IMB 389

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3M INDIA: IN INDIA FOR INDIA

Raja Krishnamurthy, Head of R&D, 3M India and Abhijeet Saungikar, Vice President, Technical, 3M India met one morning at 3M India's newly established 3M Research and Development Center at Electronic City, Bangalore. They were to discuss a suggestion from Shashi Shekar, GM, Security Systems Division, to develop a new security product for the natural resource industry, a sector that had been identified by the company for growth in India. During the meeting, the discussion gradually veered towards appreciating the systems and processes that supported innovation in 3M India. They recalled how successful 3M India had been in working towards the vision of "In India for India" that the company had adopted and the central role that research and development had played in that vision. They discussed the various global initiatives of 3M that had supported the India-based innovation initiatives, and the processes and practices adopted by 3M India, and the 3M Research and Development Center in particular, that had facilitated the introduction of unique products to cater to the specific market conditions in India, that were sometimes significantly different from other markets in which 3M operated.

Abhijeet Saungikar, who had been with the organization from almost the very beginning, recalled his experience on one of the early products that was ''made for India''. He had been involved in the development of a product to protect high-end expensive silk saris from food and other stains. These saris were prized possessions and normally worn by women on rare special occasions and had to be polished before use. Polishing, not only added to the costs of maintaining a sari, but also added significantly to hassles associated with planning well in advance for an event. The stain-protection product would avoid the need for frequent cleaning and polishing of the saris, and also prolong their life. While the product was ultimately withdrawn because it did not meet the strict environment safety standards implemented by 3M, he remembered the project for the ease with which he could access relevant technology and knowledge from other parts of the global organization, and the support he had received from the parent organization and management in India to pursue the product development. For him, it also symbolized the ethos at 3M that any idea was worth pursuing if the idea generator could justify its worth and also that failure was highly tolerated in the organization, even in India. Raja Krishnamurthy, who had joined 3M more recently after completing his doctoral degree in the United States, and also working for more than 15 years in two different research organizations, could also articulate the noticeable differences in support for local initiatives provided at 3M India relative to his earlier employers.

The two senior executives gradually found themselves discussing ways of further enhancing the scope for successful innovation in India. That is when they realized that while they were good researchers and understood technology, and could also appreciate the support systems that 3M and 3M India had put in place, they could benefit from external advice on improving the systems and processes at 3M India and the R&D laboratories to make a greater contribution to the growth of their company in India.

3M: THE INNOVATIVE ORGANIZATION

3M was "fundamentally a science-based company" recognized globally as a company that had been consistently innovative. 3M was founded in a small town called Two Harbors in Minnesota, United States in 1902; and by 2011, it was a global organization with operations in more than 65 countries, and its products were sold in nearly 200 countries. **Exhibit 1** shows the 3M 45 technology platforms that formed the foundation for 3M products. The market-facing divisions were inspired by technologies from across various technology platforms to develop more than 50,000 products that met unique needs in the market. The company claimed that "half the world's population today enjoys experiencing at least one of 3M's 50,000 products, either directly or indirectly, every day." It had about

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35 business units, organized into six businesses: Consumer and Office; Display and Graphics; Electro and Communications; Health Care; Industrial and Transportation; and Safety, Security and Protection Services.

Exhibit 2 shows the highlights of the company's progress in 6 years (earlier to 2012). In 2011, it had global sales of $30 billion with $19.6 billion, which was 66% of global sales, from outside the United States. It had about 84,000 employees across all operations with about 51,000, which was about 60% of its total employees, working outside the United States. However, reflecting its philosophy of decentralization, it had only about 300 expatriates working outside their home country. Inge Thulin, 3M's Executive Vice-President in charge of international operations stated that of the employees working outside the United States, almost 99% were from the local country or region. According to him, "A local guy understands the market better than an expat. In fact, we would like the man at the top of the subsidiary to be a local". [i]

The five founders of 3M, a doctor, a lawyer, two railroad executives, and a meat-market manager, set up the company to mine corundum for manufacturing grinding-wheel abrasives. The initial venture was a failure, as they did not find corundum. The company had experienced its first failure, which drove away most of its early investors. However, this episode also played a crucial role in developing tolerance for failure in the organization's culture, which had played a significant role throughout its years of growth. The company later moved to Duluth, Minnesota to focus on sandpaper products. In 1910, the company moved to St. Paul, Minnesota, which became its headquarters. It paid its first dividend of 6 cents a share in 1916, the first year it made a profit. This was also the year in which a small laboratory in a ''6 feet by 11 feet'' enclosure with one employee was created to examine the quality problems with the sandpaper that the company produced.[ii] In retrospect, this was one of the first steps towards becoming a research and development-based technology-driven innovation company.

3M had encouraged innovation throughout its history. At 3M, it was well-appreciated that, ''Research is the transformation of money into knowledge, while innovation is the transformation of knowledge into money". During about 110 years of its existence, it had filed for more than 40,000 patents. No discussion on innovation in business was complete without a mention of 3M, an organization that had created more than 60,000 innovative products. In the year 2011, it acquired 514 patents, which made it one of the highest ranked US companies in terms of number of patents in a year.[iii] Every year, it introduced about 100 major products (about two per week) and about 500 modified or enhanced products (about 10 per week). Much of the success of 3M in being an innovative company was attributed to the corporate architecture and culture that encouraged employee initiative, creativity, and freedom to take risks and experiment with new ideas. At the root of this was a management philosophy labeled "William L. McKnight Management Principles" which was introduced by McKnight who joined the company as an assistant bookkeeper in 1907, became president in 1929, and chairman of the board in 1949. Although practiced from the early days, the principles were formally laid out in 1948.[iv]

> As our business grows, it becomes increasingly necessary to delegate responsibility and to encourage men and women to exercise their initiative. This requires considerable tolerance. Those men and women, to whom we delegate authority and responsibility, if they are good people, are going to want to do their jobs in their own way.
>
> Mistakes will be made. But if a person is essentially right, the mistake he or she makes are not as serious in the long run as the mistakes management will make if it undertakes to tell those in authority exactly how they must do their jobs.
>
> Management that is destructively critical when mistakes are made kills initiative. And it's essential that we have many people with initiative if we are to continue to grow.

In other words, the management at 3M believes that:

> Innovation is not an accident. It is the product of a complex set of principles and practices which support and encourage the coupling of technology and creativity for satisfy customer needs. Innovation is accomplished by people: leaders who give permission and encouragement, staff who work with determination and imagination, and customers who provide inputs and feedback to the process.

Support for Innovation at 3M

Structure. The organization structure at 3M had evolved to support innovation. Of the several features, three elements were critical: small size of each business or administrative unit, research and development laboratories with each business division, and organizational roles to support innovation. A significant aspect of 3M's structure had been the small size of each business or administrative unit. As with any organization, 3M evolved from an organization with little structure to a functional structure. When the sheer size and diversity of products and technologies, made it difficult to manage the operations, the division form was introduced in 1944. Divisions were kept small, at an average of about US$ 200 million in sales.[v] As soon as a product group became successful and reached a substantive sales volume, it was spun off as a separate division. This was done with the awareness that large organizations could become excessively centralized and bureaucratic, and hence may curtail innovation. So, 3M consciously sidestepped the benefits of economies of scale to ensure that innovation was sustained. While the organization structure in 2011 could have been described as a global matrix structure, the divisions had very high levels of decentralized power and authority. For example, while the 3M India operations were linked to various business divisions and groups, and corporate research laboratories, the Chief Executive Officer of 3M India, Ajay Nanavati, had the final authority on all India-based initiatives.

A second element of 3M's structure was the existence of research and development laboratories with most business or administrative units. In 1948, 3M was organized into seven business divisions, each with its own research laboratory, production operations, and sales force. In the 1960s, after the number of divisions increased, the organization grouped divisions dealing with related products and markets into Groups of Product Divisions or Strategic Business Units. In the early 1980s, the organization, which consisted of 42 business divisions in 10 groups, was re-organized into four business sectors based on their related technologies. The Central Research Laboratories, which were created in 1937 and attached to the corporate office, concentrated on long-term basic research targeted towards opening new markets. The sector laboratories focused on core technologies to create growth within a 5–10-year time-frame. The division laboratories were expected to work on new products and process with short-term commercialization objectives.[vi]

The third element was the definition of the organizational role to support innovation. It was quite expected that the idea generator or new product champion was likely to be primarily a technically qualified person in the junior ranks. Individual engineers were given ample time and funding to nurture their innovative ideas. However, there was awareness that despite efforts to limit bureaucracy to a minimum, new ideas were likely to die if not properly supported. The idea generator had the support of an executive champion to protect or buffer the new idea from the operating organization. The same person also acted as a coach or mentor. The executive champion could belong to the same division or another division. Most 3M products took about 10 years, and sometimes more, from idea to commercialization, so they needed to be nurtured and protected for a long time. Typically, the executive champion was a former product champion who had gone through the arduous task of navigating a new idea to commercialization and understood the highs and lows of the process.

Processes. Explicit efforts had been made to design organizational processes that facilitated innovation. First, there was a 15% rule. According to Livio D. Desimone (a former 3M CEO), “We expect people to spend 15% of their time on developing products that aren't directly linked to routine work.” Employees were allowed to spend 15% of the work-week on their pet projects, a practice that was called "boot-legging". This was initiated in a division to allow time to produce adhesives for Post-its, and became a norm at 3M.

In order to encourage as many employees with ideas to pursue them, the initial proposal was expected to be short and simple and not more than about 5 pages. Initially, the idea was not subject to commercial evaluations. People were typically allowed to proceed with the idea if they were convinced of their goals. Most 3M products had very small initial markets, but gradually led to products with huge markets. For example, the first use for Scotch tape was limited to being an industrial fastener. It ultimately became one of the highest earning products for 3M.

Genesis grants of up to US $ 50,000 were provided to carry projects past the initial idea stage. Individuals with ideas had several sources of funding. As a first step, they sought funding from their immediate boss. If their request was turned down, they could go to another division within the group. To encourage this, division heads were rewarded for funding projects outside their division. The idea generator could even change divisions to be within the division

that seemed to see value in the idea. Finally, the idea champion could take the idea to the New Business Ventures Division, which funded new ideas. As a result of this process, it was rare that a good idea did not receive funding.

Once the idea generator had an idea that was reasonably well-developed, certain norms for team formation had to be followed. The individual was expected to form a multi-disciplinary team consisting of members from areas that could contribute to the development of the idea, including manufacturing, sales, and finance. The team-members worked full-time on the project even if their particular skills were not explicitly required at that stage. More importantly, all the members of the team volunteered to become part of the team based on interactions with the product champion rather than be assigned to a project by a manager. Finally, the team stayed together until the product was actually introduced to the market.[vii] 3M relied on self-policing rather than formal evaluations and controls, despite its size. Since formal constraints were few, the real control in organization was exercised through peer review and feedback. However, individuals who did not work well in the open work culture were encouraged to leave.

Despite this system, the management did not support all the ideas. Some ideas did not get past the first stage. Others were abandoned much later after substantive investments. However, the evaluation process was always tilted in favor of the individual or team with the new idea. The burden of proving that an idea would not work rested with the manager who wanted to stop the project, thus increasing the life of an idea. Ironically, despite this system, several of 3M's successful products were based on ideas that had been rejected by the management. However, the fanatical product champions found ways to persist with the idea until it became successful. Such stories were legend, and gave hope to people, whose ideas were rejected, which was bound to happen on occasion, to persist with the ideas they believed in. Desimone used to relate a story on how the Thinsulate brand of insulated outerwear was developed despite his attempts to stop the project.

In order to encourage middle managers to facilitate rather than kill new ideas, 3M imposed revenue targets that had to be met from new products. The norm at 3M used to be that 25% of the revenues in each division had to come from products that were introduced to the market in the last 5 years. By the mid-1990s the senior managers were concerned that too much of 3M's growth was based on modifications to existing products. They introduced new processes to increase breakthrough products.[viii] They also raised the innovation bar so that 30% of the revenues for each division had to come from products introduced in the last 4 years. The standard made everyone aware that innovation was the driving force at 3M. To sustain the innovation-based strategy and reap the benefits, 3M ensured that it phased out the products and businesses that did not grow fast enough. The first effort, however, was to keep 3M products ahead of the rest of the competition.

Even as it was prepared to withdraw old products from the market, 3M protected the products through patents. It also added additional features and patented the new technologies to keep out cheap imitations. For example, Post-it had 20 patents although its original patent had expired.[ix] Since technologies were sometimes revealed in patent applications, 3M did not patent few of its technologies that could not be duplicated easily. The patenting process also helped 3M keep ahead of its less-innovative competitors.

Finally, knowledge-sharing processes were an explicit part of 3M successes. The company norm was "While products belong to businesses, technology belongs to the company."[x] There were formal mechanisms for the divisions to share their knowledge and manpower. A technical council allowed senior people from diverse laboratories to meet at monthly meetings and annual retreats. The Technical Forum was created in the 1950s to facilitate grassroot scientific communication across horizontal and vertical boundaries.[xi] Among other initiatives, the body organized an Annual Technology Fair to help scientists to share their research findings. Informal knowledge sharing in laboratories, meeting rooms, and even hallways, was always encouraged. Customers were also involved in these discussions. Getting close to customers was ingrained in 3M's culture; so 3M employees frequently visited clients. According to an internal 3M story, Richard G. Drew, a young curious engineer, noticed the difficulty that painters on automobile assembly lines faced with two-color cars on one of his client visits, and invented the masking tape.[xii]

Rewards. 3M celebrated its heroes. Each time a project crossed a significant milestone, the product champion and the team were feted in style.[xiii] Great innovators who made significant scientific and technical contributions were inducted into the Carlton Society. Strong team efforts were rewarded through inclusion in the company's Golden Step Award Program.[xiv] The book published by 3M "*A Century of Innovation: The 3M Story*" highlights the heroic efforts of several innovators who had contributed to the success of the organization.

Salaries and promotions were related to the successful working of new products from inception to commercialization. The individual who championed a new product could ultimately manage the unit as his or her own business, becoming the CEO when it became an independent division. The rest of the team also grew with the product.

Despite the best efforts, for every two successful products, one product of 3M was a failure. However, rather than considering them as failures, they were seen as learning experiences. When a product failed at any stage of its development, the team members went back to their old jobs they held before they joined the new product team. In short, there was no downside to being part of an innovation team that did not achieve its intended goal.

People. 3M made an explicit effort to hire and retain people who dared to think differently. Francis G. Okie, a celebrated inventor at 3M, once got an idea to develop sandpaper for men to replace a razor so that they could rub their cheeks clean rather than risk the use of razor blades.[xv]. Although the idea that would have been summarily dismissed in most organizations, did not catch on, the incident finds repeated mention in the organization to drive home the point that the company had a wide tolerance towards unconventional thinking.

3M bred loyalty. The company rarely hired from outside, particularly at the senior levels. The turnover rate in employees was low. Chemical engineers dominated the company.[xvi] There was a separate track for scientists/technologists who did not want a career in management. A "dual-ladder" career was offered to those who wanted to pursue a career in research, engineering, or marketing.[xvii]

3M INDIA

The Indian subsidiary of 3M was formed in 1988 as a joint venture between the Ashok Birla Group (40%) and 3M Corporation (40%) with a 20% public holding. Later, 3M became the majority shareholder with a stake of 76%, while the Ashok Birla group held 8%. The name of the company was subsequently changed to 3M India Limited in December 2002. In 2011, the organization was headquartered in Bengaluru; with innovation laboratories in Bengaluru and Gurgaon; manufacturing facilities in Bengaluru, Ahmedabad, Pune, and Pondicherry; branch offices in Gurgaon, Mumbai, Chennai, Kolkata, and Pune; and several sales offices. The company had introduced over 7,000 diverse products in health care (micropore surgical tapes and Littman stethoscopes), consumer office markets (Post-it notes, Scotch magic tape, and 3M brand overhead projectors), traffic and safety (Scotchlite), tape and automotive segments (Scotch packing tapes and Scotch masking tapes), consumer products (Scotch Brite), industrial market (abrasives), and signage market (commercial graphics). As in the rest of the world, about 80% to 85% of revenues were derived from the business-to-business market and the remaining from business-to-customer market. 3M India manufactured some of the products, and imported other products from the parent in the United States or its subsidiaries in other countries. In 2011, it had an employee base of approximately 1,800, and a turnover of Rs. 1,176 crores (Rs. 1 crore = $180,050, in August 2012) with a profit of Rs. 99 crores. **Exhibit 3** shows the financial highlights of 6 years.

In India for India

After almost 20 years of healthy growth, 3M India contributed only about 1% towards 3M's global revenues, and even less in terms of profits.[xviii] However, there was a renewed thrust to expand the market in India with an "In India for India" strategy. Inge Thulin said:

> Our growth strategy for India is to accelerate development of products in India, for India, through cutting-edge R&D capability.[xix]

Explaining the logic behind the strategic drive, he said:

> We believe innovation comes from interacting with customers that is, by observing them and figuring out how their businesses or their lives can be improved. You cannot do this by sitting in the US and talking to somebody on the phone. You have to be physically present in the market. This is why we lay so much stress on localization, because customers in each market have unique requirements.[xx]

Formalizing this strategy, D. J. Balaji Rao, Chairman of 3M India in his "Message from the Chairman" in the Annual Report of 2010 stated:

> 3M India is ready for a transformation and its working with full vigor to take its ''In India for India'' strategy to reach the US$1 billion goal (by 2015)…The stage is set for greater performance in the coming future and I'm confident that with the new initiatives … the 3M India team will rein in the challenges posed by the market and outperform on its objectives, to make progress possible.[xxi]

Reinforcing the message, Ajay Nanavati in his "Message from the Managing Director" in the same report stated:

> Our ''In India for India'' theme gained further momentum …Our state-of-the-art R&D facility at Electronic City is tracking on-time… This infrastructure will accelerate our ability to drive 3M's renowned innovation engine. [xxii]

With the renewed focus on the India market and the desire to achieve revenues of $1 billion by 2015, there was more focus on developing products for India by the R&D team in India. Consistent with the general principles of 3M globally, 3M India hoped to meet its targets by obtaining about 40% revenues from new products developed in India, and about 20% from existing products with increased localization. In order to support these efforts, 3M India would invest 2.5% of its revenues on R& D.[xxiii] In 2010, 3M India had filed for 14 patents and nearly 1/3 of its revenues were derived from 23 innovative new or modified products developed in India.[xxiv]

Innovation in India

The technical operations of 3M India started in 1990 with the inauguration of the Customer Technology Support Centre in Bengaluru. This center provided technical support to products that were manufactured outside the country. In 1998, the Innovation Centre in Electronic City, Bengaluru was inaugurated. The focus shifted to the earlier attempts to develop products for the Indian market. The center supported the manufacturing facilities that 3M India added either by acquisition or establishing greenfield projects. With the inauguration of the Rs. 100-crore 3M Research and Development Centre at Electronic City, Bengaluru in 2011, a significant support for the "In India for India" thrust was ensured. The center in Bangalore possessed core laboratory facilities for research and development, and the efforts were supported by development laboratories in Ahmedabad, Rajnangaon, and Gurgaon. 3M India planned to increase its 125-member research and development team to about 300 in 5 years. While the bulk of the efforts were expected to be related to product development for India, there were plans to devote some resources to fundamental research. According to Raja Krishnamurthy, the purpose of the corporate research laboratories was to develop technologies relevant to India and not for reverse development for the US or other markets. As Raja Krishnmurthy explained:

> The primary focus of the R&D laboratories in India is to drive the product development for the local market in India. The priorities for us are to enable the growth of 3M India through the development of products and solutions that are unique to the India market.

However, if a technology was globally relevant, it could be taken up further in those geographies. The center would be a part of the network of 3M R&D facilities across the world.

As stated by Ajay Nanavati:

> There are some unique characteristics in the 3M business model. Unlike other multinational corporations which set up global centers, our centers are very country-specific. Thus, we have a China center, a Japan center, a Germany center, and now an India center. But, there is seamless sharing of technology across all these centers. For example, if China develops something, it becomes available to India. This is the core strength of 3M which is a diversified technology company. We are into so many businesses, and have so many products and so many technologies. We do not create mother units which everybody feeds off. These are amoebas or satellite units which support each other.[xxv]

At 3M India, the product development was still largely based on the family of technologies owned by the 3M corporate research and development laboratories. New products were developed or old products modified in order to suit conditions in India. To illustrate the point, Nanavati, himself a 3M Pathfinder Awardee said, "I stole an idea for a cable connector product we have in the United States and reinvented it for the Indian telecom market. We gave them due credit. Knowledge-sharing across labs is important to how 3M functions."[xxvi] While each product was modified based on unique circumstances faced in India, two dimensions were common to almost all of them (i) Value for money and (ii) Localization for Indian conditions and usage patterns. It was well-known that the Indian market was a price-sensitive market, and hence many products had been developed just to bring them to the price point that might meet the market needs. According to Nanavati, "Some customers don't want a Rolls-Royce; they are quite happy with the performance characteristics that meet their need. So, instead of trying to give them a platinum-coated product, we give them a silver-coated product".[xxvii] In other words, a product that might be ''over-designed'' may be ''right-designed'' for India to meet all functional requirements at a substantively lower price.

For example, 3M India conducted an ethnographic study for developing its home care products. Technical and sales professionals visited homes across the country to observe how homes were cleaned. This learning was taken back to the research laboratory to develop products to fit the cleaning practices and habits. One of the consumer products that emerged from this exercise was a Scotch-Brite Floor Cloth or "Pochha" (see **Exhibit 4**). It was not a technological innovation, but a product that provided value for money. Rather than provide the proprietary and expensive woven fiber developed by 3M in the entire floor cloth, it retained the regular cotton floor cloth that was widely used and cheaply available in the market, and provided the expensive abrasive fiber material only in one corner. As a result, the product met the "value for money" condition as consumers could continue their cleaning habits as in the past, but also use the 3M technology to remove nasty spills and stains that occurred occasionally. Similarly, 3M India had worked closely with an Indian automobile manufacturer to develop products. It had developed sound insulation pads for compact Indian cars that reduced noise to levels acceptable in India at nominal costs. It had also reduced the number of light-emitting diodes in brake lights for cars from 30 to four, which reduced costs without affecting the functionality. According to Jay Ihlenfeld, Vice President, Asia Pacific, 3M, "India-style innovation – good quality at a low cost – is what the world is discovering."[xxviii]

Indian conditions and usage patterns also forced localization of 3M products. An example of a product developed for India was the respirator used on shop floors (see **Exhibit 5**). The dimensions of the respirators were changed to suit the facial structure of Indians, and features were added to allow the users to speak while wearing the respirator, which is quite common. Further, it was made foldable rather than molded into a fixed shape as it was noticed that shop-floor workers had a habit of carrying their respirators during coffee/tea and lunch breaks. The folding feature allowed workers to fold their respirators and carry them in the front pocket of their overalls. Another example of a product designed for local conditions was the twin-shanked raised pavement marker (see **Exhibit 6**). 3M's regular pavement markers (3M™ Raised Pavement Marker) were durable and highly reflective, suitable for asphalt or concrete road surfaces in a wide range of weather conditions. However, they had to be redesigned for Indian conditions. Indian roads were normally surfaces with asphalt (tar), which often melted or softened in the presence of extreme heat. Further, it was quite common for drivers on Indian roads to neglect lane markers and drive on the markers. As a result, markers would get misaligned and become ineffective. The redesigned marker (3M™ Molded Shank Raised Pavement Marker) retained the features of the existing products, but added two shanks to anchor them in the tar and prevent displacement or disorientation.

Another path to development of products for India, involved seeking potential new applications for existing technologies. An example of this was researchers from 3M India working closely with a motor-cycle manufacturer to offer a masking tape and abrasion solution for etching on nickel-plated surfaces to replace chemical etching to reduce production time of a component by almost 20 hours. This was a unique first-of-its-kind application at the time of its development. Similarly, after 3M India localized a few of its corrosion protection products to the oil and gas pipeline industry; it adapted the application of the same technology for water pipelines in India. Similarly, 3M developed an anti-corrosion underbody coating for cars that was resistant to diesel as it was observed that mechanics in India often used diesel to clean the underbody, unlike in the United States. Also, masking tape technology developed for the automotive industry was adapted for the oil pipe welding so that pipes could be joined without flame/heat of traditional welding, which required plant shutdown, and reduced downtime at the plant.

In addition to product innovations, 3M India also ventured into innovative business models. In order to increase accessibility to its products in the automotive sector aftermarket, it launched car care shops. As stated by Nanavati, "We're already doing things in India that are a first for 3M world-wide. We've launched seven car care shops around

the country and plan to increase the number to 150 in a year. We see it as a market opportunity that goes well with our product range."

Support for Innovation in 3M India

Structure. The first pillar of support for innovation was the organizational structure. 3M had a global matrix structure with the technical functions cutting across the organization with business divisions being focused on specific markets. However, all decisions related to technology or business for their respective markets were located at the subsidiaries, that is, each was responsible for its own business and bottom line. As a result, all decisions related to product development and markets in India were taken in India. In other words, the initiatives in India were owned by 3M India. As one executive stated, “Nobody from the US tells us what to do”. In other words, 3M India’s business was driven by pulls from the Indian market. However, 3M maintained a global database on technology and products. Occasionally, there was a global push for a technology or a product based on the data. Based on the experiences in another part of the world, 3M India would be asked to explore the potential of some technologies or products. Over the years, 3M India’s local initiatives had been influenced by the corporate focus on the oil and gas industry, transportation, health care and transformation to name a few sectors, followed by the thrust on the renewal energy industry, and most recently on the push towards the natural resource industry.

Within the country, the organization was also structured as a matrix. However, while there were no strict boundaries across business divisions within India, the technical personnel were all aligned to business divisions. 3M India offered a dual ladder for growth with parallel technical and managerial career paths. In 2011, about 90% employees were on the technical path while only 10% were on the managerial path. Within the R&D organization, the fundamental research was conducted in the Bangalore laboratories, and the application-oriented research aligned to businesses was conducted in Bangalore and Gurgaon, while some research was also carried out in the manufacturing facilities. The personnel of the R&D organization ultimately reported to the Managing Director, 3M India in Bangalore without any dual reporting outside India. Only the Head, R &D was responsible for multiple reporting to the MD in India and the technology leaders in the Asia-Pacific region and the US headquarters.

Within this framework, the superior–subordinate relationship was based on the principles of respect and freedom for individuals. The manager was required to be a coach and guide rather than an authority figure. To ensure that organization goals were pursued, there was an emphasis on check and balance, but not control. However, there were certain norms and guidelines that could not be adjusted or violated. For example, the research team could modify the respirator to adapt it for the Indian face and usage pattern, but were ‘‘forced’’ to comply with the corporate norms on the core functionality requirements that affected health and safety.

Processes. The processes at 3M India formed the second pillar for support to innovation. The “Feel at Home” induction program, the training on Business Conduct Policies, and the Ethical Training Program with a focus on IP protection were conducted online for which employees could obtain a certificate after passing an online test on completion of the program. Rotation between divisions with about 1–2 months in each division in India, and the practice of sending employees to centers of excellence for 2–4 weeks of training collectively prepared a new entrant to start functioning as a “3Mer”.

The employees of 3M India could participate in 3M’s global mentorship program. It had a database of people willing to mentor others and a database on those seeking mentoring. The lists were matched globally, so an employee in 3M India could potentially seek a mentor from anywhere in the world. A 3M India employee could reach out within the 3M global community for expert opinion and analysis of ideas. In short, a 3M employee in India had a free of cost corporate facility to link with 3M experts across the globe.

“Collaboration and cross-connection” among employees of 3M India, and 3M also, was ‘‘forced’’. 3M India conducted internal contests among employees in India to encourage idea-sharing. Forums for sharing ideas and research outcomes were held at a global platform at least once in 6 months. Employees were expected to be present and participate in such forums.

The 15% time for innovation norm, for which 3M was famous, was also adopted in 3M India. An employee working on an idea had to just inform the immediate supervisor about the pet project (which is different from seeking permission). The employee could spend that 15% time anywhere else in the organization. Laboratories were

normally co-located and employees could work in any of the laboratories. Pet projects were started on the 15% time and employees were expected to use that time to define the project more clearly.

Explicit funding was available to steer the pet projects to the next stage. Typically, a cross-functional team had to be formed at this time to prepare a project charter. Based on the charter, the team could request the current business division to support the project. If the current business division could not support the project, they could apply to another division or apply for a grant from 3M's global funds. The grant system was based on an evaluation of projects from across the globe, but local needs were taken into consideration while disbursing the grant.

3M India had a system of gates to support and monitor the progress of projects. There was a 6-gate process for new products and 4-gate process for new technologies. There were well-defined guidelines in the gates system. The team was required to make a self-assessment of the progress of the project based on the technical and market criteria to be used at a gate. This process prepared the team for the outcome of the decision at the gate. This was particularly important for risky projects, and allowed the team to recognize the reasons based on which the project may not be allowed to progress to the next stage. Also, at the early gates, managers would normally, prepare the team by making them aware that their project may be highly risky. Most employees were advised to work on a portfolio of projects that had a mix of high-risk and moderate-risk projects and manage the pipeline of projects (or "project hopper") such that they had 2–3 times the number of projects at the early stages than were required at the last gate. Knowing that many of the projects were bound to fail, the culture of tolerance for failure stressed the fact that failure was tolerated as long as the team members were prepared to learn from the failure.

Rewards. Innovation was part of the job expectation for every employee of 3M India. Hence, there were no explicit financial rewards for working on innovations. However, several processes signaled that innovation was important and hence supported. When individuals planned goals for the year, they were asked about their pet project to ensure that each individual was focusing on innovation. Employees were provided a simple reward such as dinner with spouse and family at an exclusive restaurant for a good idea, or support to file patents for a more out-of-the-box idea. Patents provided the recognition and prestige. If someone or a team secured a grant for an idea, it not only provided money to pursue the idea, but also recognition and prestige across the 3M global community. Path Finder Awards were provided to teams that contributed to revenues over a certain benchmark consistently over a 3–4-year period. Employee of the Quarter Award was provided by the department or unit, but even for the individual award, the requirement of teamwork was an essential dimension of assessment. The Circle of Technical Excellence was awarded globally for which employees in India qualified. The 3M India management selected employees and nominated two or three of them for the Circle of Technical Excellence. The winner and his/her spouse were sent to the 3M facilities in St. Paul, United States, for the award ceremony. On the other hand, the management did not come down hard on those whose projects were not successful.

People. A key aspect of the innovation system at 3M India is the people that were employed by 3M India. As Raja Krishnamurthy put it:

> At the end of the day, innovation starts with the people. It is about leaders in the organization who give freedom to others to work on projects that they are passionate about and are important for them and for the company. It is about people who are curious to try to find new solutions and not just work with the existing and move on with it.

3M India tried to ensure that all people who were hired were suitable to the culture of that organization. It was particularly conscious about those selected for roles in the R& D laboratories. Scientists and engineers who are able to take risks based on radical thinking rather than just incremental changes were preferred. However, a balance was needed. As Raja Krishnamurthy explained:

> A key requirement is the patience to persevere with challenging problems, but at the same time being sure that it does not go too far to waste time and resources. A typical 3Mer needs to understand the balance.

Describing other qualities of 3Mers, he said:

> We expect people to have a strong technical background in a specific key area, but have the ability to apply it in other domains. We look for people who can work across areas rather than those who

> drill into the science of one area. Also, we expect people to be very hands-on. They should be able to actually create something and show others a prototype of their project idea.

Those who met the requirements of 3M India and were hired found the work environment extremely satisfying. For example, Tahir Naqvi, Senior Technical Manager, Display & Graphics, 3M Innovation Center, Bangalore who had been with 3M India since 1998, indicated that the three prime reasons for being with the organization was the (i) freedom to implement ideas without fear of making mistakes, (ii) the diversity in technology platforms and markets that one could be involved, and (iii) the informal culture that allowed one to approach anyone without any restrictions of hierarchy.[xxix]

Entrenching the 3M Innovation Culture in 3M India.

The Indian subsidiary had adopted many of the 3M practices that were central to providing support for innovation. For example, it allowed scientists to spend 15% of their time on their own projects; it had created an internal fund to support intrapreneurship, and also adopted the dual-ladder career progression system. However, several people were concerned if these practices could be effective in India: (i) Would the scientists in India become inventive if they had the 15% time to themselves? (ii) Would they be able to exploit the intrapreneurial opportunities that 3M India offered? (iii) How many of them would prefer a technical ladder to a managerial ladder? Further, there were some concerns if Indians could overcome their ‘‘fear of failure’’ to become more ‘‘tolerant of failure’’ and also overcome their ‘‘respect for hierarchy’’ to undertake the initiative, irrespective of position or rank?

The management at 3M India was aware of the difficulties of implanting an innovation culture developed in the United States in the operations in India. However, it was also confident that 3M India could overcome the barriers to adopt the culture of innovation from its parent organization. According to Nanavati,

> Corporate cultures do clash with country cultures. But, 3M is a 110-year-old company built on core values. We believe they should be applicable universally, irrespective of country culture.[xxx]

Similarly, commenting on a question on dual-career track programs in 3M, Ashish Khandpur, senior executive director R&D, 3M India, stated:

> It's too early to comment on how it is doing in India, but the dual career track program is a proven model in the USA, where tech people quite commonly choose to stay in tech rather than go into management. We need similar role models here and we need to build trust among our tech employees. These practices are ultimately based on a view of how human beings behave and how we want to be treated. [xxxi]

Raja Krishnamurthy and Abhijeet Saungikar were very upbeat about the prospects of 3M India and the role of R&D in the organization realizing its vision. They were also very proud of the systems and processes that supported innovation. However, they wondered if more could be done to entrench the 3M innovation culture in the fast-expanding workforce in 3M India, in general and the R&D Group, in particular.

Exhibit 1

3M technology platforms

Materials							**Applications**		**Bio**
Ad Adhesives	**Ab** Abrasives						**Ac** Acoustic Control	**Im** Imaging	**Bi** Biotech
Am Advanced Materials	**Ce** Ceramics						**Di** Display	**Lm** Light Mgmt	**Dd** Drug Delivery
Fi Films	**Do** Dental & Orthodontic Materials	**Processing**			**Software, Analysis and Control**		**Ec** Energy Components	**Mf** Mechanical Fasteners	**Md** Medical Data Mgmt
Fl Fluoro-materials	**Em** Electronic Materials	**Mr** Micro-replication	**Pd** Particle & Dispersion Processing	**Rp** Radiation Processing	**We** Accelerated Weathering	**In** Inspection & Measurement	**Fs** Filtration, Separation, Purification	**Op** Opto-electronics	**Mi** Microbial Detection & Control
Nw Nonwoven Materials	**Me** Metal Matrix Composites	**Mo** Molding	**Pm** Polymer Processing	**Su** Surface Modification	**An** Analytical	**Is** Integrated Systems & Design	**Fe** Flexible Electronics	**Po** Porous Materials & Membranes	**Se** Sensors
Sm Specialty Materials	**Nt** Nano-technology	**Pe** Predictive Engineering & Modeling	**Pp** Precision Processing	**Vp** Vapor Processing	**As** Application Software	**Pr** Process Design & Control	**Fc** Flexible Converting & Packaging	**Tt** Track and Trace	**Wo** Wound Mgmt

Source: Adapted from presentation by Larry Wendling, 3M Corporate Research Laboratory
Note: Mgmt – management

Exhibit 2

3M facts (2006–2011)

		2006	2007	2008	2009	2010	2011
Sales	**Worldwide**	$22.923 billion	$24.462 billion	$25.269 billion	$23.123 billion	$26.662 billion	$29.611 billion
	International	$14.070 billion	$15.475 billion	$16.090 billion	$14.614 billion	$17.452 billion	$19.583 billion
Income	**Net**	$3.851 billion	$4.096 billion	$3.460 billion	$3.193 billion	$4.085 billion	$4.283 billion
	% of Sales	16.8%	16.7%	13.7%	13.8%	15.3%	14.5%
R&D investment	**In the year**	$1.522 billion	$1.368 billion	$1.404 billion	$1.293 billion	$1.434 billion	$1.570 billion
	In the last 5 years	$6.390 billion	$6.600 billion	$6.711 billion	$6.861 billion	$7.021 billion	$7.069 billion
Capital Investment	**In the year**	$1.168 billion	$1.422 billion	$1.471 billion	$903 million	$1.091 billion	$1.379 billion
	In the last 5 years	$4.488 billion	$5.147 billion	$5.941 billion	$5.907 billion	$6.055 billion	$6.266 billion
Employees	**Worldwide**	75,333	76,239	79,183	74,835	80,057	84,198
	United States	34,553	34,138	33,662	31,513	32,955	33,198
Researchers	**Worldwide**	6,500	7,000	7,000	6,700	7,350	7,900
	United States	3,900	3,900	3,700	3,400	3,700	3,800
Patents	**Worldwide**	NA	NA	NA	NA	NA	2,673
	United States	570	571	561	518	589	514

Source: 3M facts for each year

Exhibit 3

Six-year financial highlights at 3M India

(in lakhs)

	2005 (January to December)	2006 (January to December)	2007 (January to December)	2008 (January to December)	2009–10 (January to March)	2010–11 (April to March)
Profit and Loss Account						
Gross Sales	40295	54049	64670	77989	111740	121904
Total Income	38306	51040	61905	75307	110679	120241
Profit before Tax	6058	7797	10663	9102	14087	14806
Profit after Tax	3842	5042	6768	5745	9284	9881
EPS	34.10	44.76	60.08	51.00	82.41	87.71
Balance Sheet						
Net Fixed Assets	2933	4432	9742	14332	18102	26646
Net Deferred Tax	125	304	433	512	827	640
Net Current Asset	14283	17647	18855	19931	25131	27867
Capital Employed	17341	22383	29030	34776	44059	55153
Share Capital	1126.51	1126.51	1126.51	1126.51	1126.51	1126.51
Reserves & Surplus	16214	21256	27904	33649	42933	52813
Loan Funds	--------	--------	--------	--------	--------	1213
Net Worth	17341	22383	29030	34776	44059	53940
Return on Net Worth (RONW)	22.16	22.53	23.31	16.52	21.07	18.32
Return on Capital Employed (ROCE)	34.93	34.83	36.73	26.17	31.67	26.85
CAPEX	393	2145	5957	5416	5473	102.93

Source: 3M India Limited Annual Report 2010-11
Note: 1 lakh = 0.1 million; EPS – Earnings per share; CAPEX – Capital expenditure

Exhibit 4

Scotch-Brite Floor Cloth (Pochha)[1]

Get rid of spills and stains from floors in living spaces in your home with the high performing Floor Cleaning Cloth – leaving behind just spotless floors. The unique Scrubby removes any grim and the superior quality makes it last longer.

Features

☐ Made out of cotton.
☐ With unique tri-clean corner.
☐ Strong even weave.

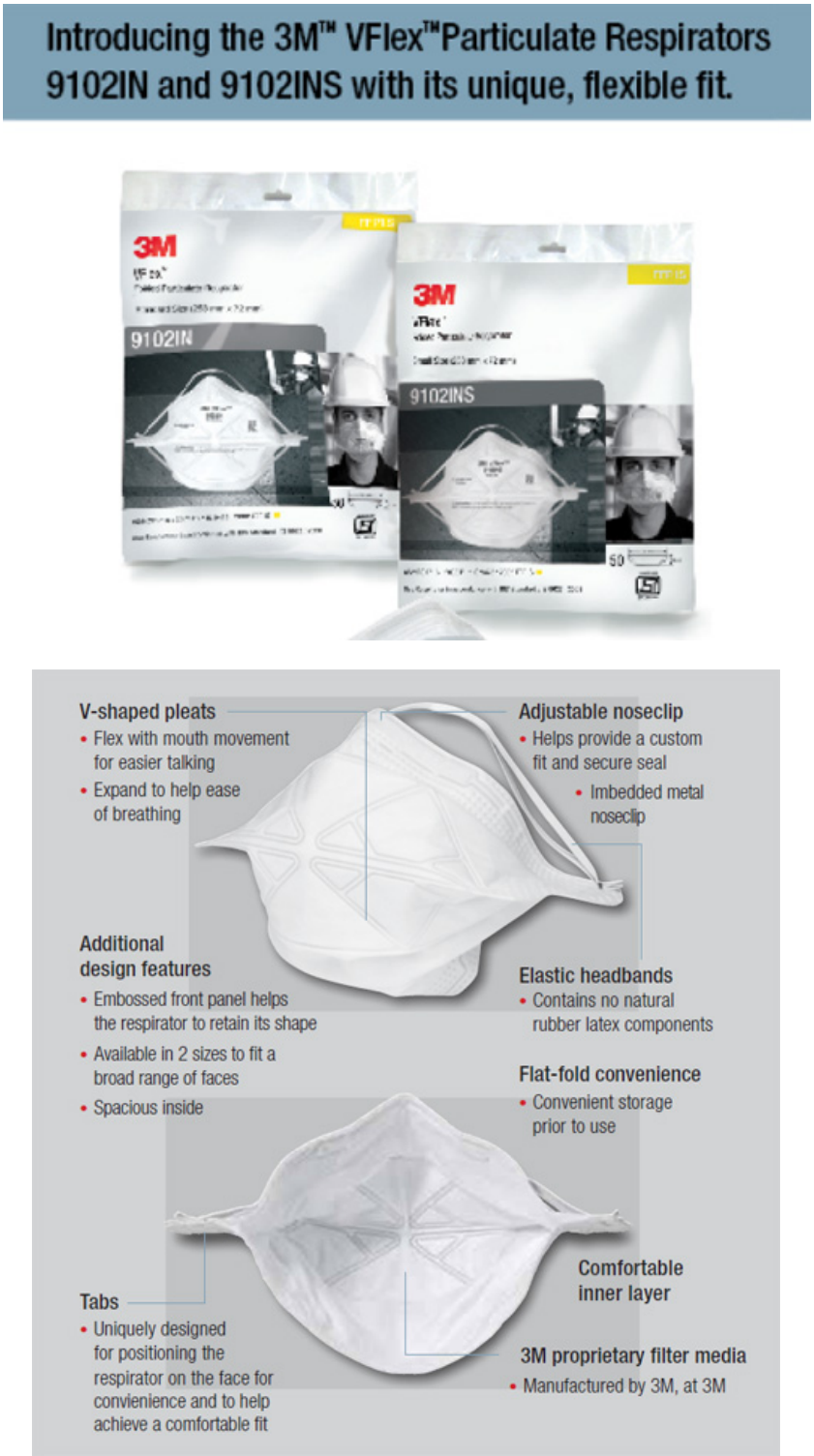
Benefits

☐ Removes stains from skirting and room corners.
☐ Lasts longer compared to ordinary pochha.
☐ Covers more floor area.
☐ Uniform water wetting after mopping.

[1] Source: 3M India website

Exhibit 5

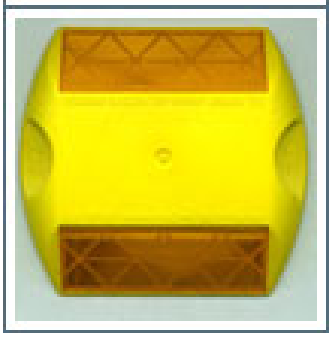
Particle respirators[2]



[2] Source: 3M India website

Exhibit 6

3M™ Raised Pavement Markers (RPM)[3]



3M™ Raised Pavement Marker

3M™ Raised Pavement Marker contains a strong body with one or two-way lens.

- Durable, lightweight and impact resistant
- Provides both wet and dry reflectivity
- Easy to install and maintain
- Rumble effect for added awareness
- Nylon shanks offer excellent anchoring

Available in

- Body color – White, Yellow
- Lenses – One- or two-way, Color – Red, White, Yellow, Blue
- With or without nylon shanks

3M™ Molded Shank Raised Pavement Marker

The series 290C/290CE in RPM's features a revolutionary molded twin-shank design that prevents displacement/disorientation post-installation.

- Molded twin shanks for longer durability
- Twin shanks for displacement resistance
- Wet & dry retro-reflective
- Impact & abrasion resistant
- Molded-in body colors
- Rumble effect
- Application finger grips

Available in

- Body color – White, Yellow
- Lenses – One- or two-way, Color – Red, White, Yellow, Blue
- With or without nylon shanks

[3] Source: 3M India website

Endnotes

[i] Innovation comes from interacting with customers, Interview of Inge Thulin, *Business Outlook India*, February 6, 2010.
[ii] 3M: Profile of an innovating company
[iii] Interview with Livio D. Desimone in *Business Today*, June 22, 1998.
[iv] 3M Website
[v] Masters of innovation, Case on 3M
[vi] 3M: Profile of an innovating company
[vii] ibid
[viii] Creating breakthroughs at 3M
[ix] Interview with Livio D. Desimone in *Business Today*, June 22, 1998.
[x] 3M: Profile of an innovating company
[xi] 3M: Profile of an innovating company
[xii] Masters of innovation, Case on 3M
[xiii] Innovating organizations: The case of 3M
[xiv] 3M: Profile of an innovating company
[xv] Masters of innovation, Case on 3M
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[xvii] 3M: Profile of an innovating company
[xviii] Q&A: Ajay Nanavati, MD, 3M India, 3M will develop products specific to India, *Business Standard*, Bhupesh Bhandari/New Delhi, August 2, 2010, 0:42 IST.
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[xxii] 3M India Limited Annual Report 2010–11
[xxiii] 3M India plans for more 'Made in India' products, *Business Standard*, BS Reporter/Chennai/Bangalore September 26, 2011, 0:20 IST.
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[xxv] Q&A: Ajay Nanavati, MD, 3M India, 3M will develop products specific to India, *Business Standard*, Bhupesh Bhandari/New Delhi, August 2, 2010, 0:42 IST.
[xxvi] [xxvi] Do Indian engineers make for great inventors? Ajay Nanavati, MD, 3M India, Dibeyendu Ganguly, ET Bureau, December 2, 2011, Economic Times Corporate Dossier.
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[xxx] Do Indian engineers make for great inventors? Ajay Nanavati, MD, 3M India, Dibeyendu Ganguly, ET Bureau December 2, 2011, Economic Times Corporate Dossier.
[xxxi] Do Indian engineers make for great inventors? Ajay Nanavati, MD, 3M India, Dibeyendu Ganguly, ET Bureau December 2, 2011, Economic Times Corporate Dossier.