

P&G Versus Lego Case Study

Rebuilding Lego, Brick by Brick

How a supply chain transformation helped put the beloved toymaker back together again.

by Keith Oliver, Edouard Samakh, and Peter Heckmann

On the surface, the Lego Group didn't look as if it was in trouble. The fourth-largest toymaker in the world at the time (today it is fifth-largest), the Lego Group sold €1 billion (US\$1.35 billion) worth of toys in 2004, ranging from its snap-together bricks for young children to Mindstorms, a line of do-it-yourself robot kits for older kids. Even in the digital age, its toys maintained a surprisingly firm grip on the market and seemed to adapt well to changing tastes. The company's steady stream of new products routinely generated three-quarters of its yearly sales. Popular enthusiasm was so great that in 2000, the British Association of Toy Retailers joined *Fortune* magazine in naming the company's classic bricks "the toy of the century."

But the Lego Group's financial performance told another story. Despite its extraordinary hold on the imagination of children around the world, the Billund, Denmark, company was in trouble. The Lego Group had lost money four out of the seven years from 1998 through 2004. Sales dropped 30 percent in 2003 and 10 percent more in 2004, when profit margins stood at -30 percent. Lego Group executives estimated that the company was destroying €250,000 (\$337,000) in value every day.



Lego art by Sean Kenney
Photographs by Matthew Septimus

How could such a seemingly successful toymaker lose that much money? Some observers speculated that the Lego Group had overdiversified its product line with moves into such areas as apparel and theme parks. Others blamed the exploding popularity of video games or pressure from low-cost producers in China.

Although there was some truth in these hypotheses, many other factors impeded the success of the iconic global brand, including its innovation capabilities and its supply chain. The company leadership knew it had to address those problems, and that the supply chain posed the most immediate opportunity for improvement. The Lego Group's supply chain was at least 10 years out of date. Poor customer service and spotty availability of products were eroding the company's franchise in key markets. Speedy attention to the supply chain, the leaders reasoned, would not only buy them time to deal with the other challenges, but could help set in motion a virtuous circle of improvements that would support subsequent changes in the rest of the company.

And it would address head-on one of the company's most pressing challenges. Having established itself in an era when supply chain management was a matter of moving boxes from here to there, the Lego Group had missed a sea change as retail giants like Wal-Mart and Carrefour gained dominance. The company's supply chain was geared for custom delivery to the smaller retailers that had owned the toy market in the 1950s when its bricks first became popular. For nearly six decades, this way of doing business had served the company very well — and then the system started to fail. In the 1990s, as competitors focused on regearing for the big-box stores, the Lego Group considered its primary challenge to be brand building — despite the fact that its bricks were already among the most recognized toys in the world. By the end of that decade, most of the Lego Group had lost ground to companies that operated with much greater sophistication, companies that analyzed and optimized every cost driver to provide just-in-time service to the behemoths. (U.S. operations were a notable exception to this problem.)

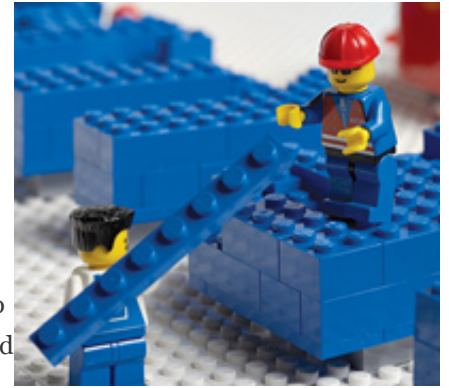
To rebuild profitability, the company had to refashion every aspect of its supply chain. That meant eliminating inefficiencies, aligning its innovation capacity with the market, and re-gearing to compete in the new big-box world. This was no small matter for the Lego Group, which by the time CEO Jorgen Vig Knudstorp took the helm in 2004, had grown to roughly 7,300 employees,

working mostly in two factories and three packaging centers — each in a different country — turning out more than 10,000 permutations of its products packaged in hundreds of configurations.

The company's leadership team recognized that even though transformation would be painful, it was imperative. "From my perspective, the supply chain is a company's circulation system," says Knudstorp. "You have to fix it to keep the blood flowing."

Diagnosing the Problem

The symptoms of a dangerously misaligned supply chain can be deceptive. At the Lego Group, for instance, it took many years of underperformance before the company realized that the supply chain was a major source of its difficulties. What made those problems especially hard to identify was that they grew out of the company's core strengths: its capacity for innovation and its commitment to quality. Those were the very advantages that the company's leaders had relied on at first to reverse the profitless streak, hoping the company could innovate its way out of trouble. From the mid-1990s through 2004, the Lego Group moved into video games, TV programs, and retail stores. But the diversification added layers of complexity, and the red ink continued to flow.



In 2004, the family that had founded and run the Lego Group knew they had to change direction. The then CEO Kjeld Kirk Kristiansen, grandson of the carpenter who had launched the company in 1932 and created the first snap-together Lego bricks in 1949, convened the leadership team to chart a new course. The measures they considered were radical, and to execute them, the Kristiansen family turned to an outsider. Kristiansen had been CEO for 25 years when he stepped aside in October 2004 for Knudstorp, then 34, a onetime management consultant who had joined the company in 2001 as a director of strategic development.

With the mandate for change clear, Knudstorp spent his first weeks as CEO working closely with Kristiansen and the other members of the board and the leadership team to pinpoint the source of the company's problems. Was the Lego Group too diversified? Yes, but focus alone was unlikely to be the silver bullet. Were costs an issue? Absolutely, but they were just one aspect of an array of challenges, including service, so a stand-alone cost play was unlikely to succeed. Had the company lost touch with the video game-obsessed consumer market? That hypothesis withered in the face of a simple fact: Three-quarters of the Lego Group's sales every year were from new, mostly nonelectronic products. "I believe that the focus on electronic competition was really a blame game," Knudstorp says.

Instead, as Knudstorp and his team examined every facet of the company's operations, they came to focus on the supply chain. They approached it holistically, analyzing every aspect of the company's product development, sourcing, manufacturing, and distribution.

Product Development. Given the success of the Lego Group's steady stream of innovative new offerings over the years, the "Kitchen," the company's product development lab, was a point of corporate pride. But the leadership team found that new products were delivering less and less profit. Each successive generation of offerings added more complexity. Plastic bricks and other elements that were once available only in primary colors, plus black and white, now came in more than 100 hues. A far cry from the simple box of bricks that baby boomers grew up with, Lego sets had grown much more elaborate: A pirate kit included eight pirates with 10 types of legs in different attire and positions.

Such intricacy and attention to detail reflected the firm's culture of craftsmanship, but also its disregard for the costs of innovation. The company designers were dreaming up new toys without factoring in the price of materials or the costs of production. That kind of carefree creativity is unsustainable in the current global toy market, where cost pressures are a constant concern.

Furthermore, introducing new products every year is not necessarily a bad thing, but the Lego Group did not align its supply chain with that business strategy. Just 30 products generated 80 percent of sales, while two-thirds of the company's 1,500-plus stock keeping units (SKUs) were items that it no longer manufactured. And the number of SKUs multiplied every year, increasing that backlog.

Sourcing. The Lego Group dealt with an astonishing array of suppliers, more than 11,000 in all. That's nearly twice as many

suppliers as Boeing uses to build its airplanes. The numbers had crept up gradually over the years, as product developers sought new materials. Each engineer had his or her own favorite vendors, and the company's lack of procurement compliance procedures allowed the engineers to form ad hoc relationships with suppliers — a practice that grew more problematic as the group expanded into new businesses.

These sourcing practices led to incredible waste. A new design might call for a unique material, such as a specially colored resin, that sold in three-ton lots. It might take just a few kilos of the substance to produce the new toy, but the company would be stuck with €10,000 (\$13,500) worth of resin it would never need. Ordering so many specialized products at irregular intervals from a large number of vendors left the Lego Group's procurement staff powerless to leverage the company's scale in dealing with suppliers.

Manufacturing. As was the case with sourcing, the Lego Group gained limited advantage from its scale in the way it organized its production facilities. The company ran one of the largest injection-molding operations in the world, with more than 800 machines, in its Danish factory, yet the production teams operated as hundreds of independent toy shops. The teams placed their orders haphazardly and changed them frequently, preventing operations from piecing together a reliable picture of demand needs, supply capabilities, and inventory levels. This murkiness led to overall capacity utilization of just 70 percent.

In such a fragmented system, long-term planning can be exceptionally difficult. Day-to-day operations were often chaotic. Operators routinely responded to last-minute demands, readily implementing costly changeovers. That the Lego Group's production sites were located in such high-cost countries as Denmark, Switzerland, and the United States put the company at a further disadvantage.

Distribution. The Lego Group paid as much attention to the thousands of stores that together generated only one-third of its revenue as it did the 200 larger chains that accounted for the other two-thirds. Without clearly defined service policies, the company spent a disproportionate amount of time and effort serving small shops, which drove up the costs of fulfillment substantially. Sixty-seven percent of all orders consisted of less than a full carton — an incredibly costly proposition that demands labor-intensive “pick-packing” at the distribution center. In addition, to serve its many small customers, the Lego Group had developed a multiple-tier inventory system with local centers; it was very difficult to position the right product in the right distribution center, a challenge that contributed to missed sales and high inventory levels.

Making Change Click

To drive the transformation, Knudstorp gathered a diverse group of senior executives and managers to take a two-track approach. The leadership team developed the strategy, while the larger group of planners and representatives from sales, logistics, IT, and manufacturing coordinated change at the operational level.

The leadership set up a war room where the operational team gathered every day to work out such nitty-gritty decisions as what toys to make, how tasks should be prioritized, and how to deal with obstacles. Team members tracked the progress of key initiatives, resolved bottlenecks as they arose, and settled a variety of issues. Assigning clear responsibility in this way avoided the all-too-human tendency in organizations to point fingers rather than solve problems.

The team drew up hundreds of lists tracking backlogged items, delivery glitches, and inventory levels, among other concerns, on white boards around the room, and at any given time over the next year, 30 to 40 people gathered to hash out plans. Knudstorp would often visit the war room, quizzing managers when he saw that an item had not been resolved since his last visit. “This is still here?” he would ask. The magnitude of the work was so daunting and the pressure to finish by year's end so intense that at one point someone joked that everything would work out just fine, provided they move Christmas to the second week of January.

Despite the urgency, executives paid real attention to detail. They took care to set clear priorities, limit the scope of individual projects, and monitor progress closely. Each team worked out its cross-functional plans through lengthy workshops. The process started with an examination of one aspect of the company's supply chain complexity and an analysis of its impact on productivity, planning, and control. These analytics were particularly useful in framing the case for transformation in the face of expected resistance. Using a hypothesis-driven approach, the team would debate how to change and improve processes. Once they'd agreed



on a plan of attack, the teams would change direction only if the original hypothesis proved faulty — a tactic that team members say kept the whole process on track.

The leadership team also allotted time to consensus building. They knew that management by decree would never work well in a close-knit, family-owned company. The executives understood that, for the initiatives to stand any chance of success, the Lego Group needed to preserve the loyalty of its workforce, even as the move to a more global supply chain did away with many jobs. The most respectful way to navigate through this transition, they reasoned, was to adopt a strategy of complete transparency. The team shared and debated the realities of the situation with the total workforce early in the process and consulted with them throughout in putting together the painful plans to address redundancy. (The Lego Group has also moved its U.S. plants to Mexico in search of labor cost savings and market proximity.) Yet as slow-footed as that process sometimes seemed at the time, working through it had an important benefit: When the teams finally reached a consensus, the decision stuck.

In tandem with the planning and consultative processes, the leadership ordered a pilot program designed to make sourcing more strategic. At its helm they placed Chief Financial Officer Jesper Ovesen — a clear signal that this initiative was of the utmost importance. Ovesen's team believed that rationalizing the cost of the company's materials would be one of the easier parts of the transformation and would yield savings immediately. Not coincidentally, the initiative went right to the heart of the Lego Group's innovation capability: the resins that gave the bricks their distinctive colors. If it succeeded, the pilot would do more than save money. It would demonstrate that the Lego Group really could change.

The price of colored resins, always a major expenditure for the company, was highly volatile. The sourcing team analyzed the prices of the raw materials and worked with a narrowed roster of suppliers to stabilize pricing. The resulting contracts made production much easier to plan. More importantly, the success of the sourcing project created a sense of optimism and the momentum to move ahead with other changes. At each cost center along the supply chain, the transition team applied its new insight: Constraints don't destroy creativity or product excellence, and they can even enhance them.

Indeed, the idea of implementing new constraints could now help the company build on its established strengths. The Lego Group motto is "Only the best is good enough," and the company name derives from the Danish words *Leg godt*, meaning "play well." The drive to innovate was deeply embedded in the corporate culture. In the early years, this idea had helped the company develop its brand and instill pride in its employees. But after a time, it had come to be seen as a mandate to create new toys at any cost. In Knudstorp's view, the perceived mandate had evolved into a crutch. "This idea had become an emotional concept and an excuse to oppose new cost-saving initiatives," he says. "Anytime there was something someone didn't want to do, they would say, 'You cannot do that because of quality.'"

But Mads Nipper, the company's chief of product innovation, worked closely with Bali Padda, who oversees the supply chain, to devise a series of day-to-day solutions to the paradox of constraints. Nipper and Padda recommended slicing the palette of roughly 100 colors in half. They also recommended cutting back on the thousands of different police officers, pirates, and other figures in production. The team took a deliberate approach, building on the resin-sourcing work to analyze the true costs of each element and identify those whose costs were out of line with the rest of the stock. This initiative, coupled with the resin pilot, helped the Lego Group cut its resin costs in half and shrink its supplier roster by 80 percent.

At the same time, the operational team put a process in place to help designers make more cost-effective choices. Team members devised basic rules regarding the creation of new colors and shapes and spelled out the requirements for ordering new materials. They also created a cost matrix, clearly showing the price associated with each change. Once the costs of innovation were clear, designers were urged to use existing elements in new ways, rather than devise new elements requiring new molds and colors. The initiative encouraged the designers to think in terms of price trade-offs when they were developing a new item: Yes, you can give sparkling amber eyes to your new Bionicle space alien action figure, but it may limit your choices on its claws.

Cost transparency gave developers a new way to define their achievement. "The best cooks are not the ones who have all the ingredients in front of them. They're the ones who go into whatever kitchen and work with whatever they have," wrote a senior manager in a memo to the Lego Group's own Kitchen. The designers seemed to take those words to heart. The product development group "initially saw reducing complexity as pure pain," says Knudstorp, "but gradually they realized that what they had seen at first as a new set of constraints could in fact enable them to become even more creative."

The evolution of the design team's thinking reaffirmed for Knudstorp an idea he has long held about the importance of looking at

business issues holistically. “I think one of the big mistakes companies often make in this kind of initiative is approaching the supply chain as one topic, innovation as another, product quality as a third. The better way to think about it is that all these issues are connected,” he says. “Innovation is also a supply chain issue, and sometimes the supply chain can provide ideas for consumer- or customer-driven innovation.”

Approaching the Value Chain Holistically

Cutting the number of elements and colors in production made it easier to take the next step — rationalizing production cycles. The team started by halting the time-honored practice of making every machine available to produce any element, an approach that necessitated constant, costly retooling. Instead, the team assigned specific molds to specific machines, and set up regular four- to 12-week production cycles. The group then deemed that sales and operations would set orders at a regular monthly meeting, reducing the need for constant changeovers.

The leadership team also clarified decision rights to ensure that schedules made sense for the enterprise as a whole. For instance, it would no longer be acceptable to make manual changes in a molding machine without informing the finished-goods packing team, an important consideration since different kits are packaged in different boxes. Clearer descriptions of rights and responsibilities made it more difficult to dodge tough decisions, or to make them without considering their impact on other departments. As a result, the company was able to sidestep many potential production glitches.

The team also considered the manufacturing footprint. The Lego Group had already outsourced 10 percent of its production to Chinese contract manufacturers, but the team decided against sending more work to Asia. Instead, building on its successful experience moving some production to Kladno, Czech Republic, the company concluded that it could actually boost efficiency by locating its factories near its most important markets. A plant in Eastern Europe would get products to European store shelves in three to four days — an important consideration given that Europe accounts for 60 percent of the company’s sales and that 40 percent of sales take place during the Christmas season.

In 2005, the Lego Group began outsourcing the manufacture of its simpler products to a Hungarian facility belonging to Flextronics, a Singapore-based electronics manufacturer. That year the company also expanded its operations in Kladno. Arriving at this point, however, was difficult in two ways: The negotiations were long and difficult, and the impact on the company’s workforce had to be managed with great care. Chief Purchasing Officer Niels Duedahl was tasked with overseeing the process, supported by a team of analysts who built detailed cost models. Their philosophy was to understand their suppliers’ costs better than the suppliers themselves did. This approach would enable the Lego Group’s leaders not just to evaluate the options but also to approach subcontractor proposals armed for negotiation.

The Lego Group also needed to move its distribution channels closer to the customer — and to lower its bloated distribution costs. First, the number of its logistics providers was cut from 26 to three or four — enough to ensure resilience and gain greater economies of scale while still encouraging competition among the suppliers. This step alone saved more than 10 percent in transportation costs. But consolidating logistics providers really just brought the Lego Group in line with what many of its competitors had done years ago. However, the company was able to leapfrog the competition by redesigning its entire distribution system.

Although many companies have taken manufacturing to lower-cost markets and to contract providers, surprisingly few have done the same with distribution, although identical advantages exist. The Lego Group phased out five centers in Denmark, Germany, and France and created a single new center in the Czech Republic, to be operated by DHL. “Putting all your eggs in one basket” might sound like a poor strategy to reduce risk, but consolidated distribution made inventory easier to track and made stock shortages far less likely. It also brought the Lego Group closer to Europe’s largest population centers, decreasing the average distance to market.

With a new value chain in place, the Lego Group could act with the understanding that customers had differentiated needs. The company’s marketing team followed the examples of other consumer packaged-goods manufacturers, working more closely with the largest retailers to conduct joint forecasting, inventory management, and product customization. Those big-box and chain stores that made up the bulk of the Lego Group’s market would receive marketing support as well. The company would continue to deal with smaller sellers, but on more regular and standardized terms. The company further minimized the cost of serving each account by providing discounts for early orders and refusing to ship less-than-full cartons.

The largest Lego Group customers were also invited to participate in product development. Not only would this presumably make the big clients happier, but the retailers' strong forecasting and replenishment technology would give the company marketers access to a greater level of insight into buyer behavior than the company had on its own. The Lego Group would also let these large retailers help make assortment decisions, and sweeten the relationship further by providing some SKUs on an exclusive basis.

Profitable Once More

Thanks in part to its supply chain transformation, the Lego Group is profitable once more. It has saved approximately €50 million (\$67 million) since 2004, and forecasts savings in excess of €100 million (\$135 million) over the next two years. The tremendous gains in efficiency meant that despite the impact of rising oil prices on materials and transportation, stock turnover increased by 12 percent in 2005, and the same year, the Lego Group recorded its first profits — €61 million (\$72 million) — since 2002. This positive trend further continued in 2006, with the Lego Group turnover up by 11 percent over 2005, and profits up by a staggering 240 percent. The Lego Group supply chain is now so advanced that the company is actually “slightly getting ahead of the competition in some parameters,” says Knudstorp.

The gains are more than operational. Knudstorp argues that the supply chain restructuring has had a transformational impact on the company as a whole. Getting the right product to the right place at the right time at the right cost was an important early step in grappling with an array of strategic challenges. “It has allowed us to again focus on developing the business, on innovation, and on developing our organization to become a much more creative place to work,” says Knudstorp. “Those are luxuries we didn’t have when we didn’t make money and we had a supply chain that was 10 to 15 years behind the times.” Now that the Lego Group has rationalized and streamlined its product development, sourcing, manufacturing, and distribution, it can pour its resources into what it does best: making wonderful toys. 

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Editor's Note: The LEGO Group spells its trademarked brand name and its company name in uppercase letters. We have followed standard editorial style for company names that are not acronyms, and capitalized only the first letter.

Also contributing to this article was Booz Allen Hamilton Senior Associate Georgina Grenon.

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Manufacturing Realities Web site: Alternatives to conventional manufacturing practice. [Click here](#).

My Own Creation pages: Independent showcase for Lego artists run by Sean Kenney (whose work is featured on these pages). [Click here](#).

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Lego

The Danish company Lego is one of the most famous brands in the world when it comes to children's toys and has grown since it was founded in 1932 into a global business. Its origins lie with Ole Kirk Christiansen, a carpenter from Billund (where the firm is still based) who bought a woodworking business in 1916 and made furniture for local farmers. For various reasons he shifted his production range in the 1930s to make children's toys and in 1934 named the company 'Lego' from the Danish words *leg* and *godt*, meaning 'play well'.

His early products - wooden pull toys, piggy banks, cars and trucks – were reasonably successful but a key turning point for the business came in the 1940s when they began making plastic toys including a truck which could be taken apart and re-assembled. In 1949 Lego began producing a set of interlocking bricks (based on an original patent by the UK Kiddicraft company for which they bought the rights) made from cellulose acetate and using an early version of a hollow design with holes and studs. The now familiar Lego bricks appeared on the market in 1953 but were not initially very successful, partly due to poor perceptions amongst consumers and retailers of plastic toys.

The key was probably the emergence of the idea of a building system based on interlocking bricks – an idea which took some time to develop and is closely linked to the son of the founder, Godtfred Kirk Christiansen. His discussions with buyers, especially in the USA, helped the idea of an architectural innovation – a product platform on which many different designs could be built – to mature. Much work was needed to improve the design to give better locking ability but gradually the concept became reality and 1958 saw the emergence of the patented basic brick design with which we are still familiar. By 1959 the company had stopped making wooden toys and concentrated solely on plastic bricks and related products. A series of product, process and market innovations – adding wheels, figures, targeting and segmenting different markets, switching from cellulose acetate to acrylonitrile butadiene styrene (ABS) plastic, adding instruction manuals, etc. – helped fuel development such that by 1988 there were over 50 elements in the Lego toy system. The company opened a theme park in 1968 which displayed miniature towns with a variety of features all made from Lego bricks – and which attracted over 600,000 visitors in its first year of operation. The power of the underlying architectural innovation becomes clear in the expansion routes followed – developing simple large bricks ('Duplo') for very young children and sophisticated gears, joints, axles and other materials for older 'Lego Technic' builders – all using the same principles and all interchangeable. Underpinning the physical toys was a growing element of 'storytelling', using home grown stories like medieval knights, pirates or space adventures but also linking into key film themes like 'Star Wars'.

Growth continued throughout the later years of the 20th century with Lego becoming one of the top ten toymakers worldwide, and with a wide range of products standing on their basic platform. The range not only diversified – including train sets, model cars and simple robotics – but also extended the architecture to include control and programmability to support such toys. Storytelling increasingly targeted different segments – for example Belville is a product aimed especially at girls whilst Bionicles introduced complex Technic-based action figures for boys.

It is worth putting the power of the basic architectural/platform innovation in perspective. With just two bricks there are 24 different combinations, and with six there are 915 million possibilities, so the range of options – both designed by Lego but also created by end users – is huge. Estimates suggest that over 400 million children (and a fair number of adults) play with the bricks for around 5 billion 'play hours'. Yet the original design still holds –



apparently bricks made today can still interlock with those made in the first batch of 1958. Not surprisingly *Fortune* magazine named Lego as 'toy of the century' in 1999. However by the late 1990s the company had begun to run into difficulties. In their main product area low cost 'good enough' quality competition was making inroads into their market – a classic example of disruptive innovation similar to the low cost airline revolution. For example a Canadian company, Megabloks, began offering a wide range of competitively priced building toys which rapidly pushed Lego along the shelf space of many stores. At the same time a large section of their traditional market – young boys – was increasingly being drawn away from building models and into the world of computer games. And finally Lego was a global company but based in a high cost economy – Denmark – with resulting pressure on its operations to remain competitive. Its supply chains were long and expensive – at one stage with 11,000 contractors Lego had more suppliers than Boeing used to build its aircraft! And its product development had become increasingly complex, with many product ranges involving such a wide range of choice – for example the Pirate figures had no less than 10 different leg designs, each with its own clothing – that it became difficult to manufacture economically.

The combination of these circumstances saw the company increasingly losing money and market share and the crisis peaked around 2003 with a reported loss of \$240m and fears that the giant Mattel company would take over Lego. The tradition of hands on family management ended with the stepping down of 3rd generation Kjeld Kirk Christiansen and the appointment of a new CEO appointed, Jorgen Vig Knudstorp. His arrival, plus the injection of \$178million from the family, allowed a breathing space within which a turnaround could be effected. The transition – although painful – seems to have worked with the company back in profitability by 2006 and in 2007 turning in its best-ever financial performance. It involved extensive rationalization and cost-cutting in areas like supply chain and factory location, together with a rethink of the product development strategy. For example the number of unique pieces being manufactured in Billund was cut from 12,400 to around 7,000. But it also included extensive learning about new ways of working with users as designers as part of the product innovation approach.

Rethinking the role of users

Users have always been involved in the Lego concept since – as we saw earlier – the potential configuration of even a small number of bricks is huge. People might buy a Lego toy to make a car or house but will quickly adapt it and reassemble the bricks in all sorts of different – and user created – ways. But since 2000 Lego has been on a journey which puts this user-linked approach increasingly at the centre of their strategy.

Early work behind the scenes in improving production efficiency involved building digital models of all the bricks and other components which they made. By having such models it became possible to explore new product options via computer-aided design and to link this to computer-aided manufacturing, helping reduce overall time and cost in manufacturing. But this also opened up an interesting product option in the market-place – customizable toys. An early product was called Lego Mosaic, originally launched in 2000, which allowed users to upload photographs to the company's website. Lego would digitize the picture and calculate the bricks required to make a wall-hanging mosaic with multiple colours.

Mosaic provided an early learning experience which has fed through to an increasing variety of user configurable products in which users can modify or even design from scratch their



own toys. Lego Factory offers this opportunity online – users submit designs and Lego calculate the bricks and other components required and generate the building instructions needed. Alternatively users can use design tools on the site to develop their own ideas and Lego simply acts as a service provider, packaging the relevant pieces and sending them out to the user/designer.

As the following press release indicates, the role of users has become a key element in Lego's innovation strategy:

"August 29, 2005: Celebrating the 50th anniversary of its System of Play, LEGO Group today unveils LEGO Factory, a consumer experience that combines today's hottest kids trends -- technology, mass customization and community -- to enhance and build relevance for its classic toy offering. Beginning today, children of all ages can visit www.LEGOFactory.com to design, share and purchase custom models.

LEGO Factory is powered by LEGO Digital Designer (LDD) -- a proprietary virtual building program available as a free download for PC and MAC users. Drawing upon a virtual warehouse of bricks and elements, children can design 3-D models just like professional LEGO Model Designers. Factory models are micro scale -- smaller than traditional LEGO minifigure proportion (roughly 1:50 life-size) found at retail -- but still provide precise detail and functionality.

LEGO Factory sets arrive in custom packaging that shows a child's model and name, and include all of the LEGO elements needed to build the virtual design in physical form. Every customized LEGO Factory creation will have a unique price dictated by the size of the model and elements used. Custom models will take from 48 hours to a week to arrive, depending on which shipment method consumers choose.

LEGO Factory is also designed to create a community of builders who share their virtual creations with consumers around the world. Children can view other builders' custom creations, add and remove bricks, rotate the 3D view and zoom in on the details, download the building instructions to build from their existing LEGO collection, or even purchase someone else's model for themselves.

"Giving children access to a virtual warehouse of LEGO elements to design their own models is a fantastic extension of everything the LEGO System of Play represents and has provided for the last half century, and marks a rare opportunity for true mass customization and community in today's toy market." says Mark Hansen, director, LEGO Interactive Experiences. "With LEGO Factory we can expand beyond our 100 in-house product designers to marvel at the creativity of more than 300,000 designers worldwide." During its Beta phase, LEGO Group sponsored a contest to better understand the types of models that consumers would design using LDD. The contest lasted for 11 weeks and 8,000 models were custom designed. Ten models were voted by consumers and LEGO Master Model Builders to become real LEGO sets available exclusively through the company's Shop-at-Home division. Contest winners, whose ages ranged from 9 to 38, will receive royalties based on sales of their winning designs. For more information on these winning designs visit <http://www.lego.com/eng/factory/design/bios.asp> .

"It's only fitting as we celebrate 50 years of a classic play pattern in an increasingly electronic toy world that we elevate the experience of building what you imagine by blending the best of both the virtual and physical worlds of play," says Soren Torp Laursen, president, LEGO Systems. "We look deep into our compatible system of play to reinvent ourselves year on year, and we only incorporate technology where meaningful and complimentary to the core LEGO building experience."

Open innovation and user engagement

A second important feature in this learning process has been the opening up of the design process to outsiders. An early product aimed at competing with the growing computer games sector was Mindstorms – a sophisticated Technic-based kit with a programmable brick, various sensors and actuators and a simple user programming language. This allowed users to create a variety of programmable models which would carry out various movements – developing ideas which the company had first explored in the 1990s. The original MIndstorms Robotic Invention System (RIS) product was launched in 1998 and became one of the company's best selling lines – with over 1 million units sold. In 2004 work began on Mindstorms NXT – as the name implies, a new generation – which appeared in 2006.

One of the key limitations of the original Mindstorms was the complexity of the programming language – market research suggested that over 70% of users were in fact adults. So a key element in the design specification for NXT was a simpler programming language. Lego – again using an open innovation approach – commissioned a Texas software firm, National Instruments, to help with this. Users can now use a simple programming language and deploy a wide range of sensors and actuators and link to their PCs or mobile phones – resulting in an impressive range of user-designed sophisticated automated products. (See, for example, a working miniature car factory – Youtube video - <http://uk.youtube.com/watch?v=GQ3AcPEPbHo>).

Significantly Lego discovered early in the life of Mindstorms that a growing number of users were 'hacking' the software and developing applications and extensions to the original code which Lego's team at Billund had produced. Rather than try and control or restrict this activity Lego adopted an 'open innovation' approach, recognizing that 'not all the smart guys work for us'. They also recognized that limiting creativity was contrary to its mission of encouraging exploration and ingenuity. As Vice President Mads Nipper commented, *"We came to understand that this is a great way to make the product more exciting It's a totally different business paradigm - although they don't get paid for it, they enhance the experience you can have with the basic Mindstorms set."* By Identifying key developers and then engaging their interest – for example by making available source code, running competitions, even putting a "right to hack" into the Mindstorms software license, – Lego were able to gain considerable leverage on the original design. A growing user community began setting up websites, over 40 'recipe' books were produced and all sorts of hardware and software add-ons were developed.

When it came to developing NXT Lego set up a Mindstorms User Panel, recruiting key developers in secrecy to work with them from the earliest stages. From 20 of the 'top' external developers Lego eventually identified four key players who formed the MUP. An important aspect of such involvement – typical of 'lead user behaviour' – is that it is not driven by financial reward but rather from intrinsic interest and involvement. For their participation, MUP members received some Lego sets and Mindstorms NXT prototypes; they even paid their own airfares to Denmark! As one of the team commented, *"They're going to talk to us about Legos, and they're going to pay us with Legos?..... They actually want our opinion?" It doesn't get much better than that."*

As a consequence of this successful experience Lego announced that they are seeking 100 'citizen developers' to work with them on the NXT project and beyond.(Koerner 2006).

This experienced was reflected across other communities. For example, Lego had been producing train sets since the 1960s but had come to a decision to axe this model as part of their rationalization plans in 2004. The response from the community was strong and



highlighted to Lego that there was an important community of users – hobbyists – who had not only bought the original trains but then created their own designs and modifications. In a similar process to that with Mindstorms Lego began to identify key users and designers and encouraged them to contribute their design ideas. The result was that a group of 20 ‘lead users’ created 76 new product designs which Lego were able to produce and sell.

Lego Universe – the next stage?

The process of identifying and working with an increasingly wide range of users and communities has transformed part of Lego’s business. It still makes bricks and toys designed and sold in the ‘traditional’ fashion. But in parallel a new business has grown which engages users at the front end of innovation, designing and co-creating their own products. Importantly designs by one user might be attractive to others and so it is not simply a version of ‘vanity publishing’ but an interesting extension of design and marketing into the open source world. In adopting an open approach Lego has managed to bring users into its world – rather than have a growing body of users designing and exchanging ideas outside – for example there is a vibrant independent Lego User Network called LUGNET.

The latest development brings several of these strands together. Lego Universe is designed as a Massive Multiplayer Online Game (MMOG) like ‘World of Warcraft’ and others. But the difference is that the characters and creatures in Lego Universe are digital models created by the children who play in the game. Since – through projects like Lego Factory – Lego knows how to create custom toys to user designs it is now possible to have not only your own digital character playing in a virtual game but also to have its physical representation to play with in the physical world. In this process Lego unites its storytelling tradition with its brick-making and platform advantages but allows the creativity and imagination of its users to shape the real and virtual elements in the game. (See www.lego.com for more details).

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THE CORPORATION

Why P&G's Smile Is So Bright

With the fast-growing SpinBrush, the company bent its own rules--and won

Darin S. Yates had watched many consumer focus groups at Procter & Gamble Co. (PG), but he had never witnessed a response like this. Out of a panel of 24 consumers evaluating a new electric toothbrush, 23 raved about the product, begging to take it home. "We were just blown away," the 36-year-old brand manager recalls.

But Yates, team leader on the new toothbrush, never imagined how successful the Crest SpinBrush would be. While most electric brushes cost more than \$50, SpinBrush works on batteries and sells for just \$5. Since that focus group in October, 2000, it has become the nation's best-selling toothbrush, manual or electric. In P&G's last fiscal year, it posted more than \$200 million in global sales, helping Crest become the consumer-product maker's 12th billion-dollar brand. It has also helped Crest reclaim the title as No. 1 oral-care brand in the U.S., a position it lost to Colgate-Palmolive's Colgate brand in 1998. "It's hard for P&G's business models to conceive of a business growing as quickly as SpinBrush," Yates says.

One reason is that P&G didn't conceive SpinBrush to begin with. Four Cleveland-area entrepreneurs developed the gizmo in 1998 with the idea of selling it to P&G. They parlayed a \$1.5 million investment into a \$475 million payout. Three of them even went on the P&G payroll for a year and a half to shepherd the product--something unheard of at the insular company. Says John Osher, the lead entrepreneur behind SpinBrush: "My job was to not allow P&G to screw it up."

SpinBrush marks a dramatic departure for the 165-year-old company. For once, P&G didn't insist on controlling every step, from product development to pricing. Instead, it harnessed its greatest strength--the ability to market and distribute products--to the innovation and risk-taking ability of a tiny startup that wasn't constrained by the culture inside P&G's Cincinnati headquarters. The strategy is not without risks or cultural challenges. P&G had to bend on how it packaged, manufactured,



shipped, and worked its mighty marketing machine. And the story isn't over: The SpinBrush founders question if the product will reach its potential once it is fully enveloped in P&G's big-company culture. "I'm not sure you can teach an elephant to dance," Osher says.

Even so, the acquisition of SpinBrush says a lot about the leadership of Alan G. Lafley, who became chief executive in June, 2000, when predecessor Durk I. Jager was ousted. Jager, a combative change agent, had pushed P&G to ramp up development of new products. He shook P&G's identity with proposals to buy two large pharmaceutical companies. In the end he overreached, missing earnings forecasts.

Lafley has been more deft. He has refocused the company on the big brands that drive earnings, including Pampers, Tide, and Crest. Like Jager, he has made acquisitions. But the \$4.9 billion purchase of Clairol, P&G's largest ever, and SpinBrush have been closer to P&G's core strengths in hair and oral care than Jager's forays with Iams pet food and PUR water-filter systems.

Those moves have helped Lafley find a balance between sales and profit growth--something that eluded his predecessor. P&G has exceeded Wall Street's earnings estimates in the last three reported quarters, while at the same time increasing share in its markets through higher promotional and ad spending. For the fiscal year ended June 30, analysts expect P&G's operating earnings to climb 9% to \$5 billion, reversing a prior-year decline. Such gains will get harder, though, as savings from a \$6 billion restructuring started under Jager start to wind down.

Still, Lafley is proving to be a radical strategic thinker by P&G standards. When Kimberly-Clark Corp. launched a moist toilet paper last year, he went against P&G's make-it-here mentality by acquiring a manufacturer of a similar product. That let him parry Kimberly more quickly and tied up less money in the capital-intensive business. Recent negotiations to outsource P&G's 6,000-employee, back-office operations would also have been unlikely at the old P&G. The move reflects Lafley's efforts to focus the company on its core strengths and suggests further payroll cuts ahead.

The SpinBrush saga also shows a new recognition that not all great ideas originate at P&G. Lafley has made clear that as many as a third of P&G's new product ideas may come from outside, and he has stepped up efforts to identify and acquire other small companies. But perhaps the biggest change for P&G was in SpinBrush's pricing. P&G usually prices its goods at a premium, based on the cost of technology. But competitors now follow new products more quickly, eroding P&G's pricing power. With SpinBrush, P&G reversed its usual thinking. It started with an aggressive price, then found a way to make a profit. If P&G had conceived SpinBrush, admits Yates, "my gut tells me we would not have priced it where we did."

That's just the opportunity John Osher and his three colleagues saw when they had the SpinBrush brainstorm back in 1998. Osher, 55, had spent most of his career inventing things and selling them to big companies. His latest creation had been the Spin Pop, a lollipop attached to a battery-powered plastic handle, in which the candy spun at the press of a button. He had teamed up on the Spin Pop with John R. Nottingham and John W. Spirk, the principals of a Cleveland

industrial design firm, and their in-house patent lawyer, Lawrence A. Blaustein. The Spin Pop had recently sold to Hasbro for millions and the men were looking for another way to utilize the technology.

They can't remember who came up with the concept, but they know it came from their group walks through the aisles of their local Wal-Mart, where they went for inspiration. They saw that electric toothbrushes, from Sonicare to Interplak, cost more than \$50 and for that reason held a fraction of the overall toothbrush market. They reasoned: Why not create a \$5 electric brush using the Spin Pop technology? At just \$1 more than the most expensive manual brushes, they figured many consumers would trade up. They spent 18 months designing and sourcing a high-quality brush that wouldn't cost more than \$5, batteries included. "If it had cost \$7.99, we wouldn't have gone forward," Osher says.

They also formulated an exit strategy: Sell it to P&G. In 1998, they saw that Colgate toothpaste was dethroning Crest, the market champ since the early 1960s. Colgate edged out Crest by launching Total and pitching it around the new theme of whitening. P&G, meanwhile, clung to its cavity-fighting message. Colgate gained 5.6 percentage points of market share in 1998, giving the company 29.6% of the market, vs. P&G's 25.6%. "We knew that P&G would be very hungry," says Nottingham.

But first they had to prove the product could sell. They couldn't afford to advertise and sell SpinBrush at that low price. So they resorted to the marketing ploy they used with Spin Pop: packaging that said, "Try Me" and that allowed the consumer to turn the brush on in the store. They also hired a former Clorox salesman, Joseph A. O'Connor, who had years of experience selling to Wal-Mart and other big chains.

When they tested SpinBrush in Meijer Inc., a Midwest discount chain, in October, 1999, it outsold the leading manual brush nearly 3 to 1, convincing Meijer to carry it. Using that sales data, they cracked drugstore chain Walgreen Co. and caught the interest of Wal-Mart in early 2000. To help close that deal, O'Connor persuaded a health and beauty aid manager at a Phoenix Wal-Mart to buy 240 SpinBrushes. "They sold out over the weekend," he recalls.

In 2000, the entrepreneurs sold 10 million SpinBrush units, more than triple the existing 3 million U.S. electric toothbrush market. With that record, it wasn't hard for Osher to get an appointment at P&G in July. The company had another reason to take notice: Colgate's recently launched ActiBrush electric toothbrush, at \$19.95, was off to a fast start, too.

Yates, a financial manager on the Crest brand, headed a team to evaluate SpinBrush. P&G code-named the project Julius, after basketball great Julius Erving. With approval to negotiate a purchase and focus group reactions off the charts, Yates moved fast. A deal to buy the startup closed in January, 2001, six months after the first meeting with Osher.

The deal's structure was unprecedented for P&G. Instead of paying a lump sum, P&G would pay \$165 million up-front with an "earn-out" payment in three years based on a formula pegged to financial results. The up-front payment alone--nearly four times SpinBrush's prior year sales of \$43 million--was rich by P&G's standards. The company paid three times sales for Clairol. But

P&G was banking on faster sales growth from SpinBrush.

The deal had another unique feature: Osher, Blaustein, and O'Connor agreed to join the company for the three-year earn-out period with a mandate of keeping the business entrepreneurial. They would become part of a 27-person team headed by Yates that would have authority to bend any P&G rules that interfered with the business. The entrepreneurs would guide the team and had carte blanche to go higher within P&G to resolve conflicts.

And there were conflicts aplenty. Some P&Gers questioned the "Try Me" feature, fearing the batteries would wear out. Others wanted to stop store deliveries for three months so P&G could build inventories. Still others worried about having more automated factories in China. In the end, though, "they would listen to us and fight their own bureaucracy," says Osher.

Yates broke the the biggest rule of all for a company whose heritage is in marketing--he didn't advertise SpinBrush for the first seven months. The traditional P&G model for a launch calls for heavy TV advertising from the outset and a high enough price to help carry that cost. But Yates didn't want the ad expense, which could force him to raise prices, until sales could support it. "I didn't want to mess up the economic structure of the business," he says.

P&G now sells SpinBrush in about 35 countries, marking its quickest global rollout ever. And it's added a multitude of models, including ones with replaceable heads. Colgate earlier this year launched Motion, a SpinBrush look-alike, at the same price. In a recent earnings conference call, Colgate CEO Reuben Mark admitted that the company had cut the price of ActiBrush from \$19 to \$12 because of the competition.

P&G and the SpinBrush founders agreed to an early payout in March, 21 months ahead of schedule. Osher's employment contract ended that month, and O'Connor's and Blaustein's ended in June. P&G pushed for the deal because SpinBrush's sales so far exceeded plans that the company faced the prospect of a much bigger payout if it waited, Osher says. The founders settled on a final payment of \$310 million. The total price of \$475 million was about 2.3 times last fiscal year's sales, a price some analysts consider a steal.

But Osher and his partners had their own reason for getting out early--they wanted to hedge their bets. They're uncertain whether SpinBrush will live up to its potential as it is further folded into P&G. Osher had an exit interview with Lafley in May in which the CEO vowed to keep SpinBrush on course. Osher has no doubt about Lafley's sincerity. It's just that he is still not sure an elephant can learn to dance.

By Robert Berner in Chicago

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P&G Versus Lego Case Study

1. How is Lego using the knowledge and expertise of its customers to innovate?
2. Identify the key factors that motivated P&G to seek innovation outside the company.
3. Identify the primary differences between the approaches to open innovation used by Lego and P&G.
4. What are likely to be the management challenges that face a firm trying to implement a form of open innovation?