around a strategic and breakthrough path that often cannibalizes their mainstream sustaining business that survives off of incremental product releases (Christensen, 1995).

The core competencies of the firm is the sum of experiences (tacit knowledge) of the engineering hero's, research, development and manufacturing practices that are uniquely embedded in the people, processes and values of the organization. Companies need to establish cross-functional teams that are focused on breakthrough innovation if delivering breakthrough products is the goal. In *Revolutionizing Product Development* (The Free Press, 1992), Steven Wheelwright and Kim Clark referred to these "breakthrough team structures" as "heavyweight teams" – entirely dedicated to the new challenges of breakthrough product development. Company's that develop a core competencies and dedicated teams focused on breakthrough products; IBM and Eli Lilly for example have successfully leveraged heavyweight team to deliver breakthrough products (Christensen and Overdorf, 2000).

When the future market space is defined from the perspectives stated above the product planning team must begin looking even closer at the target customer to uncover specific details about unmet needs and wants. Phase 1 b provides the process methodology for more complete immersion into the customers' world in a manner where unspoken needs and wants can be discovered and defined. Phase 1 a works in concert with phase 1b where of potential opportunities are filtered

through the learning's from real-time immersion and iteration efforts with the customer. This process becomes a refining activity that drives a few winning product concept ideas that truly resonate with the customer. The diagram below illustrates the critical aspects of the “breakthrough” planning process and how the Strategic phase is a feeder to the Immersion and Iteration phase all converging to a few winning product concepts.

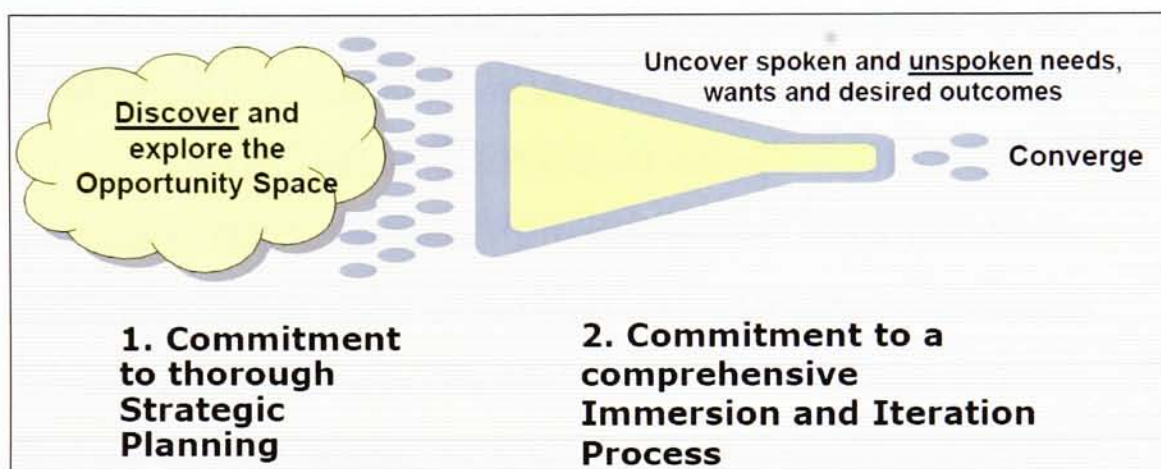
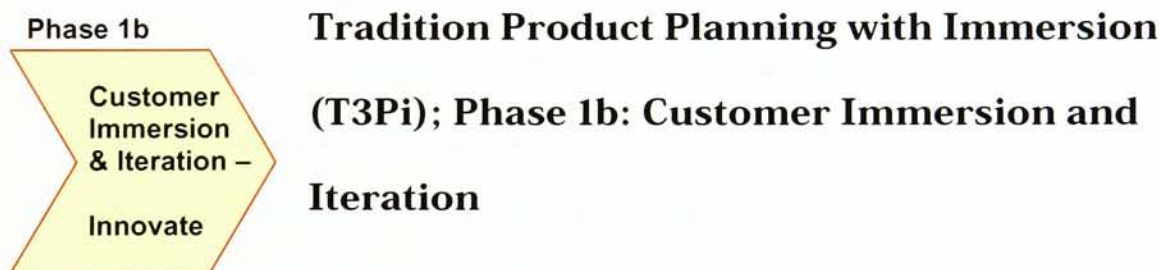


Figure 6.2 Strategic Planning coupled with Immersion and Iteration provides a funnel of breakthrough products concepts.



Phase 1b of product planning requires interaction with the customer to become immersed in their environment and the specific jobs that a customer is trying to perform. In this section, the detailed steps involved for incorporating the immersion approaches presented early in this research project

into a repeatable process will be explored. A critical aspect of the successful integration of the immersion process into a traditional product planning process also includes the notion of “iteration” – immersion is not a one-shot activity. This section will provide the following steps to the integrated Immersion and Iteration process; Select, Observe/Engage, Iterate, Analyze and Recommend.

Select: Successful immersion efforts require the use of the right immersion approach(s) based on the specific new product development initiatives in mind. The secondary research provided in chapter 4 and immersion approaches discussed in chapter 5 provide the backdrop for this step. In most breakthrough product development efforts some form of short- or long-term ethnographic study is required to begin the immersion process. For some firms a brief 2-3 week session with target customers can be used to learn and validate a specific market condition and target customer, for other companies with longer development horizons, more extensive ethnographic studies are required. The key point in the “select” step of the immersion process is that immersion begins with some ethnographic effort coupled with additional immersion approaches or additional in-depth ethnographic studies. Breakthrough development team must make certain that they are not bounded by a single approach and that they commit to the iterative nature of immersion to ensure that valued customer information is used as a constant rudder for strategic decisions.

Observe/Engage: The second step in the immersion and iterate phase is a two-step process “observe, and then engage”. Experience ethnographers and

immersion experts go to great lengths to not disturb the customer environment in the early stages of immersion. Closely monitoring the current state of the customer environment is essential to getting pure and unbiased initial feedback (Sprague and Woolfe, 2007). Once baseline understanding and observation have been uncovered, immersion efforts can go to more direct efforts of immersion where the team actually interacts with the customer with the variety of approaches that are more interactive, such as; interviews, work practice analysis, etc. The key for this step is to not limit your effort to only one immersion approach and call it complete. Use whatever immersion approaches and combinations necessary to uncover the full work process needed for a target customer to get “work” done with the product they have “hired” to do the job – and remember the next step, to iterate.

Iterate / Prototype: Much of the discussion in this research project has focused on the need for immersion, immersion approaches and the immersion process – none of this can be effective without a cultural and process commitment to iterate and prototype. One of the largest barriers to breakthrough efforts in the traditional product planning process—validated through primary and secondary research, is the pipeline nature of the traditional planning and development process. T3P is structured (process, culture, resources, budget and schedule) to move one-time from concept through delivery. The major process difference in the product planning effort for breakthrough products is the irrevocable and uncontestable commitment to iterate throughout the entire product planning and product development

process. Commitment to iterate and prototype with customers is a visible marquee of a company, team and process that is positioned for delivering breakthrough products. Information required to make large and decisive investments in the face of disruptive technology simply does not exist. It needs to be created through fast, inexpensive, and flexible forays into the market. Failure and iterative learning are, therefore, intrinsic to the search for successful and breakthrough technology (Christensen, 1997).

Analyze: After each customer engagement activity, the next step in the immersion and iteration process is to analyze the findings. Constant cycling back to information data banks accumulated to date—whether it is market, business model, technology, etc.—is essential for the process to be successful. New-found information needs to be reconciled with previous data points in a constant refining process to make sure that assumptions remain valid and unmet wants and needs are effectively addressed. The subtle nature of the immersion process makes traditional analysis difficult, yet finding ways to quantify what is being observed provides the real opportunity to uncover the hidden requirements. In many cases the unspoken needs are what experienced immersion experts are looking for—the needs that customers cannot articulate—but are identified by painstaking observation and engagement. These needs must be quantified as requirements and cross-referenced against information data banks to uncover opportunities for product breakthroughs.

Recommend: When initial immersion and analysis efforts have been conducted, requirements can be communicated back into the traditional

product planning process where the Phase 2 activities of concept creation and ideation take place. The extremely valuable result of the initial immersion and iteration phase provides substantiated requirements that can be used to help direct the subsequent product concept phases. Steelcase used work practice modeling to employee a 3-phased approach of asking, observing and experience, to determine the customer's critical success factors through first-hand experience, and used prototypes to repeat the process (ask/observe/experience) to achieve optimal performance for the customer.

The information uncovered in Phase 1a and 1b needs to be assessed through business, financial and marketing filters to catalog and characterize the significance of the information. This provides the opportunity to utilize this information and intercept a breakthrough product development initiative. It is critical to remain vigilant and cycle back to the immersion and iteration phase to constantly validate requirements and seek the truth when confusion about specific requirements arises. Establishing a cyclic path through the subsequent traditional product development process, via immersion and iteration ensures that the product development effort maintains high-relevance to target customers and holds the promise of breakthrough performance.

Recommendations may change as new information is uncovered, depending on the development horizon. This can become a very contentious activity as development gains momentum towards launch. Therefore, care must be taken to ensure the recommendations from the immersion team can continue to be open, complete and unbiased by pressures to go-to-market. Leading

companies like Corning establish executive-level visibility of the results from the immersion team so the information is presented directly to decision makers in its original interpreted state. In this way, key decision makers can formulate their own conclusions of how to interpret the findings.

The process diagram below (*Figure 6.3*), represents the immersion overlay to the traditional product planning process and illustrates the process flow from phase 1a and phase 1b activities. This iterative approach connects to the traditional product development process in phase 2 and beyond.

Note the cyclic nature of the observe/engage step and how that step requires contact with "interpreters" who are the customers, consultants and subject matter experts that the immersion team relies on for the experiential or tacit knowledge in their specific domain. The phase 1 activities purposefully take the product planning team through "discovery" activities to uncover all the possibilities prior to "convergence" activities of clustering requirement into the definition that might later become a product.

This new immersion process provides a unique starting point and iterative flow that can be successfully integrated with the traditional product development process. This occurs when the firm establishes the commitment to not only this process, but to the separate and dedicated resources that are needed to follow this process with rigor and discipline.

Tradition Product Planning with Immersion – T3Pi

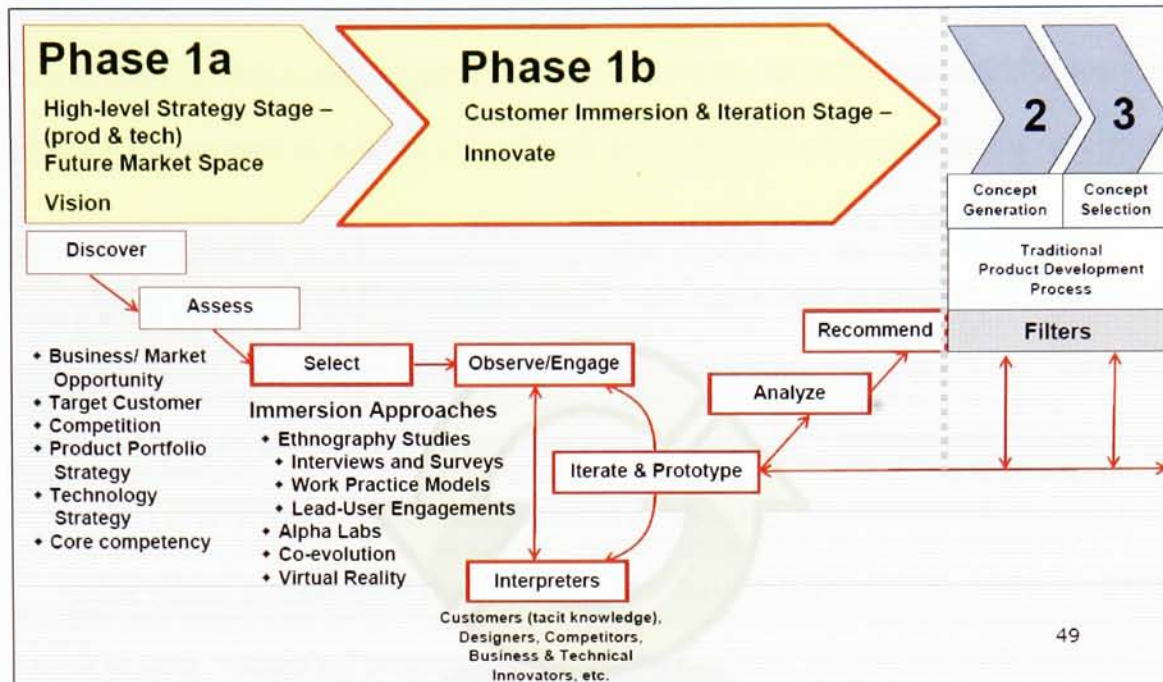


Figure 6.3 Traditional Product Planning Process with Immersion

Immersion Delivers Breakthrough Products

Tesco:

Tesco is Britain's most successful retail supermarket, transforming itself from Britain's third-ranked supermarket (by sales) to the third-largest in the world, behind Wal-Mart and France's Carrefour (Tesco, Economist, June, 2007). Their expansion plans call for building dozens of stores in the southwestern U.S., including Phoenix, San Diego, Los Angeles and Las Vegas. But it's not just about location, as Tesco has plenty of innovative ideas.

Tesco has spent years gathering detailed information about the lives Americans lead, going beyond focus groups and surveys, by actually spending time living with American families. This is a form of work practice modeling that uses

observation, documenting in a way that is meaningful to the customer, verifying and exploring the meaning of the user's actions, and identifying ideas that could improve the users experience or and increase efficiency. Tesco checked kitchen cabinets, watched families cook dinner, and followed them as they went shopping, jotting down subtle nuances and unspoken needs.

A second innovation is their store size. Tesco's stores will be relatively small compared to US grocery stores, approximately 10,000 square feet, about the size of an average Walgreen's drugstore. But their range of foods will be more diverse, using their skills to quickly respond to local trends in order to deliver a wide range of meals. Stores will be small enough to switch from selling locally made soups and sandwiches for lunch to selling ethnic suppers for dinner, part of their preservative free "ready meals" that are a rarity in American markets.

American supermarkets concentrate on taking the cost out of their supply chain, making two kinds of food: dried, canned or frozen, and meals prepared on site. In contrast, Tesco makes meals to suite every taste and lasts for days. In London you might find organic grown beef with wine, Asian noodles and vegetables, or Indian prawn curry. In Phoenix you might find tortillas and enchiladas, in California, fresh seafood and a bottle of Voignier. Tesco also developed innovative ideas for its supply chain, designing trucks with internal partitions for frozen, chilled and store-shelf foods, reducing the number store deliveries in order to sell groceries in small stores at supermarket prices.

The biggest innovation however is how Tesco collects and uses customer data from its loyalty Clubcard program. Tesco tracks every purchase, then finds

correlation between purchases allowing them to finely tune the products offered in each store. Sales of Mozzarella di Bufala Campana (mozzarella cheese made from Buffalo's milk), may suggest an Italian neighborhood, prompting the stores to stock Italian spices, semolina pasta, olive oil and balsamic vinegar.

Their database also provides insights into how customers view the firm. When the data showed British families were not buying diapers or other baby supplies, extended market research showed families were paying 20% more at a local pharmacy because they carried a trusted brand. Tesco then began a baby club, offering advice on pregnancy, and motherhood as well as food and clothing. Within two years nearly 40% of expectant parents in Britain were members of the club and Tesco seized 25% of the mother and baby market. But is their success solely a British model or can it be reproduced elsewhere?

Japan has a well-defined value system, yet Tesco became successful by living in Japanese homes, and doing extensive in-depth interviews and customer research to understand their customs. They recognized Japanese shopping patterns, where people shop every day, and quality is king. The western concepts of large, super-sized values don't work in Japan. Most American supermarkets get split into cheap (Wal-Mart) and luxury (Whole Foods Market) markets, because mid-market firms like Kroger and Safeway are forced to cut prices and are simultaneously driven to invest in luxurious displays to keep customers from fleeing to higher end stores. Tesco plans on customizing its shops, aiming its Fresh and Easy stores squarely at middle-America. CEO Terry Leahy noted "Americans shop more frequently than British people, because no one retailer

gives them what they want. The opportunity for us is that they will shop less often if they get more of what they want in one place.”

Tesco is also responding to environmentalism; its distribution center will have the largest solar-panel roof in California, its stores will use low-energy LED lighting, its refrigerated trucks are designed to use less fuel, and they halved the price on low-energy light bulbs so they become a no-brainer when customers restock. Is there anything product developers could learn from Tesco?

Leahy recommends five tips for any company expanding into new markets; 1) Do your own market research, 2) be flexible, don't use a cookie-cutter formula, 3) hire locally, 4) skill matters more than scale (don't make too many moves at once), 5) match the store's products to the customers' necessary income in your market. With 30% market share, and \$84.9 billion in annual sales, Tesco has made its mark through ethnographic research to collect customer needs. They also use their databases to validate, reinforce, measure and refresh (prototype) customer acceptance by providing groceries & services that focus on meeting local customer needs.

Barriers in Adopting the Immersion Model

Are there tools that help determine whether an organization is capable of effective innovation and adopting the immersion model? Instinctively, firms match the requirements of the job with the capabilities of their employees. Typically, management will assess whether a person or team has the required knowledge, skill set, and perspective for the job. They will also be concerned

about a person or teams judgment – how they evaluate and combine information from different sources in order to solve problems. Lastly, they assess their values – the criteria used to determine what is good and bad. The problem with this analogy is the focus is too narrow.

Just because an individual or a team has the capabilities to get the job done, does not mean the project will succeed. Organizations themselves have capabilities and disabilities; two identically capable people working in different organizations will likely have different sets of accomplishments. Successful product innovation requires management to be skilled not just at choosing the right people, but choosing the right organization as well. In order for firms to leverage their own capabilities, they need to explicitly recognize what their capabilities are, and where in the organization they reside. There are three classes of factors that affect what an organization can and cannot do: the organizations values, its processes, and its resources.

Values, Processes & Resources

Values of the organization are the criteria by which the firm and its employees make decisions. Values reflect the standards people use to judge whether a defect in the product is acceptable or not; whether an outside firm is a competitor or a potential partner; and whether people need to fix all customer complaints or there are some that remain broken. From senior managers down to the lowest level of the firm, it is essential that employees are trained to make independent decisions that are consistent with the firm's business model. A key metric of good

management is whether clear and consistent values are practiced throughout an organization. Values are a consensus about what makes sense for the individual and the firm. For example, when an executive directs employees to implement a change that doesn't make "sense," the change is likely to be implemented half-heartedly.

When a firm transforms input from customers, engineers and marketers, raw material, and technology, and integrates equipment into products and services, it creates value for the organization. The manners in which the firms people communication, coordinate, interact and work to create these transformations are the processes of the organization. These processes can be formal as in a products business plan, informal, such as seeking help from an engineer to troubleshoot a software bug, or embedded, such as lean or operational excellence programs employed by the firm. However, processes can differ in efficiency such as Wal-Mart vs Costco or K-Mart for supply chain management. Processes are also difficult to transfer from one organization to another. For example, the Toyota Production System that orchestrates continuous cost reduction coupled with continuous increased customer satisfaction through elimination of waste, vs Chevy cars (for the past 10-20 years).

A firm's resources are its people, equipment, technology, brand, and reputation with suppliers – whatever has the character of an asset that can be hired, fired, bought, and sold, upgraded and depreciated. In 1998 Daimler-Benz bought Chrysler in an attempt to form a trans-Atlantic automotive powerhouse. After nine-years the deal failed to meet its goals, and Daimler-Benz sold Chrysler to

Cerebus Capital management. It is easier to transfer resources across organizational boundaries than values or processes, which suggest that resources are necessary but insufficient for creating competitive advantage.

Culture

Edgar Schein (Organizational Culture and Leadership, 1988) describes culture as the processes and values that were at one time consciously adopted, but are now followed by assumption rather than conscious decision. This report has shown how the T3P does not create breakthrough products, yet most firms continue to use it because it provides a path for sustaining technology development. The T3P allows firms to listen and respond to customers, increase customer features and happiness, and increase company profits – all in an orthodox manner – as an accepted belief that it will continue without disruption. Christensen's example at HEC showed the culture of the firm would not support an over-bed table because the product was low-growth and low-margin. Yet the mantra from management was growth through new products and services in the patient's room. The HEC culture (supporting high vs low margins) was the reason it took seven years to develop the product.

Lack of Corporate Commitment

There is an old saying that goes - you've got to spend money to make money. Ethnographic research is an open minded approach to recording the life of the customer and understanding the ground truth of their pain. This process is time

consuming, but as noted in the Steelcase article - it prevents controversy, second guessing, recrimination, and finger-pointing and actually saves time in the end. The result is viewed as a concrete conviction that is more believable (by developer and customer) and the chosen option is less controversial.

Corporations need to determine if they are going to create incremental or breakthrough products. While every product development effort takes risk, even incremental efforts have a high failure rate (~30%). Every breakthrough product we have examined showed extensive commitment from the CEO down through the organization. Without the vision and commitment from the corporation, breakthrough product development will fail.

Lack of specific “immersion and iteration” skills

Common sense says that having a new process to incorporate immersion and iteration requires a new set of skills. Every company will have to make choices to either have people trained in the new skill set or bring new people aboard. It could even be a combination of both of these. Some might consider to have this entire process farmed out to an outside firm instead of performing this process in-house but the authors of this research paper believe there is a bigger benefit to keeping this operation in-house. The end goal is to create a cross functional team that is disciplined in the art of immersion and ethnography along with knowledge in of the customers business. The team must also have members from the engineering, operations and financial community to properly assess each concept. It is vital that the information this team collects is well documented and shared

during the product concept phase. This will enable the team to make the right choices for the company.

Financial Barriers

Every company interviewed for this research paper listed financial reasons as one of the top two barriers to carrying out the required processes need for obtaining the voice of the customer at a deep level of understanding. The other barrier was time, which will be covered in the next section. In today's business climate and budgets are watched closely and are being cut to the bone with a focus on short term goals, not the long term objectives. By hindering the ability of the company to obtain VOC with immersion, it will only be a matter of time before the growth of the company is impacted, if not already. A critical factor is the manner in which performance metrics are being used to determine the success of the group that obtains the VOC. Financial metrics are a barrier themselves – as financial metrics prevent projects from moving quickly when market changes occur. This will always be a constraint because the information collected does not always have a direct link to financial returns. This has to be realized by the company and the metric changed to something other than financial. Are there better ways?

This research has shown that Corning has found a way to do this. Corning has placed a group under the R&D umbrella, in direct support of their CEO, which focuses on customer needs, innovation, technology trends and external experts in multiple fields to identify possible future products. Corning's timeline is for a product 10+ years out, where their process emphasizes gathering functional

analysis, parameters, and differentiating attributes to develop prototypes and test the marketing end of the development process. Corning focuses on gathering the “what’s” not “how’s”, and they are not constrained by market, product, or process. The goal is inventing new materials for new products, or processes, with large investments, and long time frames. Corning realizes that financial metrics are a short term requirement and believe their future is long term, thus they can not be held to the normal performance metrics.

Time-to-Market Barriers

Our interviews also showed that the time required to obtain VOC with immersion for breakthrough projects was also a major barrier. The time itself was not a barrier; rather the culture in companies today is focused on short term, incremental product development and meeting quarter-by-quarter financial targets. Most companies do not have plans, organizations, and financial or senior management commitment to obtain VOC with immersion data. Given this environment, it is hard to determine where the competition is, as the modus operandi is fast or faster. Companies have to have a better portfolio balance, supporting activities that drive the current business as well as those that position the company for the future. It should be recognized that with the two different activities there should be two different approaches to bring the product through the pipeline. By understanding the purpose of the product, the phase gate requirements can be modified accordingly to get the product to market efficiently.

Summary

The new product planning process explored in this chapter provides a framework for approaching the planning and development of future breakthrough products. This process is a fluid process that is built off of the baseline assumptions that close and frequent contact with customers provides valuable enables insights into the user's environment. These insights, when properly synthesized, can drive breakthrough thinking and in turn breakthrough product concepts. The key to success with this process is the holistic commitment by everyone involved to be thorough and receptive to where the customer takes you. Not that customer can define what you should deliver, more so that you can interpret their unmet and unspoken wants and needs into a product concept that resonates with their requirements.

This process requires complete execution along the path of immersion and iteration – without a commitment and practice along this path this process will not deliver the breakthrough initiatives described in this research project. This “breakthrough” product planning process will face many barriers to adoption—precisely why this effort required isolated and dedicated teams with the right skill-set and mind-set fully supported by top management to ever have a chance of success.

The next chapter summarizes the key findings from the authors of this report; the author's hypotheses, local interviews, secondary research, approaches to immersion, and a new product planning model using immersion to develop breakthrough products.

Chapter 7: Capstone Summary

A bulletized summary of the findings in this report are as follows:

1. The author's proposed three hypotheses: 1) the traditional product development process is rarely executed well, 2) the traditional product planning process when executed well often delivers only incremental product development, 3) Even if done well, the traditional product planning process does not have the process capability to deliver breakthrough products.
2. Over the last 15 years, companies are spending the same amount of sales on R&D (4.9%), for a smaller return on investment.
3. The traditional product development process focuses on incremental results driven by the need for short term profits (Wall Street effect).
4. There is a lack of breakthrough, game-changing products in most company's product development pipeline.
5. Interviews conducted with local firms support the Cooper findings and validate the author's first two hypotheses. Companies think they can do better, but they are limited by the current product planning process. Technically, companies can define a good product, but it may not be as good as the competition, or what the customer really wants.
6. Secondary research provided examples of six different companies (Hill-Rom, Apple, Pratt & Whitney, Steelcase, 3M, and GM- OnStar) who used a comprehensive immersion phase in their product planning process. This led to breakthrough products that delighted customer's, captured new

market share and brought new profit to the company – along with the new insights about what the customer valued and the product market.

7. The report highlighted approaches to immersion including ethnographic studies (interviews & surveys, work practice modeling, lead-user engagements), virtual reality, alphas labs, and co-evolution. These approaches have been successfully incorporated into product planning processes to develop breakthrough product development.
8. The authors submit a new product planning process that includes customer immersion, and provides a framework for planning and developing breakthrough products. This process builds on the traditional process by adding close and frequent contact with customers to gain insight into their wants, needs (and pain), that when properly synthesized can drive breakthrough thinking and in turn breakthrough product concepts.

Chapter 8: Areas for Future Research

1. Analysis of financial returns from immersion breakthrough companies
2. Longitudinal studies on success of Immersion across breakthrough companies
3. Improved use of On-line tools for forward looking, scenario development approaches
4. What does it take to change, and implement Immersion

Appendices

Appendix 1 : Questionnaire Results and Interview Notes

1.1 Questionnaire

1. Product Planning Questionnaire — Survey Instructions					
Product Planning Questionnaire:					
This questionnaire has three sections and 17 questions total					
Section 1. Voice-of-the-Customer and Market Inputs					
Section 2. Product Definition					
Section 3. Products Performance					
The first five questions focus on Voice-of-the-Customer and Market inputs.					
Please rate (1-5) How well you/your organization does the following.					
Rating Scale:					
5 - Always / Consistently					
4 - Often / Frequently					
3 - Sometimes / Occasionally					
2 - Rarely / Not very Often					
1 - Never					
2. Voice of the Customer and Market Inputs					
The first five questions focus on Voice-of-the-Customer and Market inputs.					
Please rate (1-5) How well you/your organization —					
1. Work closely with customers/users to identify needs/problems					
	5 - Always/ Consistently	4 - Often/ Frequently	3-Sometimes/ Occasionally	2 - Rarely/ Not very Often	1 - Never
Rating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Comments:	<input type="text"/>				
2. Work with lead (innovative) users to generate ideas					
	5- Always/ Consistently	4- Often / Frequently	3-Sometimes/ Occasionally	2- Rarely/ Not very Often	1- Never
Rating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Comments:	<input type="text"/>				
3. Product definition is determined by market research					
	5- Always / Consistently	4- Often / Frequently	3-Sometimes/ Occasionally	2- Rarely / Not very Often	1- Never
Rating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Comments:	<input type="text"/>				
4. Interface with users throughout the product development process					

	5- Always / Consistently	4- Often / Frequently	3-Sometimes/ Occasionally	2- Rarely / Not very Often	1- Never
Rating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Comments:	<input type="text"/>				
5. Perform studies of buyer behavior as an input to launch plans					
Rating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Comments:	<input type="text"/>				
3. Product Definition					
The next seven questions focus on how well you ensure strong Product Definition before Product Development begins.					
Please rate (1-5) How well you/your organization delivers —					
1. Well defined target market / intended user					
Rating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Comments:	<input type="text"/>				
2. Defined product concept (in users terms), of what product will be and do					
Rating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Comments:	<input type="text"/>				
3. Benefits to be delivered are clearly defined					
Rating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Comments:	<input type="text"/>				
4. Defined positioning strategy (from customer view), compared to competition					

	5- Always / Consistently	4- Often / Frequently	3-Sometimes/ Occasionally	2-Rarely / Not very Often	1- Never
Rating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Comments:	<input type="text"/>				
5. Defined product requirements, features, specs					
	5- Always / Consistently	4- Often / Frequently	3-Sometimes/ Occasionally	2- Rarely / Not very Often	1- Never
Rating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Comments:	<input type="text"/>				
6. Stable product definition					
	5- Always / Consistently	4- Often / Frequently	3-Sometimes/ Occasionally	2- Rarely / Not very Often	1- Never
Rating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Comments:	<input type="text"/>				
7. Contract between project team and management					
	5- Always / Consistently	4- Often / Frequently	3-Sometimes/ Occasionally	2- Rarely / Not very Often	1- Never
Rating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Comments:	<input type="text"/>				

4. Product Performance

The last five questions focus on your Products Performance compared to the competition.

Please rate (1-5) How well you/your organization rate the superiority of _

1. Your (New Product) NP's main benefits are important to your customers?

	5- Always / Consistently	4- Often / Frequently	3-Sometimes/ Occasionally	2- Rarely / Not very Often	1- Never
Rating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Comments:

2. Your NP's offer customer's new & unique benefits?

	5- Always / Consistently	4- Often / Frequently	3-Sometimes/ Occasionally	2- Rarely / Not very Often	1- Never
Rating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Comments:

3. Your NP's are a better value for the money to your customers?

	5- Always / Consistently	4- Often / Frequently	3-Sometimes/ Occasionally	2- Rarely / Not very Often	1- Never
Rating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Comments:

4. Your NP's are superior to the competition in meeting customer needs?

	5- Always / Consistently	4- Often / Frequently	3-Sometimes/ Occasionally	2- Rarely / Not very Often	1- Never
Rating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Comments:

5. Your NP's have superior quality than the competition?

	5- Always / Consistently	4- Often / Frequently	3-Sometimes/ Occasionally	2- Rarely / Not very Often	1- Never
Rating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Comments:

1.2 Questionnaire Interview Results [8 Respondents]

Xerox		Ortho Clinical Diagnostics		ITT Space Division		Direct Mail Holdings		Sensis	Corning
RM	CG	BG	GM	RS	BM	KT	DM		
4	4	4	5	3	3	4	5		
4	3	4	5	4	4	2	5		
4	3	5	5	2	2	3	5		
3	3	4	5	3	2	3	5		
3	3	4	0	2	2	3	4		
4	4	4	5	3	1	4	5		
4	3	5	5	4	4	4	5		
5	4	4	0	3	4	3	5		
3	3	3	4	5	5	3	4		
5	5	4	5	2	4	4	5		
3	4	5	5	4	4	2	4		
3	3	5	3	5	5	2	5		
3	3	5	4	5	5	4	5		
2	3	4	4	4	4	3	5		
3	4	3	5	5	5	3	5		
2	3	4	5	5	4	3	5		
4	4	5	4	4	4	4	5		
59	59	72	69	63	62	54	82		
59				61					

Rating Scale

- 1 Never
- 2 Rarely / Not very Often
- 3 Sometimes / Occasionally
- 4 Often / Frequently
- 5 Always / World Class

Initials

- Work closely with customers/users to identify needs/problems
- Work with lead (innovative) users to generate ideas
- Product definition is determined by market research
- Interface with users throughout the product development process
- Perform studies of buyer behavior as an input to launch plans
- Well defined target market / intended user
- Defined product concept (in users terms), of what product will be and do
- Benefits to be delivered are clearly defined
- Defined positioning strategy (from customer view), compared to competition
- Defined product requirements, features, specs
- Stable product definition
- Contract between project team and management
- Your NP's main benefits are important to your customers?
- Your NP's offer customer's new & unique benefits?
- Your NP's are better value for the money to your customers?
- Your NP's are superior to the competition in meeting customer needs?
- Your NP's have superior quality than the competition?

TOTALS

1.3 Independent Study Kodak Questionnaire Results [20 respondents]

Always	Often	Sometimes	Rarely	Never		Avg
0	8	11	0	0		3.4
1	5	7	5	1		3.0
1	9	8	1	0		3.5
0	4	3	8	1		2.2
1	2	10	3	3		2.7
0	9	9	1	0		3.4
5	7	7	0	0		3.9
3	8	7	1	0		3.7
1	6	10	2	0		3.3
8	9	2	0	0		4.3
1	11	6	1	0		3.6
8	3	5	1	2		3.7
3	12	4	0	0		3.9
0	10	9	0	0		3.5
1	10	8	0	0		3.6
0	11	8	0	0		3.6
3	11	5	0	0		3.9

1. Work closely with customers/users to identify needs/problems
2. Work with lead (innovative) users to generate ideas
3. Product definition is determined by market research
4. Interface with users throughout the product development process
5. Perform studies of buyer behavior as an input to launch plans
6. Well defined target market / intended user
7. Defined product concept (in users terms), of what product will be and do
8. Benefits to be delivered are clearly defined
9. Defined positioning strategy (from customer view), compared to competition
10. Defined product requirements, features, specs
11. Stable product definition
12. Contract between project team and management
13. Your (New Product) NP's main benefits are important to your customers?
14. Your NP's offer customer's new & unique benefits?
15. Your NP's are a better value for the money to your customers?
16. Your NP's are superior to the competition in meeting customer needs?
17. Your NP's have superior quality than the competition?

59.5

Total

1.4 Independent Study: Xerox Questionnaire Results [7 respondents]

Always	Often	Sometimes	Rarely	Never	Avg	
3	3	1	0	0	4.3	1. Work closely with customers/users to identify needs/problems
2	4	1	0	0	4.1	2. Work with lead (innovative) users to generate ideas
1	4	2	0	0	3.9	3. Product definition is determined by market research
1	3	2	0	0	3.3	4. Interface with users throughout the product development process
1	3	2	1	0	3.6	5. Perform studies of buyer behavior as an input to launch plans
3	3	1	0	0	4.3	6. Well defined target market / intended user
3	2	2	0	0	4.1	7. Defined product concept (in users terms), of what product will be and do
2	5	0	0	0	4.3	8. Benefits to be delivered are clearly defined
4	1	2	0	0	4.3	9. Defined positioning strategy (from customer view), compared to competition
5	2	0	0	0	4.7	10. Defined product requirements, features, specs
0	4	2	1	0	3.4	11. Stable product definition
3	2	1	0	1	3.9	12. Contract between project team and management
1	5	1	0	0	4.0	13. Your (New Product) NP's main benefits are important to your customers?
1	6	0	0	0	4.1	14. Your NP's offer customer's new & unique benefits?
0	5	2	0	0	3.7	15. Your NP's are a better value for the money to your customers?
0	7	0	0	0	4.0	16. Your NP's are superior to the competition in meeting customer needs?
1	5	1	0	0	4.0	17. Your NP's have superior quality than the competition?

68 Total
59 Score from Interview (see other page)

63.5 Avg. Xerox Score from interview and Questionnaire

1.5 Interview Notes

Company	Corning
Date / Time	October 12th 2007 11am
Interviewee(s)	Bruce Kirk Director Corp Innovation Effectiveness Deborah Mills Director Early Stage Marketing

Roles and Responsibilities

Bruce works with NPD team across company. Current businesses will handle their own extensions.

Debbie has expertise in early stage product development – looking for new business.

The Strategic growth arena:

- Identifies the next big growth, carves out funding targeted to look beyond.
- 50% of R&D on fundamental for breakthrough 50% for support of existing.
- Support & Report to top line of company. CEO and Board of Trustees
- Focused on growth through organic innovation.

Process, VOC collecting

Currently driving VOC into process and product design, and they are familiar with the publications of R. Cooper.

Magellan process: where to look for innovation, external experts from field, what is going on in market or technology, conflict with trends, requiring technology solutions.

- People are stimulating, talk to scientist, forward looking business folks, and determine hot spot for innovation.
- Prioritize based on screening, highest priority assigned to leader, flush out in 12 weeks
- Link it to capabilities: 4-6 week period to gather secondary & primary research, conferences, labs, etc
- 45 presentations on what opportunity looks like – white paper bake-off.
- Winner gets assigned team for more in depth research; go to field, lab work, conferences, leading companies, in order to gather requirements. Bring problem statement and requirements in to determine how product concept would be produced.

Mainly market driven buy still tied into companies Core Competencies. Looking for new divisions, new businesses.

CEO has buy in, support from top down. CEO knows portfolio well. Co-location within R&D. Strongly aligned on marketing side. Don't fall prey to financial constraints, present stage 1 to Board of Directors.

R&D performs core competence advancement, which is a fundamental research technology push. They are not constrained by market, product, or process. The goal is to inventing new materials for new products, or processes, with large investments, over long time frames.

Time frame: 18-24 month for extension, 13 years for new products.

Current structure for this group has been in place for 5 years, resulting in improved linkage between business units and innovation

Only B-B. Triangulation with agencies to gather functional analysis, what are functions, parameters, differentiating attributes. Develop prototypes and test in stage 1. Marketing end on development process – to gather the what's not the how's.

Cultural: risk tolerance fairly high, repercussion is not out the door.

- Did not succeed in tel-com. Downturn called for their heads.
- CEO said no – paid to learn lesson, learned too much to loose that knowledge. They have the religion.

Process to determine future products

Incremental vs Breakthrough – culture of company, 7-15 year to commercialize. Other companies benchmarked have problems getting over the number of years.

Corning performs their own market research. In the past they would collect what the customer wanted to come up with solution – now changed – modified stage gate – nervous about how early they engage customers from IP perspective.

10-year innovation cycle...Input from customers can affect product launch.

- Iterate far down the path; but do not build a mfg plant until product is locked in.
- Investments are huge, need rigor to affect – betting on the company.
- Thoroughness vs throughput, Rigor vs speed. Hundreds of millions; 1 million in year 1, 10 million by stage 2.

Projects are not being tracked by money, rather by learning cycles and product churn. E.g.; product had 1 year in stage1, ½ year in stage 2, didn't pass gate – go back to stage 1. Since it's not being tracked by money, it's thought of as learning curve. No negative impact to group.

Establish importance of product to customer by value analysis for each product, quantitative approach of product vs alternatives. What is unique that provides value and benefits

Offer customer new and unique benefits... Is this going to provide step change in product or performance – if not don't proceed.

Due to the level of investments required product concepts that are less favorable are weeded out early on. Desired state.

We have to be the leader attitude is taken in all the products.

Immersion example at Corning.

Crawl through coal plants – understand life of the customer – 6-8 months worth of data collecting. Why would you farm that out to someone else – we want our people to have that knowledge

Opportunities come from observation and customer.

--end--

Company	Direct Mail Holdings
Date / Time	September 28th 2007 2pm
Interviewee(s)	Randy Seberg CEO Bill McKim VP Marketing

Roles & Responsibilities

Relatively small company with a very flat organization. Proves to be an advantage in the market. Bill is the expert on getting to understand the customer. While Randy is the wizard on understanding the machinery and how to differentiate output. Has multiple bins to pull from, use different stocks on different devices (Kodak, Xerox) to provide customer sellable products – unique in that multiple inputs one output – design for manufacturability – beat competitors.

Sources of VOCs

Customers have an idea to perform a task or job. Bill works on understanding that job and adds to the customers request to meet the customer needs while still aligning with the companies capability. 95% of time job submitted are modified.

Face-to-face – understand what they are doing or trying to do (goals), some being subjective. Looking at files, interpretation, ring-around packages (4-5 options), let hem choose

Market differentiations – how to generate product that is unique while standard to manufacture. Consistently new all the time.

8.5, 8.5x114, 11x17 – with 17 as common denominator, multiple ops on page, forward restraint confined – form fits whatever anyone wants to mail – all derivatives fit inside format. Earth shattering – streamline what manufacturing needed to supply

Be seen as someone who can solve customer problems – constantly test against control program. Sales draw it out – create manufacturable product. Timelines for change can be 12-24hrs.

Two types of customer

Agencies [Non for Profit] – hold on to stats; 8-9 customers at once

Direct – less stats; 1:1

Product Cycle Overview

Product cycle here is done in days not months or years. Quick turn-around is key. 24/48/72 – Design/Manufacture/Deliver

Deliverability – acquiring companies that help bring completeness to overall customer offering.

Goal is always to drive top line – understanding each customer, understand file, demographics, intent – database management - will drive how we develop product

Teach customers how to use the data they have in house

Summary

DMH has a very good understanding of their market and is able to differentiate itself by offering an output that is appealing to the customer yet difficult to imitate by the competitors. The size of the company and the equipment available plays a key role in this ability. They are able to act fast and produce output quickly. As for breakthrough products... DHM is on the edge of being early adopters. With the close relationship with the customers DMH has good visibility of what the need is and is able to react.

--end--

Company	ITT Space Division
Date / Time	September 28 th 2007 9am
Interviewee(s)	Gary Matthews Director Persistent Surveillance Systems

Roles & Responsibilities

Oversees government work projects. Interfaces with customers to gain knowledge for bidding on jobs.

Sources of VOCs

Majority of work are from government agencies. Build to spec over long periods of time (years). Have a decadal survey done every 10 years. All lead users' agencies, academic and science communities gather and brainstorm to determine where the field is heading and what technologies are needed. [Technology Road Map] Everyone works from this and is how projects are started.

Community meeting (State of the Art)

PHD Academic Brainstorming

Program Studies

Principle investigators

Product Cycle Overview

Not a normal production process. One-offs or one of a kind equipment. Very structured process. Very big on tracking cost. Process "earned value". Driver for all projects. If projects don't pan out due to technology barriers, project go through resets.

All VOC Driven

CAIV – trade, assessment, budget

Summary

When asked a barriers...

Time is always a barrier. Process is very slow.

Money is the other.

ITT is a built to spec contract house. They are paid to develop products requested no more no less. Maybe innovative in process and how they attack the problem. Discoveries are made along the way. ITT does not develop a technology then try to sell to the community. They develop the technology only through contracts.

--end--

Company	Ortho Clinical Diagnostics; (Johnson & Johnson)
Date / Time	September 21st 2007 11am
Interviewee(s)	Bob Geen Worldwide Product Director [453-3937]

Roles & Responsibilities

Bob Geen job is to specify market requirements for hospital labs/environments. Being on the systems side of things the equipment is usually large capitalize equipment.

Sources of VOCs

Requirements are generated from many sources.

- Input from current products

- Customer training

- Field Sales

- Interviews

- Market research

- Customer events [in-house] w/multifunctional team (Eng + Mktg) WW perspective

- Surveys (Survey Monkey) to complement analysis

Product Cycle Overview

Brief overview of current process in J&J. Bob noted the process is very formal with gate reviews after each phase.

Phase 0 – VOC [funding starts after this phase is passed]

Phase 1 – Feasibility

Phase 2 – Development / validation [Lock down of requirements]

Phase 3 – Launch

Phase 4 – Commercialization

\$11 Billion dollar market – 50% w/current products

Global process that marry's up with the phase process. (Market product concept)
Works as a preliminary market assessment

Preventative Innovation

ASADS vs Instruments that test are run on

Would be able to provide better segmentation... how medicine reacts with every person.

Seen Barriers /Changes

What would you change in the process if there were no constrains...

- Not enough investment in front-end: earlier the better: resource constrained

--end--

Company	Sensis
Date / Time	October 5th 2007 10am
Interviewee(s)	Ken Tollstam

Roles and Responsibilities

Market and product: sell solution that is embodied in a product. 80% time dealing with external customers.

Process, VOC collecting

Tender based. Problems of a customer are related to requirements and a tender is placed. Sensis then response to the tender. Balance is required to sell what the company has to offer verse what the customer wants.

Uncover/understand what customers need to buy via regulations or direct need, then map product or solutions to customer needs

Three classes; niche business, know big players, meet face-to-face

- High end, USFAAA, astute, sophisticated – features that drive premium, early adopters, western European (Apple iPod)
- Middle market – may not be able to differentiate; if not lowest price (few %), within range to be able to differentiate, demonstrate lower risk, move down to mass market, more stable, less complex
- Emerging 3rd world – price conscious, commodity, minimize feature/function

Above classes map into the product life cycle. Early adopters, Mass market acceptance, commodity cost.

Sensis has credibility leveraging power.

Commodity verses value add specialty.

- Goal is to sell to high end at premium to fund new products, then offer to other tiers and cost have been recouped.
- Better to drive the market verses mapping the market. Attend trade shows, presentation to customer/feedback. No surveys due to niche business, face to face time.

Standards bodies; governmental and non-governmental aerospace – drives standards/requirements that need to be met

Sales cycle 18-36 months, Product Development may take as long as 5-years
Conservative industry, capacity and efficiency.

Sensis targets maintaining or improving safety.

- Surveillance – managing aircraft in the sky – primary mode. Concern w/ how to take away profits from traditional rotating radar without cannibalizing current business. Need to sell today's product in today's market

- Emerging market... Automated Dependence Surveillance Broadcast not operating in every country, automated safety logic – does not exist operationally today, need to sell concept to regulators and insurance providers. We are betting on future with technology being developed today.
- R&D spend on future development of technologies. Hedging on where the market is going. Being ready when the market arrives. Understanding and reading the market is key. Many factors beside VOCs have to be looked at.

Process to determine future products

Front end of funnel is free form; suck in market, competitive, technical info (all possibilities). Then gating process to determine top 2-3 to spend serious money. e.g. Staffed towers vs virtual towers. Looking out the window made sense 20-30 years ago; consolidate and move into central location. Market acceptance is a different story.

Sensis has product modules to work with. Ask customers to establish requirements that closely line up with our product performance.

Market leaders. Surface movement radar dominated by Danish company Turma.

Depending on market, need to compete via low cost, better mouse trap, or me too products

Process exist that captures technical info, provide enhanced product features that allows firms to retire expensive equipment with new products.

Make products that are good enough for current market (what is threshold – do not over engineer)

We want to cannibalize our products, not have competitors do it for us. Need to be constantly aware of competitive market place

Barriers in Process

Government procurement restrictions

Sophisticated – government restrictions, customers w/ strong ideas

Less sophisticated – customers w/ weak set of ideas want everything, competition drives kitchen sink set of requirements

First set of questions – Realistically, are we world class - were good but not that good.

U.S. is very bureaucratic – make sit non-competitive for European market. Boils down to prioritization, lean, understanding non-value added structure that foreign customers do not require

--end--

Company	XEROX CORPORATION
Date / Time	September 14th 2007 10:30am
Interviewee(s)	Robert McDonald PSG Monochrome, Product Planning Manager Cathy Gueli PSG Monochrome, Project Manager

Robert McDonald –Responsible for the full portfolio makeup for monochrome products.

- Program managers for each segment report to him (Cathy Gueli, Shelly Hayes)
- Good and Frequent contact w/customers
 - Mostly a intellectual exercise
 - Not much investment in the “Life of a Customer”
 - Isn't that they don't think about that. Team seem very aware of the benefits of the process but current culture and process seems to constrain.
- Stated that Xerox is a very Metric Driven company. This type of culture has troubles supporting immersion
 - Would require a new paradigm in order to adopt immersion
 - Also team construction might not be “right”, currently creativity is stifled

Cathy Gueli - Responsible for a specific segment of the monochrome market (Light MC)

- In addition to being a metric driven company Xerox is Technology oriented and sometimes has difficulty translating technology innovation to what customers need. “Technology for Technology sake”
- Not as market driven as we may think we are
- Engineering driven changes

There was also discussion on how people are trained in their roles or lack there of. Specially for the marketing sector. No credentials required... work your way through it. Most see it as a stepping stone to move forward in their career. Downfall since the marketing sector is the closes touch point with the customers. One would think that a company would invest more effort in this area.

--end--

Appendix 2 : Xerox Time To Market (TTM)

Xerox Time-To-Market (TTM)

Market Attack Plan or MAP (3.1M)

- *Line of Business [LOB] Strategy:*
 - Clearly define boundaries, hi-level strategy, consistent with XBU.
- *Market Segments Served by LOB:*
 - Define market and customer requirements, how target markets & customers are segmented
- *Current Period Investments and Economic Profit:*
 - Describe how we are get value from this line of business today.
- *Competitive Assessment:*
 - Define current and future competitors. Explain what competitors are doing and how products compare Xerox. Describe competitive advantage, viability over the next 3-5 years.
- *Differentiation Strategy:*
 - Define our differentiation strategy from as viewed by end-user. Explain how we will win in the market.
- *Product Portfolio Roadmap:*
 - Include all future products on a timeline, showing component platform content [releases], customer segments, product platform grouping.
- *Platform Architecture:*
 - Describe the product platform that will enable Xerox to win
- *Platform Technology and Roadmaps:*
 - Explain how we will ensure that we will sustain our VOD.
- *Value Chain Strategy:*
 - The focus must be on end-to-end delivery of the product and service.
- *Gap Analysis [Agenda Management]:*
 - Identify and prioritize "Top 5" issues for each LOB
- *MAP Economic Case & Investments:*
 - Determine economic case and investment strategy.

Proposal (3.1P).

- *Analyze Target Market Opportunities*
 - In-depth analysis of current and future customer needs and problems
 - Market opportunities
 - Competitive threats
 - Business requirements
 - Technology options, trends and dynamics
- *Address Target Market and Customer Requirements*

- *Initiate Product Platform Development*
- *Contract Technology and Value Chain Plans*
- *Demonstrate Economical Viability*
- *Comply with Standards*
- *Maintain the Robustness and Viability of Market Attack Plan*
- *Initiate Products into the Product Delivery Phase*

Defining the Product and Delivery Technology phase (3.2)

- *Refine Customer Expectations and Market Attack Plan*
- *Confirm Customer Requirements*
- *Demonstrate Technology Readiness*
- *Complete Product Requirements and Specifications*
- *Complete Integrated Master Plan and Product Business Case*

Design Product (3.3)

Demonstrate Product (3.4)

Deliver Product (3.5)

Appendix 3: Kodak KECP (1994)

Kodak KECP (1994)

Define and Refine Value Proposition and Product Offering Concept

- Phase 0: Product Concept Proposed
 - Define business and market opportunity
 - Identify superior product ideas
- Phase 1: Product Concepts and Technology Development
 - Translate customer needs into product requirements
 - Select technologies and baseline design approach
 - Ensure technologies are robust
 - Adapt business, marketing, manufacturing and services strategies
- Phase 2: Production Systems Optimization
 - Complete product features and performance requirements
 - Develop subsystem configurations and skeletal design
 - Integrate subsystems to ensure robustness
 - Develop preliminary marketing, manufacturing and service plans
 - Develop detail business plan

Product and Marketing Launch Design Stage

- Phase 3: Product Design
- Phase 4: Product Design Certification

Manufacturing and Operations

- Phase 5: Product Launch Preparation
- Phase 6: Shipping Approval

Production

- Phase 7: Production Preparation
- Phase 8: Product Discontinuance – EOL Strategy/Plan

Appendix 4: Kahn – Product Planning Essentials 2001

KAHN: Product Planning Essentials (2001)

Phase1: Product Opportunity Identification

1. Underused resources: Most companies pursue line and market extensions because of an ability of their product development and production to handle a greater variety of product types and volumes
2. New Resources: New skills, new technology, mergers and acquisitions
3. External mandate: government regulations, self-imposed standards, change in customer attitude, strong emerging customer preference, competition
4. Internal mandate: Upper management

Develop Market breakdown:

Use breakdown structures mentality to segment what is meant by market, market segment, and target market. Breakdown structures allow distinct subsets of until valid market segment or target market is identified based on following criteria:

- **Size** sufficient in terms of sales to make worth pursuing
- **Identification**: must be able to recognize and describe
- **Access**: must be feasible to contact in efficient manner
- **Different Response**: each segment should respond uniquely to different attributes
- **Coherence**: members of same market should be homogeneous
- **Stability**: customer preferences in target market will not change in the near future

Develop Market Segmentation:

- Demographic: objective quantifiable customer characteristics
- Psychographic: subjective lifestyle, personality, culture characteristics
- Geographic: Northeast, Midwest, Southeast, and West Coast
- Benefit: distinguished according to way product is used by customer
- Usage: distinguished by way respective customer base

Create Product Development Charter: describe the initiative to be achieved and guidelines to follow. Comprised of section to account for Background, Arena, Goals/Objectives, and Guidelines

Screen Charters (scoring) based on market related criteria: market need, uniqueness of product (relative to competition), competitive advantage, ability to explain benefit to customers, understanding of the product market, synergy with current products offered

Screen (Scoring) based on technology criteria: Uniqueness of technology, potential life cycle, ability to develop technology, ability to patent technology, keep development costs under control, development time short, manufacture technology, applicability to future products, minimize risk

Phase 2: Concept Generation or Ideation: Iterate as many concepts as possible, screen, determine most valid for future developments

Concept generation techniques

1. Needs assessment

- a. *set objective: determine the kind of information you want to collect*
- b. *select sample: determine the type and number of customers to be visited*
- c. *compose team visit: identify members of cross-functional team who should visit*
- d. *develop discussion guideline: generate topics and questions to be covered*
- e. *Conduct interview: specify role of team players, seek loose interaction*
- f. *Debrief after interview: assess whether changes need to be made, process data*
- g. *Analyze, report, save data: heed limitations of qualitative research, disseminate to interested parties*

Also use experts, consultants, members of advisory board, role playing.

Lead users: underlying premise is that lead users will reflect the needs of the main market early on in the product life cycle. (Moore notes problems with this is in "Crossing the Chasm") - lead users do not reflect the same concern of the main market and can be misleading in terms of what the market will truly accept.

2. Scenario analysis:

- a. *Extended starts in the present and gathers all current trends and facts. Move into future, and based on current trend speculate about future products*
- b. *Leap starts in the future and paints a scenario of what is going to happen. Future products based on this scenario are then described*

3. Group Creativity

- a. *Group think, Brainstorming, all ideas welcome, judgment deferred*
- b. *Quantity breeds ideas, the more the better*
- c. *Singular focus, everyone has turn, overnight incubation, combine, refine, improve, poll team members*

4. Attribute analysis

- a. *Utilize product attributes to generate new ideas;*
 - i. *determinant gap analysis*

- ii. *perceptual gap analysis*
- iii. *Similar/dissimilar analysis*

5. **Relationship Analysis:** *force relationship between unrelated issues to discover new product ideas*
- a. *Two dimensional Matrix - identify two key elements in question concerning product to assess a solution the company has not considered*
 - b. *Morphological Analysis - identify attributes and multiple levels of each attribute to produce possible attribute combinations*
 - c. *Conjoint analysis - trade-off analysis; attributes more preferred by customers*

Phase3: Concept Evaluation

- 1. Charter review - management review against established metrics
 - a. Concept testing - folds customer opinion into the evaluation process; determine if customers have interest and would likely buy.
- 2. Scoring Models
- 3. Snake Plots - unweighted score per criteria is plotted to compare various concepts
- 4. ATAR Model - Awareness, Trail, Availability, Repeat purchase.
- 5. ECV approach (Cooper - 1998) - NPV may unfairly penalize certain types of products, use economic commercial value instead
 - a. $ECV = [(NPV \times \text{Probability of Commercial success} - \text{Commercialization Costs}) \times \text{Probability Technical success} - \text{Development Costs}]$

Phase4: Technical Development

Product protocol, Design for Excellence, QFD, TRIZ, Kano Model, Product Use test

Market Planning (within Technical Development Stage)

- i. *Market planning*
- ii. *Situation analysis; industry, competition, company, customer, sales*
- iii. *Marketing objectives*
- iv. *Marketing mix; Product, place, promotion, price*
- v. *Marketing Budget*

Appendix 5: Academia Sources

5.1 New Product Management – Crawford and DiBenedetto 2000

Phase 1: Opportunity Identification and Selection

- Market Planning – research, evaluate, validate, rank enhancements to existing products and new product ideas looking at changes in market, needs and wants in market place

Phase 2: Concept Generation

- Select high potential, urgency opportunities and begin customer involvement. Collect available new product concepts that fit the opportunity and generate new ones.

Phase 3: Concept / Project Evaluation Phase

- Evaluate new product concepts, technical, financial and marketing criteria. Rank and select the best.

Phase 4: Development

- Technical Tasks – Design, develop, prototype, test, manufacture and service
- Marketing Tasks – Strategy, marketing plan, launch plan, branding etc.

Phase 5: Launch

- Commercialize the plans and prototypes, begin distribution and sales.

5.2 Effective Innovation – Don Clausing and Victor Fey (2004)

Technology Strategy

- Opportunity for Innovation
 - Customer Surveys
 - Focus Groups
 - Conjoint Analysis
 - Probe and Learn

Concept Generation

Concept Selection

Robustness Development

Technology Readiness

Technology Transfer

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