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Constraints, Innovation and  
Competitive Advantage

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> ILLUSTRATION BY JOSH COCHRAN

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# Necessity Breeds Opportunity:

## Constraints, Innovation and Competitive Advantage

BY ATANU CHAUDHURI > CRAIG GIFFI > KUMAR KANDASWAMI  
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ILLUSTRATION BY JOSH COCHRAN

WHEN TATA MOTORS RELEASED THE WORLD'S CHEAPEST CAR, THE US\$2500 NANO, THEY SURPRISED SKEPTICS WHO DOUBTED THAT SUCH AN INNOVATION COULD COME OUT OF INDIA, A COUNTRY KNOWN MORE FOR ITS FEEBLE INFRASTRUCTURE THAN FOR ITS MANUFACTURING-FRIENDLY ENVIRONMENT. POWER SHORTAGES, POORLY MAINTAINED ROADS, DIFFICULTIES IN MANAGING SUPPLIERS, AND A HOST OF OTHER CONSTRAINTS CONTRIBUTE TO A COMMON BELIEF AMONG MULTINATIONAL COMPANIES (MNCs) THAT SETTING UP SHOP IN EMERGING MARKETS SUCH AS INDIA IS RISKY BUSINESS.

Typically, companies respond to these constraints in one of two ways. The first is to postpone engaging with these emerging markets until they look more like their developed counterparts. This “wait-and-see” strategy comes with an obvious drawback: competitors might establish themselves in these markets and create barriers for new entrants. Moreover, there is no guarantee that these economies will evolve to look the same way as the now-developed economies, so the wait-and-see strategy may be self-defeating in the long run. The second option is to ascertain how other companies have succeeded in these markets and learn from their best practices. Call it Darwinian, but companies can gain competitive advantage by exploiting the very constraints that others find daunting.

The quest for competitive advantage drives companies to increase both efficiency and responsiveness to customers, but there is a trade-off between the two. Improving responsiveness to customers entails higher inventory, distributed warehousing, and multiple transportation channels that raise costs and compromise efficiency. Companies find this balance harder to achieve in emerging markets because of constraints in the external environment like infrastructural bottlenecks and talent shortages.

This doesn't mean a balance between efficiency and responsiveness is unattainable. Toyota, among other things, is a classic example of thriving amidst external constraints through its ability to overcome both high fuel prices and paucity of space in its home market. Instead of building large and fast cars, Toyota improved efficiency through the world-class Toyota Production System and designed products that recognized customers' needs by developing small, inexpensive, fuel-efficient cars. The automaker was ultimately rewarded with success in the North American market during the oil crisis of the mid-1970s.<sup>1</sup>

Tata's success, which is supported by a growing body of work, suggests that companies operating in emerging markets can capitalize on institutional voids in these economies.<sup>2</sup> Toyota, by extension, demonstrates how these innovative strategies can be extended globally in the long run. In this article, we look at ways companies can drive innovation to address external constraints and sidestep trade-offs between efficiency and responsiveness.

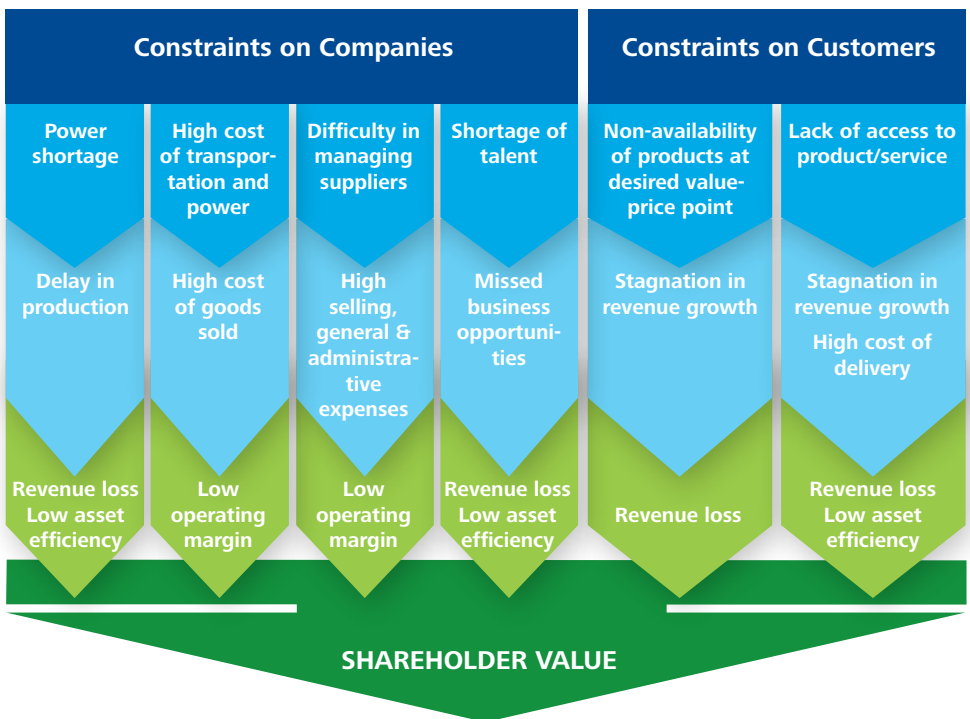
## A BETTER UNDERSTANDING OF CONSTRAINTS

When companies fail in the Indian market, they often blame their difficulties on either external constraints like power shortages, high costs of transportation, and talent shortages that affect their operations, or on issues stemming from poor access to products and services that affect their customers. Figure 1 shows how a set of constraints can compromise shareholder value. Mapping

constraints to shareholder value can help companies analyze past performance and understand why they fail to achieve business objectives.

Given these constraints, companies believe they can achieve process efficiency only at the expense of customer responsiveness, and vice versa, so they design their improvements accordingly. For example, enhanced service offerings might come at a higher price to their customers. Thus, MNCs that try to replicate their global practices in emerging markets find their efficiency limited by external constraints, so they're left to serve only premium customers.

Figure 1: Constraints can derail the growth plans of a company



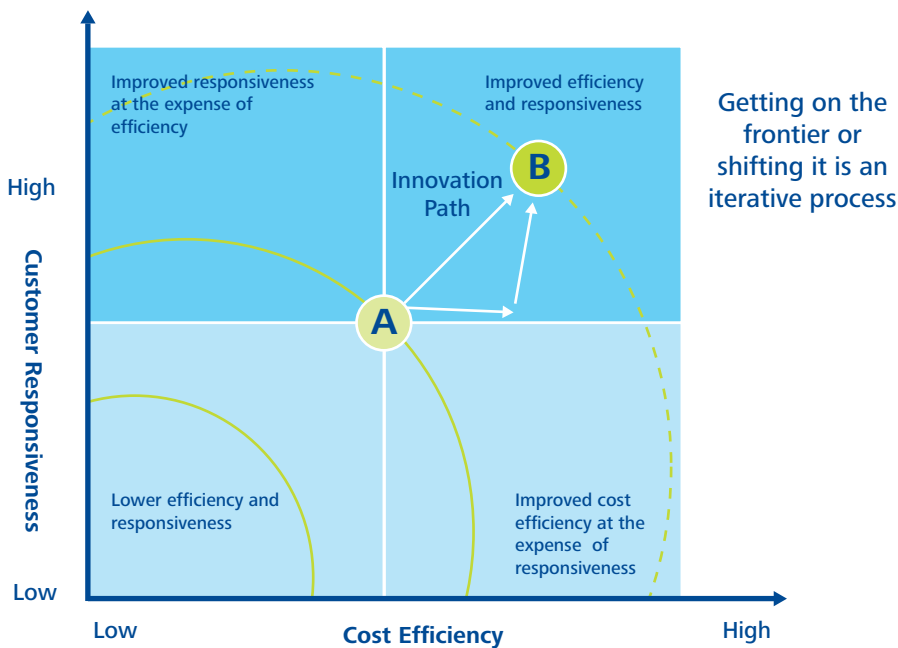
However, in an emerging market like India, companies targeting only premium customers lose the opportunity to serve a larger customer segment that wants more for their money. In the first decade of its presence in India, Samsung Consumer Electronics, the Korean electronics giant, consciously developed a premium positioning with products that emphasized design, aesthetics and cutting-edge technology at prices that were commensurately higher. But focusing on the premium segment only brings in so much revenue, especially in a market like India with its enormous mass market. Samsung Consumer Electronics' new strategy in India, therefore, is to boost volume growth by gaining greater mass appeal through product innovation. "We are providing superior technology and differentiated products even for the mass market. We are aiming at market leadership not only in the

premium category of products but also mass categories like flat televisions,” said Ravinder Zutshi, Samsung India deputy managing director.<sup>3</sup>

While companies assume there is necessarily a trade-off between efficiency and responsiveness in a constrained environment, research shows that only those organizations operating near the performance frontier (the optimal performance a company can achieve) should expect trade-offs (see figure 2). The companies that operate away from the frontier have the potential to improve both efficiency and responsiveness; the companies that operate at or close to optimal performance levels can strive to shift their frontier through innovation and gain sustainable competitive advantage.<sup>4</sup> For example, let us assume that a company is currently at point A, as shown in figure 2. While moving away from the frontier, it may manage to improve only cost efficiency at the expense of customer responsiveness or vice versa. But by developing innovative processes, products and services, companies can improve both cost efficiency and customer responsiveness and position themselves on a new frontier at point B.

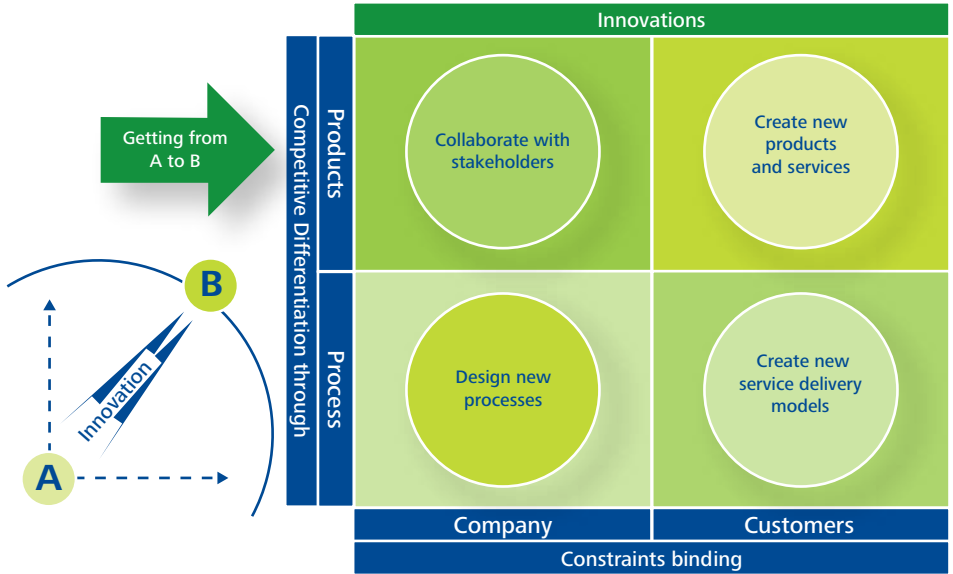
Companies can identify the right approach for innovation by analyzing their constraints, as shown in figure 1, and then identifying unique innovation oppor-

**Figure 2: Innovate to achieve higher levels of efficiency and responsiveness**



tunities to improve both efficiency and responsiveness. Have internal efficiency improvement initiatives failed to build competitive advantage or grow revenues?

Figure 3: Innovating to overcome constraints: a four-pronged approach



Are there customers who want products and services not being supplied by competitors? If the answer to such questions is “yes,” then it is probably time to start paying more attention to external constraints.

Companies essentially have four options when trying to innovate and build a competitive edge, based on whether external constraints affect the company or its customers, and whether the firm can gain an edge over competitors by improving products or processes (see figure 3). Each of these options offers the possibility to move to a new frontier on the efficiency-responsiveness map. If firms manage to cover multiple options in this matrix, they may develop a business model that will be difficult for competitors to replicate.


### DESIGN NEW PROCESSES

Typically, process innovations are seen as an exercise to improve efficiency. However, many Indian companies have achieved both efficiency and responsiveness while reducing their dependence on scarce resources such as power supply and transport. Ambuja Cements, for example, simultaneously reduced transportation costs and improved responsiveness to customers.

For a cement company, the opportunity to gain competitive advantage through differentiated products is, at best, extremely limited, so manufacturers must focus on developing the transportation and logistics process to improve efficiency. Transportation costs account for a significant proportion of any cement manufacturer’s operating expenses. Cement plants are usually located close to limestone mines,

but out-bound transportation costs substantially increase when markets are located far away from the raw material sources. Ambuja Cements viewed these constraints with an eye to reducing transportation costs to improve efficiency while still being near its customers. The solution was found in “split plants”: the initial stages of processing are completed at plants located close to the mines, which trims the weight of the material to be transported. The lightweight material is then sent to grinding and packing plants that are located closer to the market, significantly reducing transportation costs and improving responsiveness to customers.

ALMOST 90 PERCENT OF THE CEMENT IN INDIA TRAVELS IN BAGS BY RAIL OR ROAD. AMBUJA CEMENTS REALIZED THAT THE ONLY WAY TO SPEED UP TRANSPORTATION WAS THROUGH A COMPLETELY DIFFERENT APPROACH. IT BECAME THE FIRST COMPANY IN INDIA TO INTRODUCE BULK CEMENT MOVEMENT BY SEA.



Almost 90 percent of the cement in India travels in bags by rail or road. Ambuja Cements realized that the only way to speed up transportation was through a completely different approach. It became the first company in India to introduce bulk cement movement by sea. Seaborne cement transportation helped Ambuja Cements avoid bottlenecks in road transportation and thus improve efficiency. This innovation also gave it access to many previously untapped coastal markets and made Ambuja India’s largest exporter of cement for the last five years.<sup>5</sup>

#### COLLABORATE WITH STAKEHOLDERS

**T**alent shortages or operational complexities can hinder the creation of new products and services and compromise competitive advantage. To overcome these constraints, companies can collaborate with stakeholders to create innovations that reduce costs and improve customer responsiveness.

Many offshore units of MNCs or domestic companies operating in India find it difficult to attract and retain talent. The concern is that the education system does not produce enough graduates with the right skills (both technical skills as well as soft skills like language). This issue especially worries the software industry, which has seen years of double-digit growth. According to B. Ramalingan Raju, chairman of Satyam Computer Services Ltd., most of the three million graduates in India every year “are uncut diamonds that have to go through polishing factories, as the trade requires only polished stones.”<sup>6</sup>

It is not surprising, therefore, that Satyam, the fourth-largest IT outsourcing



company in India, has decided to train and groom talent in-house to make up for the shortage of engineering graduates with the right skills. Satyam has collaborated with three educational institutions to launch SEED (Satyam Entry-level Engineering Development), which will train 600–800 engineers per year. It has collaborated with the Indian Institute of Science, Bangalore; Indian Institute of Technology, Chennai; Central Institute of Tool Design; and others to help impart training and design curricula for aerospace and mechanical design.<sup>7</sup> By grooming the young educated workforce, the company can avoid the high costs of recruiting



experienced professionals and thereby improve efficiency. Satyam can move up the value chain by providing high-end engineering services to its customers with specially trained professionals.

However, companies cannot hope to operate alone; they have to collaborate with suppliers for certain critical aspects of their operation. This is particularly true of the automobile industry, another high-growth sector in India. For collaboration to result in timely and quality delivery, suppliers must have certain capabilities. To create these capabilities, automobile companies work closely with their suppliers to develop products and processes. As shown by Mahindra and Mahindra, close collaboration with suppliers involving joint problem solving and risk sharing reduces the cost of product development and accelerates the process of bringing products to the market. Supplier involvement in value engineering activities during the design stage helps in reducing costs even before the manufacturing process begins.<sup>8</sup> Such collaboration also results in improved designs and facilitates design for manufacturing considerations.<sup>9</sup>

Mahindra and Mahindra developed Scorpio, India's largest-selling SUV, which won three Car of the Year awards in 2003.<sup>10</sup> Integrated Design and Manufacturing, the innovative production process used for designing and producing Scorpio, was based on a cross-functional team that included suppliers.<sup>11</sup> Suppliers catered to every aspect of product development, from design and engineering of systems, through testing and validation, to vendor development and marketing. Suppliers were involved even in assembly plant improvements and in deciding sourcing and engineering locations. (These are the activities that an automotive manufacturer does not usually delegate to suppliers.) Supplier involvement at every stage, including assembly plant improvements, ensured that the US\$120 million project moved from concept to reality and reduced the investment to just one-fifth of what a major automobile manufacturer would have spent on a similar-sized project.

## CREATE NEW PRODUCTS AND MARKETS

When customers face constraints such as inadequate road connectivity or power shortages, or cannot find products at the quality and price points they want, companies can capitalize by creating new products and services. Most companies struggle to develop such innovative products in a cost-effective manner because they try to adapt existing technology or business practices for local markets. Companies that innovate and succeed in breaking the efficiency-responsiveness trade-off can open up hitherto unexplored markets.

IN A WORLD OF SKYROCKETING FUEL PRICES, INCREASING ENVIRONMENTAL CONCERNS, AND LITTLE COMPETITION FROM GLOBAL PLAYERS, TATA'S NANO POWERED WITH MDI'S COMPRESSED-AIR ENGINE CAN POTENTIALLY BRING ABOUT SWEEPING CHANGES IN THE AUTOMOBILE INDUSTRY, NOT JUST IN EMERGING MARKETS LIKE INDIA BUT IN GLOBAL MARKETS.



Manoj Upadhyay, founder of the US\$500 million Acme Tele Power considers India “a land of problems and therefore a land of business opportunities.”<sup>12</sup> Telecom service providers in India need to install sensitive electronic telecom equipment every 10–20 kilometers, but they were constrained by inadequate and fluctuating power outside the metropolitan areas. In 2003, Acme, a five-man engineering consultancy firm, developed a power interface unit (PIU) that worked on an electronic chip, unlike traditional voltage stabilizers that ran on motors. Acme’s innovative product helped improve power correction, which resulted in power savings of 20 percent. Airtel instantly adopted the technology. Currently Acme’s PIUs are installed at about 50,000 base stations of various telecom companies. Acme uses a service-driven business model — charging for power used and the costs of running the sites instead of products. Thus, by recognizing the power constraint faced by customers as an opportunity, Acme was able to come out with a simple, innovative product that met customer needs at a lower cost.

Some MNCs have also started converting the unique needs of Indian customers into innovative products and technology. Honeywell Technology Solutions Lab is working on innovative products such as a device to control electricity losses and a cost-effective sensor that can help farmers select the right crop for a soil type by measuring the water content in the soil.<sup>13</sup> Such products, while conceived for India and emerging markets, can also create new opportunities in the developed world.

## DEVELOP NEW SERVICE DELIVERY MODELS

When customers face constraints in accessing goods and services, there could be opportunities to create new service delivery models. Hindustan Unilever, for example, markets its products through rural women and local people who travel door to door on bicycle.

One of the most innovative approaches, devised by the Indian Tobacco Company (ITC), uses the same channel to source raw material from farmers and market goods at a low cost. Historically, in the Indian agricultural market, middle-

men gave credit to farmers, sold them raw material like seeds and fertilizer, and bought their output to be sold in the market. This made up for the lack of marketing infrastructure in the rural areas. However, these middlemen extracted large surpluses for themselves, pushing up costs of procurement.

ITC developed a new sourcing channel by unbundling two aspects of the supply chain — information (price discovery) and transaction (weighing and delivery). It set up Information and Communication Technology kiosks to give farmers information related to optimal crop price, grading standards, and the lowest cost of raw material. This has helped farmers break out of the clutches of the middlemen and improve their return on investment. Simultaneously, ITC set up warehousing hubs managed by the erstwhile middlemen, which reduced transaction costs, screened products for quality, and created efficient logistics with clear traceability. The gains in terms of improved efficiency were enormous: the transaction cost of procuring soybeans fell by more than half,<sup>14</sup> and the overall savings were over a million U.S. dollars.<sup>15</sup>

The kiosks also improved ITC's responsiveness to its customers. First, it enhanced the quality of inputs and therefore ensured better quality for its end products. Moreover, ITC was able to customize its products to local tastes. Greater visibility into the supply chain lets it clearly trace the source of the grain. For example, the Aashirvaad brand of whole wheat flour that is sold in the Delhi markets has a different wheat combination from the one sold in the south.<sup>16</sup>

The benefits have proved even broader. The procurement channel, called e-Choupal, has opened up new opportunities for ITC. For example, it is now in a position to use e-Choupal as a retail channel for underserved rural markets. Motorola, for example, is selling mobile phones in rural India through e-Choupals.<sup>17</sup> As the incomes of farmers rise, ITC is in a unique position to exploit this opportunity based on the relationship it has developed with the farmers.



## DEVELOP METRICS TO TRACK EFFICIENCY-RESPONSIVENESS OPPORTUNITIES

Many companies fail to identify opportunities to improve both efficiency and responsiveness because the existing metrics to track business and operational performance do not simultaneously capture how the company is performing on efficiency and responsiveness; some of the existing metrics capture responsiveness while others capture efficiency.

Companies monitor responsiveness at an operational level by using metrics like order-to-delivery time, or at a business level in terms of revenue growth. Similarly, companies use metrics like logistics cost or cost of goods sold as measures of efficiency. But with these separate metrics, companies cannot determine how a particular product, service or a new service delivery model improves both efficiency and responsiveness. There is a need, therefore, to develop company tailored metrics that capture both efficiency and responsiveness.

Figure 4 offers an illustrative list of metrics that can act as indicators to identify and sustain the advantages generated by using a constraint-driven strategy. Efforts to improve energy efficiency, for example, can simultaneously reduce costs and improve yield, quality and productivity. UltraTech Cement's Tadipatri plant has been able to significantly reduce thermal and electrical energy consumption over the years. Equipment breakdowns in process plants decrease production and increase energy consumption when restarting the equipment. Thus, at UltraTech Cements, energy efficiency became a part of its Total Productive Maintenance initiative because improved equipment uptime results in less stoppage, better productivity, and less energy consumption.<sup>18</sup>

More broadly, when targeting a new customer segment, companies may want to compare the addition of revenues against the incremental cost of serving this new segment, as well as the potential losses if this customer segment is ignored. The idea boils down to the age-old maxim: what gets measured gets done. Without suitable metrics to measure performance, companies are likely to struggle in converting constraints into competitive advantage.

## TAKING CONSTRAINT-DRIVEN INNOVATIONS GLOBAL

Process or product innovations developed in response to constraints in local markets may have the potential for application in global markets. While the innovations might have been triggered by local constraints, companies stand to gain in the long run if a solution has the potential to change global practices. It now seems likely that companies operating in emerging markets will reshape the global industry in unexpected ways, just as Japanese companies did in the 1970s.

Consider, for example, Tata Motors in India. As this issue of *Deloitte Review* goes

Figure 4: Metrics to make a constraint-driven strategy work

Process Design	Collaboration	New product and service development	Service Delivery model
<p><b>Energy efficiency</b></p> <p>Increase in throughput/reduction in energy costs</p>	<p><b>Talent acquisition effectiveness</b></p> <p>Revenue earned by employees/(employee acquisition and training cost+ education institute relationship building cost)</p>	<p><b>New customer segment share</b></p> <p>Sales to new customer segments as percentage of total sales</p>	<p><b>Service delivery effectiveness</b></p> <p>Revenue from new service /new service delivery cost</p>
<p><b>Distribution effectiveness</b></p> <p>Increase in revenue due to improved distribution/reduction in distribution costs</p>	<p><b>Product development effectiveness</b></p> <p>Revenue from new product/(cost to develop new product* time to develop new product)</p>	<p><b>Sales effectiveness to new customer segments</b></p> <p>Revenue from new customer segments/ Cost to serve new customer segments</p>	<p><b>New service delivery share</b></p> <p>Revenue from new service channel/Total revenues from the business</p>
		<p><b>New customer segment opportunity cost</b></p> <p>Potential revenue loss by not serving new segments</p>	

to press, the company is planning an innovative distribution model for Tata Nano. Thousands of distribution centers across India will double as assembly units. These distributors will assemble kits of car parts on-site.<sup>19</sup> This model reduces transportation costs when moving its product from the manufacturing site to distributors and increases customization to meet the unique needs of customers in rural and semi-urban India. This distribution model, once in place, can create entry barriers for other automobile companies because it will be difficult to replicate this volume and market penetration.

However, the story does not end here. Company Chairman Ratan Tata increasingly wants to focus on cars that are cheaper to buy and to maintain. Tata Motors is collaborating with France-based Motor Development International (MDI) to develop an air-powered car.<sup>20</sup> The air-powered MiniCat or CitiCat car is designed to run for approximately 125 miles between fueling and will have a maximum speed of around 68 miles per hour. According to MDI, a full charge of air, including the electricity used to compress it, would cost less than US\$3. For greater range, the vehicles could use a “dual energy” system that combines compressed air and a combustible fuel like gasoline. When running under 31 mph in urban areas, the

engine runs only on air. At faster speeds, the engine switches to fuel mode.<sup>21</sup> The light bodies of Compressed Air Technology (CAT) cars are made of glued-together fiberglass and injected foam, and they have passed crash tests. To simplify manufacturing, the aluminum chassis will also be glued together rather than welded. Apart from manufacturing cars based on compressed air technology, Tata is also looking at the feasibility of applying the technology to power generation, as the French company has specified that compressed air technology can be applied to emergency generators.<sup>22</sup> To date, the larger automobile manufacturers have not attempted to adapt an air engine to their vehicles.<sup>23</sup>

The compressed air model demonstrates how Tata Motors is converting external constraints into competitive advantages: its low-cost cars will serve a previously untouched customer segment that couldn't afford cars, thus improving responsiveness. Its innovative assembly/distribution units and the simplified manufacturing method reduce costs and streamline processes, thus improving efficiency. In a world of skyrocketing fuel prices, increasing environmental concerns, and little competition from global players, Tata's Nano powered with MDI's compressed air engine can potentially bring about sweeping changes in the automobile industry, not just in emerging markets like India but in global markets. Other companies should consider its unique strategy as a model for turning constraints into competitive advantage.

#### FROM "NO GO" TO "BON VOYAGE"

**I**nfrastructural bottlenecks and other constraints in emerging markets like India need not stop companies from entering these markets. On the contrary, they present opportunities to experiment with product and process innovations that could help companies benefit from the growth story now unfolding in these markets as well as prepare for an uncertain future. Arguably, had the big U.S. automobile companies decided to design products and processes for the Japanese market in the 1960s and 1970s, they would have had options to compete with the Japanese car makers later. Yet they failed to fully recognize the Japanese threat adequately, and the share of the top three Japanese automakers in the U.S. market went up from under four percent in the early 1960s to nearly 15 percent in 1979<sup>24</sup> and nearly 40 percent in 2008.<sup>25</sup> Innovating to convert constraints into competitive advantage in the now emerging markets can help global companies prepare for future challenges.

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