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Leading Innovation

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ABSTRACT

The key takeaways from the wide-ranging World Innovation Forum 2009 can be grouped into three themes. First, opportunities for innovation exist not only in new products and services but also in customer experiences, as the case studies of Build-a-Bear, JFK's new T5 terminal, and GlaxoSmithKline's Alli illustrate. Second, understanding future trends in innovation requires knowing that radical innovation often takes years to be adopted and begins in populations other than the traditional users. Anticipating trends in innovation means looking for signs that people's expectations are changing and that new ideas are about to reach critical mass. Finally, biology provides a both source of innovation and a useful metaphor for innovation-related thinking, as Paul Saffo, C.K. Prahalad, Clayton Christensen and Fred Krupp described.

OVERVIEW

The presentations at the 2009 World Innovation Forum covered a wide range of ideas that can be grouped into three thematic areas. The first theme that emerged concerned innovation that focused on customers' subjective experiences of a product rather than just the objective technological product performance. Second, many speakers commented on the temporal dynamic of innovation: the *who* and *when* of adoption patterns. Third, numerous speakers connected innovation to biology as a source, metaphor, or motivator for innovation in the future.

1. THEME 1: INNOVATION IN CUSTOMER EXPERIENCES

Many of the presenters described innovation in terms that went beyond the physical attributes or objective performance characteristics of products. Experiences and emotions take innovation beyond the rational into the sometimes-irrational world of customer behavior. By understanding what customers really want — rather than what companies *think* customers want — companies can innovate more effectively.

1.1. Bear Experiences vs. Bare Products

For example, University of Michigan Professor C. K. Prahalad asked the audience about their experiences with "Build-a-Bear" — an e-commerce company that lets kids of all ages design their very own Teddy Bear. Audience members reported spending as much as \$200 in choosing the look of the bear, the amount of stuffing in the bear, adding a custom sound to the bear, getting the bear's birth certificate, buying clothing for the bear, and buying accessories and siblings for the bear. This culminates in making "The Bear Promise" to care for this personalized stuffed animal. Discussing the depth of the experience and the simplicity of the physical product revealed that the bear embodies both negligible product costs and priceless customer experiences.

A typical "trick question" in job interviews is to ask a candidate, "How would you redesign a Teddy Bear?" This example shows that the design of the bear may not change much, but the design of the experience of buying the bear may be where the real opportunities are. In fact, Build-a-Bear is more about the *customer* redesigning the Teddy Bear than it is about the *company* redesigning the Teddy Bear. Therefore, C. K. Prahalad recommended that companies think more about experience innovation to complement and enhance product innovation.

The Build-a-Bear phenomenon is not unique to toys. Other companies provide experience-intensive products. These companies include Medtronic (the Medtronic pacemaker is augmented with remote monitoring, health records coordination, and provider networking services), Bridgestone Tires (which provides by-the-mile fleet usage pricing with value-added vehicle usage services), and Nike's iPod-connected shoes (the shoe sensor feedback provides work-out feedback and performance). The point is to think about the value chain of the experience, rather than the value of chain of the product.

1.2. T5 Case Study: Mixed-Use is Effective Use

A good example of a customer experience, and innovations to improve that experience, can be found in a trip to JFK's new T5 airport terminal. Frequent travelers know the frustration of the airport food court being located one place while the gate is located in another, and a power outlet to recharge the laptop can rarely be found. In most airports, no single location suffices for all these purposes. When sitting at the gate, a traveler doesn't know if there is enough time to go grab a bite to eat. And when sitting at the restaurant, one doesn't know if one's flight is about to board.

OTG, a company that runs food operation at nine airports, tackled this problem when they designed the airport experience for JetBlue's new T5 terminal at JFK airport. OTG created a new mixed-use approach for some of the gate space. About half the 26 gates have special 16-seat clusters called "re:vive" that let passengers eat, recharge, and keep an eye on their flight. Touchscreen monitors and credit card readers at each seat let passengers order, pay for, and have food delivered right to the gate. The ordering process even provides a delivery time estimate before a passenger gives the final "OK" for the order.

"Re:vive" is more than just a passenger convenience. It also boosts revenues for food concessionaires by reaching the underserved market of so-called "gate huggers" — passengers who don't want to leave the gate area. "Re:vive" and OTG's other improvements to the airport dining experience give the new terminal higher Revenues per Passenger Enplanement (RPE) than any other major US airport, including international airport terminals where passengers have considerably longer dwell times. The point is that creating a dining experience that people like provides benefit to both the passenger and the airport.

The "re:vive" concept is not unlike the notion of mixed-use building developments for cities, which create buildings with retail on the first floor, offices on the second floor, and residential condos or lofts on the top floors. Mixed-use reduces urban sprawl and urban commuting times in the same way that re:vive reduces airport terminal sprawl and the burden of dragging luggage to and fro. Co-locating the functions that people need provides convenience. The point is that merging functionality can create innovations in efficiency and convenience.

1.3. Job-Focused Innovation

Understanding experience, and innovating to improve that experience, implies understanding why the customer uses the product. One way to do this, according to Harvard Business School Clayton Christensen, is to understand the job that the product is hired to do by those customers. Christensen cautioned companies against looking only at customers when they create incremental innovations.

To illustrate the "product's job" concept, Christensen described fast food chain's milkshake sales. At the demographic level, many milkshake buyers are working-age people. But the demographic similarity is not what drives people to buy milkshakes. (When the company researched demographically similar people, the results did not improve sales.) In fact, a focus on age and gender missed the job that milkshakes perform — why do people "hire" (buy) the milkshake? What job do they want the milkshake to perform?

Through further research, the fast food chain found that about half of milkshake sales occurred in the morning. These buyers came into the restaurant by themselves, bought a milkshake and nothing else, and drove away with the milkshake rather than consuming it at the restaurant. Looking deeper, researchers learned that the buyers were commuters, and the job of the milkshake was to provide distraction on a long commute and a tide them over until lunch. For this job, the milkshake competed with bananas, donuts, breakfast bars, and coffee. Commuters hired milkshakes over the competition because milkshakes take a long time to eat, don't slosh or leave crumbs, and can be held in one hand or put into a cupholder during the drive.

A very different group of milkshake buyers came in the afternoon and evening. These buyers were predominately dads with little kids. The dads were buying milkshakes for an entirely different job: that of assuaging guilt over not having enough time with their kids. Kids liked the milkshakes, and the dads could finally say "yes" to something and feel good about themselves.

Understanding the jobs people hire milkshakes to do is important when it comes to incremental product improvements. The two jobs for milkshakes call for diametrically different innovations. Thicker milkshakes would delight the bored commuter, but they would frustrate time-pressed dad because kids take too long to finish thicker shakes.

Simply put, innovations to boost sales in one group are very different from those that delight the other group. Commuters might want increased thickness, small added fruit chunks, and a grab-and-go purchase system that lets customers buy a milkshake without standing in the regular food line. In contrast, dads might want a smaller, thinner milkshake that provides fun but quick treat for the kids.

The point is to understand *why* someone buys the product, not *who* buys the product. The demographics of milkshake buyers are less important than the fact that one segment buys the product as a distraction and protracted meal while the other buys it as a sweet attraction and quick desert.

1.4. Innovating for the Irrational

It seems natural to assume that when people buy a new product, there is a rationale to their behavior that innovators can study and understand. Duke University Professor Dan Ariely, author of *Predictably Irrational*, finds that people display a host of consistent behavioral quirks in how they respond to products and marketing.

In particular, many of the quirks concern how people react to choice. For example, consider choosing whether to be an organ donor or not. Ariely showed that the percentage of people who choose to donate varies widely across nations. Yet when examining these variations, Ariely couldn't find consistent cultural predictors. Seemingly similar countries had divergent percentages and seemingly different countries had similar percentages. The difference that accounted for most of the variance amounted to a single word on the organ donation form. If the person had to check off the box to say "yes" they would be a donor, then the percentage of organ donors was low. If the person had to check-off the box to say "no" they would not be a donor, then the percentage of organ donors was high. In sort, people tend not to check off the box, regardless of whether that inaction commits them to donating an organ. This research, and other research, show that the default (do nothing) option is most preferred.

When faced with three choices, other curious irrationalities appear. Ariely gave the example of a three-choice offer provided by the *Economist* magazine: 1) a online subscription for \$59; 2) a print subscription for \$125; or 3) a combined print + online subscription for \$125. On one hand, no one picks option #2 because #3 is clearly superior in providing the online edition for no extra cost. On the other hand, deciding between the low-cost option #1 and high cost options #2 and #3 is not so easy but about 84% of people pick #3 and 16% pick #1. But what happens if we take away the never-chosen option #2 and rerun the test. This time only 32% pick the high cost print+online choice and 68% pick the cheaper option. Given three choices and an easy decision between two of the choices and a harder decision with respect to the third, people make the easy choice and forego making the hard choice. The fact that one option is clearly superior to another clouds our comparison of the good choice in the pair versus a third, harder-to-compare choice.

Large numbers of choices result in another pattern of irrational behavior. Consider a jam tasting booth at grocery store. What happens if the tasting booth offers six flavors of jams or if it offers 24 flavors of jams? More people visit the booth offering the bonanza of jams. But, do people buy more when offered more choice? In fact, they don't. If offered 24 choices, only 3% of people buy a jar. If offered 6 choices, fully 30% of people buy a jar. This and other research shows that an excessive amount of choice creates regrets and paralysis.

The point is that if innovation is about creating new choices for customers, then companies need to understand customers' irrational reactions to choice. Default choices, obvious asymmetries in choices, and excessive choices all affect people's behavior and the ultimate pattern of choice adoption.

1.5. GlaxoSmithKline's Innovation: An Emotional Talisman

One major dimension of predictably irrational behavior concerns emotional responses that augment or forestall product adoption. Products that fulfill a rational purpose can fail if they don't address emotional needs. At the World Innovation Forum, Donna Sturgess, Global Head of Innovation at GlaxoSmithKline Consumer Healthcare, described some of the innovations behind Alli, an over-the-counter weight-loss drug which can help people lose 50% more weight. The heart of the innovation lies beyond the physical chemistry of the medication (which blocks the absorption of fat) because the medication does no good if it's not taken at mealtime. Instead, the real innovation of Alli is in the emotional chemistry of the small blue pill carrier called the Shuttle, which encourages customers to stay on their diet.

Alli faces two significant challenges. First, the pharmaceutical performance of a medication means nothing if patients don't take the drug. Compliance could be a issue with Alli because it needs to be taken with meals, including meals eaten outside the home. That means people need to carry their pills with them.

Second, dieting comes with strong emotional issues. Dieters run a gauntlet of body self-image issues, willpower, fear of failure, and cravings as they attempt to achieve their goals. Sturgess cited data that emotional issues affect 85% of all decisions. Products that perform a rational purpose can fail if they don't address emotional needs and wants.

To provide emotional support, GlaxoSmithKline designed the Shuttle to be both discrete and distinctive. The calming blue pill carrier looks like a contact lens case. The linear-arrangement of three smooth lobes fits comfortably in the hand. GlaxoSmithKline gave the Shuttle a smooth texture, like a worry-stone. The company intentionally left off any brand markings or names to avoid customer embarrassment — only fellow Alli users know what the little blue case means. The point is that the Shuttle is more than just a functional accessory: it's a emotional talisman to support dieting.

2. THEME 2: FUTURE TRENDS IN INNOVATION

The second theme that emerged from the World Innovation Forum concerns the temporal dynamics of innovation. In particular, the adoption of innovation over time includes some characteristic features that are often modeled by an S-curve. Adoption of radical innovation is generally slower than innovators might like, and it often involves new populations. Understanding the future adoption of innovation means learning to look for the signs that people's expectations are changing and that new ideas are about to reach critical mass.

2.1. Signs of the Future

At the *Cultivating Intuition: Effective Forecasting in the Face of Rapid Change* workshop preceding the World Innovation Forum, forecaster Paul Saffo described how to watch for signs of the future. In 1991, as he and his newlywed bride were driving to Mendocino County for their honeymoon, he saw a new road sign that was so intriguing that he turned around, drove back, and took a photograph of it while his exasperated bride waited. The sign simply read, "End Emergency Call Boxes." But the sign told Saffo of both the near-term future and the long-term future. First, the literal interpretation of the sign told Saffo that he and his wife were on their own. If they had any problems, they couldn't expect to quickly reach the authorities for help. Yet fear of being incommunicado was not why Saffo stopped at the sign.

Second, and more crucially, the sign indicated to Saffo that people's expectations had changed. Why would the California Highway Department think that such a sign was needed? Prior to the 1990s, no one expected to be in constant communication. But now, the advent of the solar-powered call boxes meant that people expected more.

The sign was part of a series of long-term changes in communications. Only a couple of years later, the sign was gone because the call boxes extended all the way to the Canadian border. Low-cost communications enabled almost-universal coverage. About a decade later, the call boxes themselves were gone because everyone had cell phones. Yet that sign triggered Saffo's thinking about communications and how changing technology led to changing expectations and future changes in technology.

Saffo also recommended paying close attention to repeated failures of new product and service ideas. These failures often signal new veins of innovation that are still in the flat part of the S-curve. Innovators often overestimate the short-term adoption of their inventions and underestimate the long-term impact. A variety of social, technological, and infrastructural factors conspire to limit early adoption of radically new ideas. Thus, the early versions of an innovation often fail. The presence of multiple failures over the years suggests that a succession of visionaries saw great promise in that idea even if the world did not yet share that vision. Saffo suggested it takes 20 years to create an overnight success.

2.2. Jumping to the Next Level with Nonlinear Change

Whereas Saffo discussed the dynamics of the early part of the S-curve, Dartmouth professor Vijay Govindarajan presented a useful analogy for thinking about jumping from the mature top of one S-curve to the performance ramp of the next S-curve. Govindarajan used the analogy of Olympic high-jumping to illustrate the non-linear thinking that companies need to make to create radical innovations. The traditional approach to high-jumping until 1920 was the "scissors" approach: jumping over the bar with a scissoring motion similar to what is used by hurdlers. The highest jump possible was about 5' 3".

The best approach to jumping higher, however, is to identify the *limiting factor* in the jump. For high-jumping, the limiting factor is the jumper's configuration of body parts relative to their center of gravity and to the bar. In the 1920s, the innovation called the "western roll" changed the jumping style from a hurdling over the bar with a scissors kick to rolling over the bar sideways with the jumper's back to the bar. In the 1960s, the innovation of the straddle changed the center of gravity even further with the jumpers keeping their belly to the bar. And in 1968 the Fosbury flop (invented by Dick Fosbury) changed the motion yet again: jumpers launch themselves straight up into the air using both feet, and then they twist over the bar so that the head clears first.

The challenge for organizations: you can't win by incrementally improving the incumbent scissors kick if your competitors are inventing the western roll or the Fosbury flop. Radical innovations require removing or changing the limiting factor. This often means breaking old assumptions. Prior to the Fosbury flop, all high jump techniques assumed that jumpers go feet-first over the bar and land on their feet. Fosbury jumped head first over the bar to flop on the mat and thereby extended the possible jumping height to over 8 feet.

2.3. The Innovator's Emerging Market Opportunity

Adoption of radical innovations may occur in new locations or among a new, previously non-consumer population. The future of solar power may be in the markets of Mongolia rather than in the high-tech companies of Western countries, according to Clayton Christensen

Christensen's recent visit to Mongolia led him to this view. In Mongolia's capital, Ulan Bator, Christensen saw a very popular product in local markets: cheap solar panels attached to small portable TVs. Rural herders were buying these solar-powered products, and they were buying the products without needing government inducements to do so.

In the West, solar power competes with established power grids. As a result, solar has been seven years away from cost-competitive performance for 35 years. Solar still costs too much and needs government support (grants, subsidies or tax breaks) to create even the current low levels of adoption.

Adoption of solar power is low in the West because solar power competes with anytime/everytime electricity from 24-hour power plants and ubiquitous power grids. Sunlight, in contrast, is sporadic.

For Mongolians, the imperfections of solar aren't a problem because the alternative is either no electricity at all or expensive disposable batteries. Almost one-third (32%) of Mongolians still live an off-grid, semi-nomadic life style. They move their collapsible, felt-lined homes to follow their flocks of goats, sheep, yaks, horses, and camels across the high plateau of Asia. Mongolians don't expect flip-of-the-switch power for air-conditioners, hair dryers, or halogen mood lighting. Untold hundreds of millions live without power in Asia and Africa.

Christensen's evidence suggests that solar power has the greatest opportunity to shine where it faces no preexisting electrical infrastructure. The rise of solar power may come from expanding the total base of electricity users, not from replacing one highly-optimized incumbent electrical system with another emerging innovation. For emerging technologies, emerging markets can be a key because they represent large populations of non-consumers for which the new idea needs to out-compete nothing.

The larger point is that Mongolia symbolizes a larger market of non-consumers with different needs and different requirements. Many companies have used this strategy to good effect. Christensen cited the example of the transistor, which initially could not compete against the well-established vacuum tube in the large household consumer electronics. Transistors found their first widespread use in portable radios bought by teenagers — a new application and a new consumer population. Similarly, Govindarajan cited the example of Tata's Nano low-cost car, which competes with 2-wheelers in India. Sometimes, an innovative product that can't compete head-to-head with incumbents may nonetheless be vastly superior to the alternative of "nothing" in the population of non-consumers.

3. THEME 3: A BIOLOGICAL FUTURE

Biological metaphors were a recurrent theme across the conference on three levels. Biology can be a source of innovation, a metaphor for innovation-related business thinking, and the core of a long-term goal for sustainable economic performance. Various speakers and examples illustrate each of these three connections between biology and innovation.

3.1. Biology as a Source of Innovation

Paul Saffo traced the history of innovation in terms of a series of S-curves in which a particular scientific discipline provided a fount of ideas for an era of innovation. Chemistry, physics, electronics, and information defined respective multi-decade periods for technological innovation. These patterns occur over very long timescales — a given major innovation may take more than 20 years to progress from the time of first invention to the ramp of the S-curve of adoption. Saffo suggested that biology is part of the current and coming wave of innovation. Three examples from the conference illustrate this.

First, the declining cost of bioscience tools, such as genetic assays, provides a new basis for innovative products and service. 23andMe exemplifies this trend with a service that gives individuals information about their personal genetic make-up. A customer submits a saliva sample to the company,

the company analyzes the DNA of the person for a host of common genetic variations, and the customer can then learn about the likely implications of those variations. These implications include likely ancestry, predilection to various diseases, and sensitivities to various drugs. The company also provides forums where genetically like-minded people can converse. Finally, 23andMe aggregates data on genetic variations to enable new lines of research. In particular, personalized medicine could change which drugs people take, and it could affect which drugs make it to the market. For example, Vioxx was pulled from the market when further research showed that some people had a higher risk of heart attack when using the drug. Yet many Vioxx users were very disappointed by the removal of the medicine. If genetic testing can identify which consumers would respond well to a drug and those which might react poorly to a drug, then many more drugs could be safely used with reduced costs from side effects.

Second, biology will also provide the basis for new physical product innovations. For example, Paul Saffo described how gecko lizards have an amazing non-toxic, reusable adhesive that enables them to climb walls and cling to ceilings. Rather than using a fragile, gooey chemical, gecko toes have large arrays of microscopic hairs that cling to any and every surface through the weak forces between the atoms in the hairs and the atoms of the surface. Advances in materials enable scientists and engineers to replicate gecko toe structures to create new innovative materials modeled on the results of millions of years of evolution.

Third, people are manipulating biological systems to mass-produce desirable materials ranging from medicine to gasoline. Saffo used an eBay listing for a thermocycler to illustrate how dramatically costs of such devices are declining. The low prices and increasing availability of genetic engineering tools to make them affordable to hobbyists, small business, and corporate innovators. The range of applications to which people have put the new technology is wide. Some people have used the technology to create glow-in-the-dark rabbits, while others are looking to create zero carbon-footprint fuel sources. Fred Krupp of the Environment Defense Fund presented examples of companies such as Amyris Biotechnologies and Verenium, which are pursuing clever modifications of yeast and biological enzymes to enable the efficient conversion of sugars or waste plant material (e.g., the inedible leftover sugar cane stalks) into ethanol, gasoline, or diesel fuel.

3.2. Biology as Metaphor for Non-Biological Systems

Other presenters saw biological systems as very useful metaphors for understanding non-biological systems. For example, C.K. Prahalad suggested that thinking about the value chain as an ecosystem allows managers to consider the web of relationships and the exchange of resources. With an ecosystem model in mind, managers can co-create value with suppliers and customers. For example, Medtronic Carelink combines Medtronic implantable pacemakers with wireless telemetry systems and a network of third-party healthcare providers to provide round-the-clock monitoring and care. In recognizing that the value is in the ecosystem, rather than in the isolated individuals, companies can provide more comprehensive service.

Clayton Christensen noted that the patterns of biological evolution explain why change is so hard for organizations and why some organizations do manage to change. The key insight is that in Darwinian evolution, the *individuals* do not evolve. Instead, *populations* evolve as new mutant individuals arise, compete, and overturn the incumbents when and if the mutant can thrive. Similarly, companies find it hard to evolve as individuals. Yet some companies can evolve by thinking of themselves as a population and intentionally spawning individual internal divisions. For example, IBM did this several times in its history by spawning mutant divisions within itself and allowing those mutants to thrive and overtake aging incumbent divisions of the company. Whereas many mainframe computer makers died when minicomputers arose, IBM joined that technology shift by creating its own minicomputer division far from the incumbent corporate headquarters. And when desktop computers arose, IBM again joined the technology shift by creating its own PC division far from the incumbent corporate headquarters.

3.3. Biological Ecosystem Integrity as a Determinant of Economic Futures

Rising awareness of climate change and competition for natural resources mean that economic and commercial leaders are paying more attention to biological systems. Ecosystem integrity will be a key determinant of economic future. Disruptions to food and water supplies would lead to disruptions in most other economic activities. Thus, many companies, such as those that joined the United States Climate Action Partnership, are bringing notions of sustainability to business strategy and considering the use of innovation to either improve their own sustainability or to generate new business by offering sustainability-augmenting products or services.

Fred Krupp, leader of the Environmental Defense Fund, described how cap-and-trade will spur multiple dimensions of innovation around reducing the carbon footprints of many industries. Cap-and-trade is a regulatory regime in which carbon emitters must buy emission permits at market prices. Krupp cited the sulfur dioxide cap-and-trade system that reduced emissions by 50% while costing 1/8 as much as universal mandates would have cost.

Most crucially, two features that cap-and-trade regulations don't include make the regulations more likely to succeed. First, the regulations say nothing about the means of reductions, only the amount of reductions. Thus any company can innovate to create new means of reducing their own carbon emissions or the emissions of others. Rather than pick a few winning technologies now, cap-and-trade provides long-term financial incentives for R&D into future methods of cost-effective reductions in greenhouse gas emissions.

Second, the regulations do not specify that every company or every industry must reduce emissions by some amount. Instead, the permit system only defines economy-wide reductions. This regulation encourages the transfer of permits from companies or industries that can easily reduce emissions to those that can't reduce emissions so readily. Moreover, by encouraging the buying and selling of permits, companies that do emit will face a market price for those emissions tied to the highest-possible economic value of emissions and the lowest-possible incremental costs of reducing emissions. Companies that can easily curtail emissions will find it profitable to do so. Cap-and-trade encourages all participants to innovate around the cost-benefit trade-offs.

Many innovations will come in new green energy methods such as the low-cost solar panels described by Christensen or the geothermal methods employed at the Chena Hot Springs Resort in Alaska. Krupp echoed President Obama's statements about the rise of new green-collar jobs. Old rust-belt steel workers and auto workers will be on the forefront of creating green energy products and sustainable transportation systems. The point is that sustainability offers a large range of opportunities for innovation.



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