New Approaches for New Products

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From product ideation, design, and forecasting to post-launch evaluation and diffusion, marketing research plays a critical role in new product development. In the MSI conference summarized here, managers and researchers offered new views and case studies.

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Introduction

On May 1-2, 2003, academics and marketing executives gathered to explore "New Approaches for New Products" at an MSI conference in Chicago. Presentations offered examples of quantitative methods to forecast and evaluate marketplace acceptance and diffusion, as well as qualitative techniques focusing on idea generation and product research. Case studies and reports on research findings demonstrated that both approaches aid managers in developing products that lead to real growth. The report below summarizes the proceedings. ▨

Securities Trading of Concepts
Ely Dahan, UCLA

Virtual customer research offers some significant advances over traditional methods of market research:

- It allows for fast communication between the firm and customer, reducing the time required for the entire research cycle.
- It takes advantage of fast computation to allow for adaptive research designs.
- It allows the researcher to show visual stimuli instead of just a verbal description of a concept.

The Virtual Customer Initiative encompasses a number of projects including one that measures consumer valuations of attributes (Toubia, Simester, Hauser, and Dahan 2003), one that assesses consumer valuations of full concepts (Dahan and Srinivasan 2000; Chan, Dahan, Kim, Lo, and Poggio 2003), and one that allows respondents to trade off attributes and costs to develop their own concepts (Dahan, Hardy, and Weisberg 2003).

The representativeness of Web respondents is an important issue. However, given the sizes of existing online panels and the conclusions of Willke, Adams, and Girnius (1999), Web representativeness seems adequate and is improving over time. Of course, controlled samples can be recruited and directed to respond over the Web.

Research conducted through online games ("game markets") offer another advantage over traditional research methods in that playing games is fun and may involve a payoff for the respondents, so they are likely to be better motivated and involved during the process of the research. The Securities Trading of Concepts (STOC) is one such game.

STOC method

With the STOC method, respondents start off with an initial endowment of "stocks", for example, 100 units of all products. They trade these products with the objective of maximizing their total security value. Thus, each respondent has an incentive to predict not just his/her own preferences, but also those of other participants. That is, if a respondent can accurately predict what the "market" (i.e., other traders) believe, he or she has a higher chance of maximizing total security value. In this case, the only "information" on which to trade comes from the trader's own preferences and beliefs about others' preferences.

The Iowa Electronic Markets has used this methodology for a number of years, and has generally predicted election outcomes with less error than other methods. Similarly, the Hollywood Stock Exchange uses this market-based method to predict opening earnings of movies, and the Foresight Exchange predicts outcomes like stock market crashes or "Apple bankrupt by 2010" etc. These game markets predict actual outcomes, but do not explain the underlying reasons for these outcomes.

A question about Securities Trading of Concepts in particular, and Web-based research methods in general, is whether Web representations of products generate similar results as the physical products themselves. Dahan and Srinivasan's 2001 study comparing preferences for physical products with preferences for their virtual counterparts, in this case for bicycle pump concepts, revealed that the results can be very similar.

A study of "crossover" vehicles (car/SUV) also revealed that respondents trade in the STOC game according to the stated preferences of the traders. Thus STOC is a mechanism of aggregating people's preferences quickly. In addition, STOC participants tend to bid up products that are preferred by the market, even if they are not their own preferences.

An important question about STOC games is what metric to use for assessing preferences. Using the entire series of prices during the course of the game was much more informative than using just the closing price.

Visuals important

A STOC game for laptop bags revealed that visual stimuli were very important in such games. A STOC game with verbal descriptions of the bags produced very poor results while one with visual stimuli had better results. A follow-up study involved trading attributes of the laptop bags instead of full concepts. Since each attribute or feature involved additional costs, participants had an incentive not to want all possible attributes or features. This game did a good job of predicting outcomes, as did similar attribute-trading games for crossover vehicles and ski resorts.

In another study, 241 respondents designed their ideal PDA/cell phone hybrid device, and then participated in a STOC game where 14 features of these PDA/cell phone devices were traded. With student participants, the game did a good job of predicting preferences; with executives, the game did an even better job, even though these respondents had not participated in the user design study.

An interesting finding of this research is that while the STOC game is useful in predicting market outcomes, it is not necessarily accurate in identifying individual traders' predictions well. Thus, some traders are "accurate" winners, that is, their predictions are accurate, and others are "inaccurate" winners, that is, their personal insights are not accurate, but they have good trading skills. Similarly, there are accurate and inaccurate losers.

An important finding for research design is the presence of order effects. Participants tend to trade the stocks that are at the bottom of the list less rather than those higher up in the list. Therefore, the game must randomize the stocks

ordered by trader. Another finding is that personal preferences are important: while traders learn about and take into account others' preferences, other things being equal, they sell off stocks they don't like and buy stocks they like.

Summary
- The STOC game performs well when the traders are informed about the product category.
- It is reasonably accurate at predicting winning concepts, but it is best used as a method to reduce the number of concepts to be considered in other, more detailed, studies.
- It aggregates individual preferences efficiently, quickly, and at relatively low cost.
- Traders behave heterogeneously but they learn from each other. Over time, the volatility of trading decreases.
- The method works for diverse categories, and is useful for attribute levels as well as full concepts.
- Real outcomes are not absolutely necessary though traders need to believe that there is a real outcome.

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Consumer-focused Development of New Ideas
Paul Zimmerman and Joey Suntken, The Procter & Gamble Company

In the new product development process, marketers typically collect data on how consumers react to a product idea, which is developed after listening to consumer needs. In short, developers and researchers are in the middle of the process, acting as intermediaries for consumers. Procter & Gamble uses a consumer-focused process, which utilizes semiotics and several rapid-iteration online tools to better understand the mind of consumers, and deliver more relevant products to the market.

Consumer first, product second
The consumer-focused process for developing new ideas revolves around three key principles. New product development should be consumer driven (rather than technology driven), holistic (rather than atomistic), and based on behavioral (rather than attitudinal) measures.

This process recognizes that the marketer's ultimate goal should be to "get into the mind of the consumer" to understand his/her needs. Thus, it is important that the entire ideation process be based on the consumer first and the product second, rather than the other way around.

The process begins with a focus group/one-on-one process in which consumers are asked

non-standard questions on their lives and their views on the broad issue that a product is trying to address. Consumers are asked to create concepts and to select, create, and use visuals to convey the emotion attached to a product purchase. The developer then tries to understand commonalities and differences of needs and wishes expressed. No effort is made to interpret consumer inputs to create a "least-common denominator" need or benefit.

Based on these inputs, product developers generate seed ideas which are shown to a new panel of consumers. Each consumer is asked to rate four or five ideas based on how they address the issue at hand. In contrast to other methods, the consumer is also allowed to suggest his/her own needs/benefits, which are added to the database.

Subsequent consumers then see a random mix of four or five need/benefit ideas, which could include the new ideas added by previous consumers. As ideas are developed, modified, and ranked by the consumers themselves, the good ideas rise to the top.

Holistic development
A holistic orientation toward communicating with the consumer involves conveying the emotional content of the new product through a multi-sensory product message. Communication should convey the emotional content of product consumption through the manipulation of sounds, tastes, scents, and textures. Semiotics—the study of signs—can help the marketer design such communications. Semiotics can help decode and clarify the hidden meanings of images and sounds, and the associated emotions they evoke in consumers.

Behavioral measures
Using attitudinal measures to understand the buy versus no-buy decision of consumers is problematic for two reasons. First, consumers are in an unnatural context. Second, the well-documented gap between stated and actual consumer behavior suggests that a measure

based on actual purchase behavior would be better than one based on attitudinal measures/stated intentions.

Behavioral measures of consumer purchase behavior are collected at P&G as follows. As ideas are developed, they are put up on a website as part of a store "shelf," arranged next to relevant competition. Consumers vote on their preferred idea by buying the one they like the most, using seed money provided to them at the start of the test. Consumers are also given the option of not buying any of the products. At the end of the test, consumers are given a check for the sum of money not spent. Thus, the process mimics as closely as possible, within a laboratory environment, the real-world context in which purchases are made.

Creativity Templates in Marketing
Jacob Goldenberg, Hebrew University of Jerusalem

New ideas can come from three sources—new technologies, the market, or the mind. New technologies usually develop in the time span of decades. Market conditions leading to an unexpected idea can be split into two stages. In Stage 1, very few consumers are aware of a new need. In Stage 2, a much larger number of consumers are aware of the need. However, given the same resources, competitors could be expected to discover the need at about the same time. Further, while marketing research is usually good to find the preferences for existing products, it is not very good to determine the potential for completely new concepts. Thus, there are limitations to the extent to which ideas for a really new product can come from the market.

Recent research has focused on the mind as a source of ideas. This line of research rejects the notion that randomness or anarchy in the thought process is what leads to new ideas. It argues that there is a productivity loss if the thought process is too random.

Needs "mapped into" products

Product evolution can be considered an almost Darwinian process: a selection process ensures the survival of the fittest products. Thus, those products that do not adapt to emerging demands cease to exist. This means that each new demand is "mapped into" the product. Over years, the surviving products become a physical representation of the set of demands that evolved in the market. Hence products contain a lot of information about the structure and patterns of needs emergence.

Research on creativity takes one of three approaches. The first attempts to identify measurable traits of creativity, and to form teams of creative people for tasks that require creativity. The second studies thinking patterns and models for thinking. The third approach focuses on fundamental structures, or creativity "templates," in ideas themselves. In the context of marketing, creativity templates are patterns of evolutions of successful products that match the evolution of the markets, and thus may predict emerging needs before market signaling.

For example, consider the following ideas: "Edison's gate," in which guests applied force to open the gate which was connected to a water pump, and a Kinetic Compaq keyboard, where the punching of the keyboard charges the battery. In both these ideas, there is a fundamental commonality at an abstract level: a component in the configuration or the immediate environment of the product fulfills a required function by replacing a component that formerly fulfilled that function.

Another example is a Wirefree product that transmits all cell phone conversation onto the car radio's speakers. It uses the existing resources (car radio speakers) to give a benefit at no incremental cost. Another example is a product for the Search for Extraterrestrial Intelligence (SETI), which allows anybody to download a screensaver that uses the processing power of the computer for the purposes of the SETI project when the computer is not otherwise being used.

Replacement template

All these examples demonstrate the creativity template called "replacement" which uses a component in the product configuration or in its immediate environment to fulfill a required function.

This "replacement" template is defined thus: X and Y are two components of a product; if X intentionally controls Y's parameters, there is defined to be a functional link between X and Y. The complete set of product links constitutes a product configuration.

For instance, in the case of a chair, there are two links between the seat and legs. The legs intentionally control the height parameter of the seat, and in some chairs, the seat holds the legs together. A chair's configuration would include the human body and the floor in addition to the seat, the legs, and the back of the chair.

Components that are under the manufacturer's control are defined as internal components; in the case of the chair, the seat, the back, and the legs. External components are those not in the manufacturer's control—in the case of the chair, the human body and the floor. Finally, an intrinsic component is defined as one without which the entire product configuration loses its meaning. The seat and legs would be intrinsic components of the chair.

The application of the replacement template would be to remove an intrinsic component without doing away with the function it serves. This would require looking at its environment to see if any other external component could serve this function: in the case of the chair legs, this might be the wall or a table. Using a replacement template, one could systematically design a new product configuration, in this example, a chair without legs.

Another template is attribute dependency. A candle offers an example: in a regular candle, the melting point of the wax is the same at the outer edge and the center of the candle. Thus,

the attribute of melting point is independent of the diameter of the candle. However, if the wax closer to the center of the candle had a lower melting point, attribute dependency is introduced—that is, the melting point is dependent on the diameter of the candle. The advantage of this new product configuration is that the wax at the outer edge melts slower, eliminating the dripping of wax that we see in regular candles.

Almost 70% of the successful products fall into one of five templates: attribute dependency, component connection, replacement, displacement, and division.

The usefulness of creativity templates in creative ideation was tested by using three groups. In the first group individuals were trained to use creativity templates. In the second group individuals were trained to use rival methods such as random stimulation and mind mapping. The third group consisted of individuals that were trained in a dummy method. Judges that were blind to the purpose of the experiment rated the ideas suggested by the creativity templates group significantly higher on scales of originality and quality (in terms of market success potential). This kind of study was replicated several times in various fields.

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"Listening in" to Find Unmet Customer Needs and Solutions
John R. Hauser, MIT

The Virtual Customer Initiative (VCI) is funded by MIT's Center for Innovation in Product Development (web.mit.edu/cipd), a center begun by the National Science Foundation and funded by industry. (See mitsloan.mit.edu/vc for papers, demos, and open-source code.) The VCI focuses on new Web-based methods to provide customer input to the new product development process. Some methodologies focus on concept evaluation and concept generation, others focus on user design of products, and still others focus on intelligent and efficient ways to tease out relevant information from large sources of data. The "listening in" approach (also funded by MIT's eBusiness Center with the cooperation of General Motors) is a methodology to find relevant new concepts, i.e., "what product to design in the first place."

"Listening in"
Virtual advisors are Internet-based tools that customers use in order to get advice on products. The use of virtual advisors is widespread: 62% of new-auto buyers use the Web for information, 70% for travel, and 56% for health care. The "listening in" approach, developed with Prof. Glen Urban of MIT, uses data already collected through virtual advisors to identify unmet needs combinations and to intervene with a "virtual engineer" to probe these needs more deeply. In addition a "design palette" lets customers design their own product.

The methodology is particularly relevant for complex categories such as automobiles. There are 200-300 make-model combinations of automobiles, for example, Toyota (make) Camry (model). The authors' application monitors preferences with respect to 38 features of trucks—1.5 quadrillion (1,015) potential combinations. To search this many combinations is infeasible with conventional means of market research, but is possible by monitoring customer's directed

searches as aided by virtual advisors. In addition, when the virtual engineer is triggered, the authors' application explores an additional 1,031 combinations based on 117 features.

Triggering unmet needs

Prominent virtual advisors include Amazon (collaborative filters), Dell (configurators), Nordstrom (chat rooms), and the Auto Choice Advisor (Bayesian advisor).

The Bayesian virtual advisor (underlying GM, Kelley Blue Book, and J. D. Power's Auto Choice Advisor) asks a series of questions and chooses the next questions so as to maximize information. Bayesian methods are used to update the suggestions such that the probability of the product satisfying customer needs sequentially goes up after each update. The trigger mechanism is based on the following two propositions:

Proposition 1. If the recommended truck after question bank q is the same truck as that recommended after question bank q-1, then that truck has undesirable characteristics if and only if the recommendation probability decreases. If the recommendation probability decreases, a new truck with mixed characteristics has higher utility than the recommended truck. That new truck is not currently available in the marketplace.

Proposition 2. If the recommended truck after question bank q is different than the truck recommended after question bank q-1 and if the recommendation probability decreases, then the recommended truck has undesirable characteristics. A new truck with mixed characteristics has higher utility than both the recommended truck after q-1 question banks and the recommended truck after q question banks. That new truck is not currently available in the marketplace.

Another way to put this is that if the probability that the customer will purchase the recommended truck decreases between one question and the next, a truck with a new feature combination would be better than anything currently

in the market. Thus, the decrease of probability is a trigger mechanism for the presence of unmet needs combinations.

The matrix of correlations of conditional probabilities across question banks can be obtained from Attitudes, Interests and Opinions (AIO) data. Whenever the trigger mechanism is activated, it is important to examine all the strongly negative correlations among the respondents' answers. The "virtual engineer" and the "design palette" help uncover the root causes underlying these unmet needs combinations.

The virtual engineer seeks further information about the needs of the customer by asking the respondent to elaborate on pre-identified (unanticipated) needs, and by asking open-ended questions. The design palette allows the respondent to design a product with sophisticated engineering models that simulate product features, prices, etc. based on parameters selected by the respondent.

To estimate the size of the opportunity, respondents are clustered based on the triggered negative correlations. An unmet-needs-combination segment is identified when members share requests for features that were previously negatively correlated. A new product is then simulated to meet the needs of this segment, and a Bayesian model is used to forecast probabilities of purchase. Such a methodology gives preliminary estimates of the opportunity size.

Testing the approach

A simulation study tested the ability of this methodology to identify unmet-needs-combination segments in the market for trucks. Even with 10% errors in responses by respondents, 100% of the needs combinations (segments) were correctly identified.

A real-world application was also conducted with 1,092 Web-based respondents from the Harris Interactive Panel. These respondents spent 45 minutes each on this study and received a $20 incentive. The respondents

preferred virtual advisors to dealers by a ratio of 8 to 1, they were four times more likely to purchase due to the virtual advisor, 88% of them found the questions asked easy to answer, and 77% felt it related to their needs.

Some key unmet-needs-combinations in the market for trucks were unveiled by this study. The first was for maneuverable large trucks, with an opportunity size of approximately $2.4-3.2 billion per year. The second large opportunity revealed by this study ($1-2 billion per year) was for a compact truck that could tow and haul heavy materials. A smaller opportunity was found for a full-sized truck with a six-cylinder engine. Further, the study elicited an elaboration of these customer needs and identified the underlying root causes.

New Product Research: Process, Infrastructure, and Technology
Jeff Hunter, General Mills Inc.

New products have taken on increasing importance in General Mills' business objectives in recent years. As a result, volume objectives are increasingly dependent on new products, and development timelines are reducing. Overall, there is a greater degree of reliance on the new product research process to identify business opportunities and to develop the total brand offering quickly and at low cost.

General Mills has developed a unique infrastructure to deal with these changes. Consumer research is carried out by business units and by central resources. Strategic and tactical research focused on the brand is conducted within the respective business unit. Over-arching initiatives are managed within the central group in consumer research.

The consumer research function in General Mills, called Consumer Insights, has focused on the use of technology, such as "MarketTools"—an Internet-based survey technology, "Invoke"—an Internet-based, structured, inter-active dialogue, and Affinova, which uses genetic algorithms to optimize concepts, products, and other propositions for dynamically determined consumer segments. The use of Internet technology has reduced cost as well as time, enabling General Mills to shift from tactical to strategic research.

Four-phase process
The third building block is the four-phase new product process: identification of business proposition, development of total brand offering, pre-sell activities, and marketplace execution.

Opportunity identification starts with strategic work. A current project is mapping the entire product space, including the current categories in which the company is present, adjacent categories, and emerging categories. The aim is to provide a clearer direction for ideation through a formal framework, and the generation of ideas that are better "formed" earlier. In addition, an important objective of the opportunity identification research is early volume estimation.

Opportunity identification is aided by the low cost and high speed of Internet-based research. For instance, a typical study in 1995 involving 18 brands and 3,600 interviews cost about $200,000. In 2002, a study involving 60 brands and 24,000 interviews cost only about $90,000.

Development research aims include the optimization of the total brand offering, the generation of early feedback, and the estimation of total brand offering volume.

Current practice is to consider aspects of the new product—price, package, positioning, place—separately and sequentially, which stretches out the time-line. Since these items are inter-related, it would be better practice to consider them jointly, and it would save time. New technology (Invoke) allows the researcher to go back to respondents interviewed previously to probe more deeply on specific questions, saving the time and expense of finding a new sample for the specific question.

The use of Internet technology and sample provides time and cost advantages that translate to larger and more robust samples of consumers. A few years ago, a typical offline study cost $80,000 for 12 SKUs and 360 interviews. Today, an online study involving 10 brands and 1,000 interviews costs about the same.

An important component of the research process is post-launch assessment of business results and research process. Two questions need to be answered: Are we doing the right thing? Can we do the right thing faster?

Designing New Products with an Eye for How Consumers Evaluate Them
Page Moreau, University of Colorado

Consumers value both product features and product aesthetics. While consumers' valuations of product features have been studied extensively, little is known about how consumers value aesthetics. This research aims to better understand the psychological responses that product form evokes in consumers, and use these as inputs to design more aesthetically appealing new products, which will be able to compete better against other functionally identical products.

The key to understanding consumer's valuation of product form is to understand how consumers form cognitive evaluations of the product. Cognitive evaluations include categorization (the consumer classifies the product as belonging to a specific category) and beliefs (the consumer forms perceptions about the product's function and quality).

Product beliefs, which affect the consumer's final evaluation of the product and the decision to purchase, are influenced by the categorization process and by the context in which consumers get information about the new product.

Further, consumers learn about many new products through word-of-mouth processes and/or recommendations from friends and family. The way in which consumers communicate product-related information is also affected by the categorization process and by context.

Thus, it is important to understand the role of context and categorization on the formation of product beliefs and on the communication strategies of consumers. These form the twin goals of this research.

Product beliefs
In a two-by-two experimental design, consumers were randomly assigned to one of four groups. The first group was shown a demonstration of the product ("context") and told the specific category to which the new product belongs ("categorization"). The second group was shown a demonstration but not told the specific category. The third group was told the specific category but not shown a demonstration. A control group was neither told the category to which the new product belongs nor shown a demonstration of the product. All groups were subsequently told to rate their perceived innovativeness of the new product.

Results indicated that when a demonstration is provided or when the category is revealed, the perceived innovativeness ratings are higher. Further, those who were shown a demonstration of the product, and also told the category to which the new product belongs, rate the product to be of significantly higher innovativeness than all others.

This implies that providing a context for the evaluation of the product, and providing a "benchmark category" by which to make quality judgments, significantly improve consumers' evaluations of the product.

Communication strategies
In a two-by-two experimental design, consumers were randomly assigned to one of the four groups described previously. However, subsequently they are asked to explain the functions/

category of the new product to another consumer.

The proportion of consumers using the correct category when explaining the new product to another consumer is higher when a demonstration of the product is provided or when the category is revealed. Approximately 80% of control group members—those who were neither shown a demonstration of the product, nor told the category to which the new product belongs—got the category wrong when explaining it to another person. Note that those learning about the new product from these consumers also categorize the new product inaccurately.

This implies that providing a context and categorization to consumers for the evaluation of new product is important in driving positive word-of-mouth, and that not doing so can significantly hurt new products.

Relevant Innovation: Finding a Balance to Achieve Commercial Success
Chris Bradley, 2ndEdison, Inc.

Although innovation can occur on multiple dimensions—including product design, busi-ness model, supply chain, etc.—most firms compete on only one dimension. The 5i innovation model is a method to achieve more relevant innovation by searching for innovation opportunities on neglected dimensions. Two case studies demonstrated how this approach fueled new innovations and increased the likelihood of commercial success.

The 5i innovation model
The 5i innovation model is based on four assumptions:
- Innovation opportunities exist for any given product along at least five axes.
- Disruptive innovations typically come from neglected axes.
- There are synergies among innovations on different axes.
- When products are redesigned to achieve innovation on multiple axes, the likelihood of success increases and risk is reduced.

Based on these assumptions, the 5i model involves a systematic process to develop innovations along multiple axes. The first step is a thorough audit and analysis of the product to look for innovation contributions on each of the five axes, followed by brainstorming of new opportunities with a special focus on the hitherto

5i Innovation Model
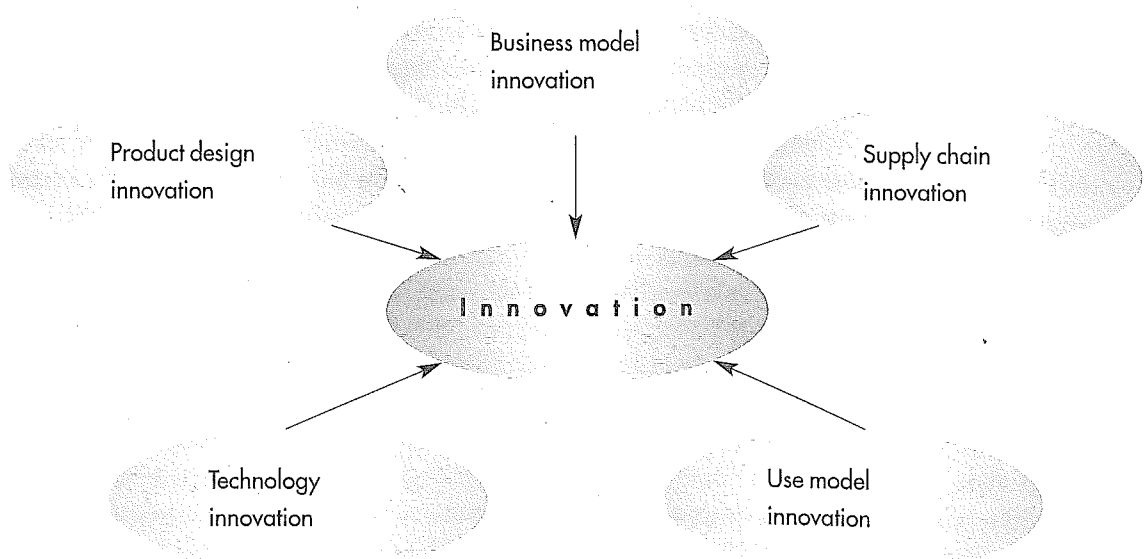
neglected axes. Ideas generated by this process are combined to identify synergies between innovations on different axes. The product is then redesigned and repositioned, with an objective of achieving innovation on at least two axes. Innovations are re-framed as relevant customer value propositions. Research validates the relevance of the value propositions, product positioning, and pricing. Finally, after refining the product and revalidating the refined mix again, the product is launched.

The 5i innovation model is most useful in the case of rapidly commoditizing markets where competitors typically compete on one or two axes, and customers are often unable to differentiate competing products. Thus, a product with innovations on the neglected axes can make a significant impact in the market. In addition, in such markets margins are under pressure, and innovations can offer new sources of profitability. Two case studies illustrate.

HP Meritage PC

The HP Meritage PC was developed through the 5i process as a new opportunity for HP in the notebook PC market. This market was characterized by low margins, moderate growth, and a rapidly commoditizing market. Most innovation was along the supply chain axis, for example, Dell.

2ndEdison and HP's objective was to find a way to double the net margin of HP's Notebook PC division. An audit of the business model axis revealed that accessories for notebook PCs delivered ~50% of gross margins, while accounting for just 10% of sales. This acknowledgement led the team to focus on accessories with high margins but low connect rates; as a result, docking stations for notebooks were determined to be the highest priority accessory. The aim in redesigning docking stations was to get a 75% connect rate, i.e., sales of docking stations to 75% of customers who bought HP notebook PCs. If this could be achieved the business model would change and profitability would go up substantially. Achieving such a

high connect rate would require redesigning the entire system of docking stations and notebook PCs holistically; in fact, the dock became the central feature of focus in the notebook and docking station "solution." Extant industrywide practice was to first design the notebook then design the docking station.

An analysis of the use models revealed that customers often made compromised tradeoffs between different forms of PCs—desktops, notebooks, PDAs. Desktops offered features such as monitor, keyboard, and mouse ergonomics while notebooks offered portability and absence of wires and cables. Often, customers bought both desktops and notebooks. The analysis also revealed that customers were not very satisfied with docking stations: a very low percentage of notebook buyers used them.

The supply chain analysis revealed that a typical new notebook "platform" becomes profitable only after several hundred thousand units based on that platform are sold. Therefore, a key decision was to base the new product on an existing platform to reduce both risk and cost.

Other key innovations were on the product design axis. The objectives were to eliminate the need for another monitor—yet keep it at eye level, eliminate all cords, have an ergonomic design, and enhance aesthetics substantially.

The newly developed product achieved these objectives: the notebook display could be swiveled and turned, used like a tablet PC, and had no cords and an ergonomic design. The innovation on the product design axis allowed innovation synergy on the use model axis (it could be used like a desktop and tablet in addition to a notebook). The product also leveraged supply chain innovation to keep costs low (i.e., using an existing platform). The business model axis innovation was the acknowledgement that the design of the notebook should be focused on increasing dock sales, which helps to double the profitability of the whole solution.

Sikko snowboards

Snowboarding is the fastest growing winter sport in the United States. The major brands in the market are currently competing on graphic design and technology; in other words, most innovations are along the product design and technology axes. Customers are almost entirely fashion-driven and many make their purchase decisions based on the snowboard graphic alone; only a small segment of the market is technology-driven. Leading snowboard manufacturers have 300-400 SKUs each, primarily because many graphic designs are required to satisfy customer preferences, resulting in huge inventory costs on the supply chain axis. In addition, since the supply chain is about 18 months long, manufacturers must determine graphic designs a year and a half in advance— even though market trends change rapidly.

The objective was to enter the snowboarding market in a low-risk, yet disruptive manner. The innovation on the supply chain axis was to separate the graphic design on the board from the board itself, significantly reducing the inventory costs, while not compromising on graphic design variety. The 18-month lead-time for graphic design was also eliminated by using available low-cost printing technology to make laminates to order.

On the product design axis, the innovation was to develop a website for graphic artists to display their work and customers to buy snowboard graphics. Artists selected for the website receive royalties; in addition, artists and designs are rated by customers and these ratings are displayed for other customers.

The business model innovation was that the board and a laminate film with the snowboard graphic were sold separately. The film was also sold to people who already own snowboards, but want a new graphic design. The collection of ratings information on designs and artists gave the venture another potential business model innovation: the ability to sell information on popular designs to snowboard manufacturers.

The product has not yet been introduced in the market, but the entire marketing mix for the product has been developed. The innovations along multiple axes and their synergies allow for a sustainable and low-risk proposition.

New Product Diffusion across Countries and Products
Andrew Ainslie, University of California, Los Angeles

To what extent are commonalities and differences in the new product diffusion process driven by country and product characteristics? Combined datasets and a single estimation procedure across the set can lead to significantly improved forecasts in the early stages of new product diffusion.

Bayesian approach
The Bayesian approach to model estimation is based on probability theory. The analyst first specifies a prior distribution for all parameters of the model. Using observed data, the prior is updated according to the rules of probability, providing the posterior distribution of the quantities of interest. The updating mechanism works such that the more informative the data are, the less important the prior is in determining the posterior. Thus, analyst beliefs and observed data are optimally combined into a single coherent estimation framework.

The Bayesian approach is especially suited to the analysis of problems with multiple data sources and that require the continuous updating of model estimates as new and better data become available.

Two aspects of the Bayesian approach make it particularly attractive for modeling new product diffusion early in the product life cycle. The first, *hierarchical regressions*, enables the model to pool information within and across countries and products to better explain diffusion patterns. The second, *adaptive shrinkage*, enables the estimation method to optimally "mix" the hierarchical

regressions across products and countries with the actual data to create predictions specific to each product and country. The model predictions thus obtained tend to be better than those obtained under standard approaches, even in sparse data situations.

Bass model

The Bass model is the most popular analytical framework for modeling new product diffusion. Over time, researchers and practitioners have documented the ability of the Bass model to predict the familiar S-shaped sales growth pattern of a wide variety of new products. In the Bass model, diffusion is determined by three parameters. These are (1) the long-run market potential of the country, (2) the coefficient of innovation, representing the proportion of the population in any period that adopts the new product for intrinsic reasons (the "innovators"), and (3) the coefficient of imitation, representing the proportion of the population in any period that adopts the new product because others have adopted it (the "imitators").

Researchers typically use the Bass model to model the diffusion of a single product using data from a single country. However, by pooling information across countries and products and exploiting the commonalities in diffusion patterns across countries and products, one can improve predictions of diffusion patterns. Adapting the Bass model to a Bayesian framework that uses cross-country and cross-product information helps achieve this. The Bayesian-Bass model predicts sales better and earlier in the product lifecycle and helps to explicate the determinants of diffusion rate across different countries.

Framework

The broad framework adopted was as follows: The long-run market potential of the country was postulated to be a function of the population's ability and willingness to pay, and degree of access to the product. The coefficient of innovation was parameterized as a function of the population's access to product-related infor-

mation, and consumer inclination and ability to process non-word-of-mouth information. The coefficient of imitation was parameterized as a function of the degree of homogeneity of the population and the degree of persuasiveness of existing adopters. The data included 31 countries, spanning all continents and cultures, and six products including cell phones, fax-machines, and microwaves. The model was estimated using the WinBUGS software package.

Results

The model performs very well in modeling the diffusion pattern. Most of the results were in line with what we would expect a priori. For example, country-level purchasing power parity-adjusted disposable income, capturing the ability and willingness-to-pay of the population, was found to be a significant determinant of long-run market potential. Further, more than 50% of the variation in the long-run market size across countries and products was explained by country-specific effects rather than product-specific effects. The degree of literacy in the country, capturing consumers' ability to process non-word-of-mouth information, was found to be significant in explaining the coefficient of innovation across countries. Further, about 50% of the variation in the coefficient of innovation and imitation across countries and products was explained by product-specific effects. About 30% was due to random variance unexplained by the model.

The broad conclusion is that country-specific variables help us predict how many units of the product we can sell in the long run, while the product-specific variables help us understand how fast it will diffuse. This information can be used to predict, based on data from previous products and previous countries, how the sales growth curve of the new product will evolve in the future.

Finally, the predictive ability of the model was found to be vastly better than the standard Bass model, especially in the early years of the product introduction. Specifically, in a one-

year-ahead forecast, the Bayesian-Bass model was 36% better than a country-only model, and 23% better than a product-only model.

To conclude, the Bass model, extended to pool information across countries and products, is found to be an extremely effective tool for understanding and predicting the diffusion of new products. Managers can develop improved and more reliable forecasts of the sales of their newly launched products by adopting this framework.

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Discussion: Methods for Innovation
Moderator: José Antonio Rosa, Case Western Reserve University

For successful innovation, every step is critical, from the identification of an unmet need to the conception of an innovative solution to the marketing of this solution. Implementing innovations requires a shared understanding throughout the organization, and starting at the top. The discussion followed two main themes, communication and balance, which are crucial to well-planned methods of innovation.

Communication

External and internal communications play an integral role in an innovation's success. Externally, a firm must appropriately communicate the qualities of the new product or service and its benefits to the consumers. Internally, members of an organization must communicate with each other to determine what new ideas to implement and how to implement them.

Participants discussed a number of examples of failed communication. In one company, after

extensive analysis the company concluded that a major segment of consumers was not finding a product or brand to meet their needs. Research revealed specifically what was missing in existing products and what could be offered. However, after creating a "solution," the company met with little success. The product was familiar to them, and the benefit was understood, but the company was unable to convince consumers that the new technology could actually deliver the benefit.

This story prompted others to discuss how to best communicate the general and specific benefits of an innovation to consumers. It is most difficult to market new advantages and new technology at same time. Consumers process information better if the product is communicated as a new technology that provides a familiar benefit or as a similar technology that offers a new solution.

Another problem is communicating the costs as well as the benefits to consumers. Testing the product alone will not predict how consumers will react to the "full experience" of owning the product. Because a product really facilitates a process and activity, it is useful in pre-launch testing to articulate the tacit issues that may upset a customer and prevent repeat purchases or positive word of mouth. However, it is a difficult task to communicate to consumers the full costs of the ownership experience while attempting to induce product-trial.

Communicating the value of an innovation is equally important within the organization. Multifunctional teams are created to develop new ideas. This can pose a problem as people with different backgrounds and knowledge are expected to come to a common solution. One participant noted that having clearly defined goals and screening criteria in place is critical to successful communication.

Diversity vs. homogeneity

The process of ideation can be slowed by conflict of thought. Engineering, marketing,

and finance often have different goals, personalities, and cognitive styles. Discussion participants agreed that this diversity should not be compromised. While homogeneity would quicken the pace of meetings and the process of innovation, it could have negative consequences during the launch phase.

Multifunctional teams should be carefully picked to strike a balance. Some members found that shared task experiences could help bridge the gap between members of the group. Building shared knowledge and establishing a common frame of reference through activities such as job rotation was also found helpful. In general, moving from ideas to execution was greatly enhanced by developing external focus and shared vision.

New vs. old ideas

One participant told the story of a CEO who focused too heavily on the innovativeness of new products. This CEO allowed the roll-out of new products that had not been rigorously tested and implemented a reward system that essentially ignored the base brands. Not only did failed innovations cost the company a fortune, the value of the base brands declined.

It was suggested that firms should "build and understand the landscape." It is important to understand what problem the proposed innovation solves, who would benefit from it, and where the benefiting consumers are. During this process, the role of existing products and services must be carefully examined.

Key points

- Costs and benefits are involved in a process facilitated by innovations, and both must be communicated to consumers.
- Product innovation needs to consider consumer response to the full experience.
- Holistic assessment is needed for predicting consumer responses.
- Fine grained and close-to-the-action analysis is needed for translating objectives into actionable plans.

- Maintain existing brands while pursuing innovations.
- Knowledge diversity cannot be compromised; however, teams need to build on their shared knowledge.

Discussion: Prediction and Evaluation
Moderators: Donald Lehmann, Columbia University, and William Qualls, University of Illinois, Urbana-Champaign

This discussion focused on current practices as well as challenges in predicting market performance before a product is launched and evaluating a product after it is launched. In general, the group found that quantitative analysis techniques were not very good for products that were really new or for new categories. Updating forecasts subsequent to launch to reflect changes in initial assumptions was another key challenge. Current methods were also found to be unsatisfactory in addressing certain unique characteristics of industrial markets.

Current practices

Most firms represented in the discussion group used quantitative analysis for forecasting. Many used standard models like BASES; others used simulated test market methods. One firm did not use standardized benchmarks for assessing product potential, and instead used a first-principles-based approach of assessing product versus market potential. Another participant shared a method of forecasting that incorporated emotional appeal elements of the brands into a BASES-type quantitative model.

A key conclusion of the discussion was that existing techniques are inadequate to deal with really new products and categories when available data are limited.

Updating forecasts

Other problems include the difficulty of developing long-range forecasts and the difficulty of screening products early based on their performance. One participant suggested the use of

Bayesian methods which allow new information to update model predictions. With new software for Bayesian analysis, their accessibility to practitioners has also gone up substantially.

The participants were of the view that an important problem with current forecasting methodologies is that they are based strongly on a set of assumptions on marketing activities, the competitive environment in the market, etc.— assumptions that invariably change by the time of product launch. Thus, it is difficult to assess the accuracy of a forecast because any deviation between the forecast and the actual performance could also be due to changed assumptions. A robust method of incorporating these changes in assumptions would be very useful.

Another challenge that emerged in the discussion was the incorporation of qualitative research results into forecasts provided by quantitative research. Existing techniques for forecasting do not account for many qualitative factors. One participant suggested that meta-analysis could be used to arrive at some generalizable conclusions about factors affecting forecasts. The meta-analysis results could be used to update assumptions and to integrate qualitative and quantitative research.

Trade and industrial marketing

The participants of the discussion felt that existing techniques of forecasting and evaluation inadequately deal with issues particular to trade marketing and industrial marketing. Issues like channel power are potentially critical factors in product sales performance, but are typically not taken into account while arriving at forecasts.

In industrial markets, unlike consumer markets, the decision to adopt a product is made by a group of decision makers. The interactions between influencers and decision makers is much more complex than in consumer markets. Future research in forecasting methods should focus on developing techniques to incorporate these features of industrial markets.

Discussion: Methods for Development
Moderator: Tom O'Guinn, University of Illinois at Urbana-Champaign

This discussion of new product development methods addressed a number of challenges: fostering innovation with geographically dispersed teams, encouraging/rewarding creativity in bureaucratic organizations, and generating, sharing, and storing insights. Participants shared experiences with approaches that worked and those that didn't.

Multi-site challenges

In today's multi-site, multi-country organizations, distributed product development teams present a unique challenge. Reflecting on a difficult experience with a dispersed team, one participant observed that two key components of a successful team were missing: communication and a shared identity as a team. Technological solutions could not offer the immediacy, contextual richness, and shared experiences of face-to-face communications in co-located teams. Ultimately, this presented a barrier to team bonding and identification as a team, leading to other inefficiencies and a general lack of commitment and shared understanding.

In response, John Hauser referred participants to MIT's Distributed Object-based Modeling Environment (DOME) project, which is working on facilitating geographically distributed team effectiveness with technology. Other research on development team functioning includes that of Rebecca Henderson, Deborah Ancona, and Nelson Repenning at MIT, and David Bell at Xerox PARC.

Other challenges for firms with multiple locations include "hometown ownership," which creates a positive bias for ideas generated locally and an aversion to ideas generated by other locations. Another is the lack of visibility of what other groups are doing, which makes it difficult to leverage disparate experiences in organizational learning. To address the latter,

one participant's organization holds best practice meetings across locations, by function, to facilitate greater organizational learning.

Another participant suggested that development projects should be off-site or isolated in some manner to avoid interruptions from the day-to-day firm operational activities. Cited as an exemplar was the Java development effort at Sun Microsystems in which the firm rented offices in a bank building away from Sun's campus for the development team.

Creativity vs. bureaucracy

Citing Howard Gardner's book *Creating Minds*, Tom O'Guinn noted that many notable creative persons have had difficulties in traditional organizations. But, we all know that creativity is essential to innovation. So, how do you motivate creative people in big organizations when their creativity is generally defined by nonconformity to the organizational majority?

Supporting this notion was one firm's comparison of current hiring criteria for scientists and engineers against the most productive scientists and engineers in the firm (judged by patents and successful products); the study revealed that the firm's most successful inventors would not be hired today. Some participants suggested that the most creative people they know in their organizations survive by adapting in unique ways—consistent with their creative capabilities.

Another participant noted the organization's efforts to create "career paths for weird people." Essentially, the typical career path through various functions and groups was neither attractive to, nor the best use of, a subset of unconventional people. The group elaborated that, indeed, the entire reward and recognition system in most companies focuses on specific objectives and tasks, which may create disincentives for more innovative people. At the same time, participants wrestled with the concern that dual incentive systems could create resentment towards more creative people who would be seen as "rogue gurus" without responsibility.

Innovative ideas

Moving onto innovative concepts, the group addressed ways to encourage and identify product and service innovations. Group members shared stories of great innovations that were shelved or dismissed within organizations and subsequently achieved great commercial success elsewhere (e.g., the Mosaic web browser developed at UIUC's National Center for Supercomputing Applications or Xerox PARC's creation of the graphical user interface).

One observation was that successful, innovative products typically have passionate people driving them through to completion. Without that, it is too difficult in most organizations to get the level of needed resources and support.

Regarding intrapreneurship within large organizations, the group noted that it is very difficult to encourage this concept on any broad level when people also have immediate issues facing them day-to-day. In other words, the ideal situation is to encourage people to focus on market needs; however organizations structure innovation initiatives by product or service. Therefore, when an idea surfaces, people assess whether it is relevant to their immediate product/service development objectives and, if not, don't have the time or incentive to find someone else in the organization to exploit the insight.

The group also discussed how ideas are solicited and analyzed. A participant noted that LEGO reintroduced their classic LEGO set, which became their most successful product, based on parent requests for the classic rather than the progressively more sophisticated products the company was offering.

Web-based tools for soliciting and capturing end-user ideas were discussed. How does an organization find the great idea among all the suggestions? In this regard, passive observation on-line, such as eavesdropping on non-affiliated user groups, listserves, etc., was also discussed. For example, Saab's decision to keep the ignition key on the car floor for their new

line resulted from monitoring on-line conversations of current Saab owners lamenting that key placement anywhere else would remove the "Saabness" of the car.

Another challenge identified was how to store and route such insights in large organizations. Although participants were aware of a few data repository products, direct experience was limited and the shared concern was how to notify the appropriate people about additions. The most common distribution method used by the group was e-mail lists, which have the positive attribute of creating awareness, although sometimes can be overwhelming.

The birth of cool

Finally the group discussed the notion of "cool". Tom O'Guinn mentioned Thomas Frank's bestselling book, *The Conquest of Cool*. It argues that ever since the 1960s, advertising, marketing, and now commerce itself chases what is "cool". Cool (however one says it) has moved way up in the list of factors considered by consumers, particularly where innovation is concerned. Examples include Mountain Dew as a pop icon, the fashion trend of baggy pants as an unpredictable result of prison culture, and the American commercial success of the original Volkswagen Beetle, a mere decade after World War II. Examples of designed coolness included Apple's iMac and iPod products and Chrysler's PT Cruiser.

Tom O'Guinn argued that the management of innovation should come from the realization that all products are socially defined by their users every bit as much as by the engineers and the marketers. In a very real way, the innovation process does not end with engineering, or even marketing. Marketers who best understand this partnership with the consumer are typically the most successful.

The group discussed various methods for uncovering coolness by observing leading-edge subcultures known to influence behavior; searching for unmet functional needs in markets that, when addressed, signify coolness because of their user insightfulness; searching for unmet cultural needs in end-user markets; and, finally, recruiting designers trained in behavioral methods and the art of design (e.g., IIT's Institute of Design).

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