3M: Profile of an Innovating Company

As a perennial winner in Fortune magazine's annual poll of American CEOs to determine "The Ten Most Admired Corporations," 3M was almost universally recognized as one of the world's most consistently innovative companies. Indeed, Fortune described it as "a kind of corporate petri dish that fosters a culture of innovation." In an era when large companies were struggling to reignite employees' entrepreneurial spark, 3M was the benchmarking standard.

Yet, in November 1991, as "Desi" DeSimone assumed the job of CEO in the midst of a worldwide recession, he was more focused on 3M's uncertain future than on its glorious past. Beyond the stagnating sales and declining margins he knew would be reflected in his first annual report (see Exhibit 1), DeSimone was aware that the company faced some longer term challenges. With a portfolio of over 100 core technologies being leveraged into some 60,000 products which it sold in 200 countries, some observers were beginning to ask whether this $14 billion giant with over 88,000 employees could continue its extraordinary innovation-powered growth and expansion. It was a question that the new CEO knew he would have to confront honestly. A lot more than the continued admiration of his Fortune 500 peers depended on it.

The Beginning: Foundations of 3M's Values

In 1902, on the basis of a report that deposits of corundum, an abrasive mineral, had been found nearby, five businessmen from Two Harbors, Minnesota invested $1,000 each to form Minnesota Mining and Manufacturing (3M). When it was learned that the mineral deposit was not commercially viable, management decided to manufacture its own sandpaper. But initial manufacturing efforts were not much more successful than its earlier mining performance, and losses continued. Things began to change only after a young bookkeeper named William L. McKnight took the place of 3M's sales manager who had quit in frustration over the product's continuing quality problems. By communicating directly with the 3M plant, he gradually resolved the quality problems; and by taking the product directly to customers' front-line operations he helped develop new applications. Finally, after 14 years of losses, the company turned a profit in 1916.
The Founding Philosophy

Despite continuing struggles, 3M's first quarter century was a vital period that saw the emergence of many of the values and beliefs that subsequently guided the company's development. One pivotal event occurred in 1916 when McKnight, now the general manager responsible for sales and production, authorized the creation of a laboratory to deal with the continuing problems with 3M's sandpaper. It was a tiny 6 x 11-foot enclosure staffed by a single employee, but its impact on product quality was immediate. Within 18 months a larger lab was built and the seeds of 3M's technology-driven culture were sown.

A second influential event occurred when McKnight received a letter from an ink manufacturer named Francis Okie asking for samples of every mineral grit size used for abrasives. Curious to find out why he had not written to a mineral supply house, McKnight dispatched a salesman who reported that Mr. Okie seemed to be a very creative man with an idea for developing a waterproof sandpaper. Eventually, McKnight persuaded Okie to join 3M as the company's first dedicated product developer. The resulting patent-protected "Wetordry" waterproof sandpaper found immediate acceptance, particularly in dust-filled automobile plants and repair shops. Its success not only confirmed the value of research and experimentation within 3M, it also established product differentiation as the key to commercial success.

Another critical event occurred in 1925, when Dick Drew, a young laboratory technician, was sent to deliver sandpaper samples to an auto repair shop for testing. Seeing the problems that workers were having refinishing the new style two-tone paint jobs, the brash 23-year-old told the shop manager he could help. Back at the lab, Drew began to work with sandpaper adhesives, eventually developing a paper coating that held tightly but also stripped off easily. Masking tape was born, and quickly found wide acceptance. The experience was significant not only in confirming that innovation was driven by matching technology to customer needs, but also because it represented the first step on a voyage of diversification that was to lead the company far from its simple abrasive and adhesive origins.

As the 3M salesforce continued to relay customer needs to the company's expanding lab, technicians adapted the abrasive and tape product line to a variety of applications. No such adaptation was more important than the experiment conducted to coat DuPont's newly-introduced cellophane with adhesive to solve a customer's need for a moisture-proof tape for an insulation job. Although the particular application was unsuccessful, the innovative development created an enormously successful product launched in 1930 as "Scotch"™ Cellulose Tape.

Having seen how the efforts of capable and motivated individuals were able to turn an almost bankrupt venture into a highly successful company, McKnight and his management developed an unshakable belief in the power of individual entrepreneurship. Organizationally, this belief was translated into what 3Mers described as "a climate that stimulates ordinary people to produce extraordinary performances."

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Okie was a brilliant, but absentminded and unconventional individual. Among his many inventions, he even tried to develop a product that would allow men to sandpaper their face rather than shave, and for years followed the practice himself. A by-product of his employment may have been a tolerance in 3M's culture for quirky genius.
Post-War Growth: Leveraging the Capabilities

Building on the solid operations and the strong principles established in 3M's first quarter century, it was the accountant-turned-salesman, William L. McKnight, who led the company into an era of diversification and expansion that spanned from the Great Depression to the postwar boom years. As 3M's president from 1929 to 1949, then chairman from 1949 to 1966, he oversaw a development process that transformed a $1 million, U.S.-based industrial abrasives and adhesives firm into a $1 billion international corporation with a highly diversified portfolio of businesses built on a broad and expanding technology base. What made the achievement unique, however, was the company's ability to do so while retaining the early legacy of technological innovation, market responsiveness, and institutionalized entrepreneurship.

Expanding and Leveraging the Technology Base

In the process of developing its product line of coated abrasives and pressure sensitive tapes, 3M quickly amassed a strong knowledge of materials technologies and an impressive capability in the precision coating process. To leverage and expand this expertise, in 1937 McKnight approved the creation of a Central Research Laboratory (CRL), thereby launching a technological development program that resulted in a product-market explosion within 3M.

In the culture that emerged, opportunities were generated by both external demand and internal capability. Externally, expanding product applications led to new customer needs that created new development opportunities. The simple tape business, for example, led to scores of new opportunities: electrical tape customers pulled the company into research on specialized technologies from new conducting materials to electrical connectors; reflective tape applications resulted in the development of traffic control and safety systems; and magnetic tape users led 3M technologists into new applications in audio and video recording.

Internally as well, the culture encouraged employees to recognize how existing products, processes, or technologies could be leveraged into new market opportunities. For example, the development of coating process technologies led to research on heat sensitive paper, which in turn got the company involved in duplicating technologies. Even research into basic raw materials contributed to the technology expansions, when, for example, a detailed study of fluorochemical compounds resulted in the development of a by-product that became the basis for products like "Scotchgard" fabric protector. Over time, the products, processes and materials that were the roots of 3M's knowledge grew into a technology tree with over 100 branches, and bearing a prolific crop of new products (see Exhibit 2).

The pace and scope of this development program was possible only because members of 3M's research community recognized the value of sharing their knowledge. Building on the technology leveraging process originated by Dick Drew when he applied adhesives know-how to develop masking tape, 3M developed a strong and clearly articulated company norm: "While products belong to businesses, technology belongs to the company." Although this philosophy was easily implemented in the days when 3M's technologists were linked in a tightly-knit informal network, as the company's research community grew and its technology base expanded, more formal mechanisms were required to maintain the free-flowing transfer of knowledge.

The Technical Council allowed the heads of its increasingly dispersed labs to meet on a regular basis. In addition to their monthly meetings, this group (numbering about 80 people by
the early 1990s) held a three-day annual retreat to discuss company priorities and items of common interest. Always on the agenda was the issue of cross-unit technology transfer.

Even more broadly encompassing was the Technical Forum, a body created in the early 1950s and composed of "senators" drawn from the practicing scientists and technologists in each of 3M's 80-odd U.S.-based labs. The role of this body was to facilitate grass roots scientific communication across horizontal and vertical organizational boundaries. One important role was to represent the concerns of the scientific community to top management. Another was to manage its scores of specialized "chapters" whose purpose was to allow researchers from diverse operations but with similar special interests to hold seminars or invite speakers on their narrow scientific specialty. Finally, they organized the Annual Technology Fair, a three-day internal event in which 3M's scientists showcased their latest findings. Walking from exhibit to exhibit, members of the scientific community learned about the company's latest developments directly from their colleagues.

Through these and other formal channels and forums, the company was able to maintain the vital networks of informal contacts that connected its scientific community. The relationships were strengthened by a strong norm that encouraged any company scientist to contact any other to discuss a problem or ask for advice or help. As a result, even as the company grew, technologies continued to diffuse rapidly, becoming adapted and refined as they did.

Product Development: Linking Technologies to Markets

3M did not think of itself as a "high tech" company, but rather as "a creative company that needs a high level of technology." The recognition that continuous, market-oriented, technologically based development was 3M's lifeblood was institutionalized in the formal objective that 25% of its sales should come from products introduced within the most recent five-year period.

From his experiences as a sales manager, struggling with sandpaper quality problems, McKnight felt that a continuing exchange of ideas between employees in sales, manufacturing, and research would give the company "tripod-like stability." Salesmen were encouraged to provide feedback to production people, plant engineers and technologists routinely discussed new product designs, and researchers were often pulled into customer's plants. Management encouraged employees to pursue ideas stimulated by such interaction and exposure, by actively promoting individual entrepreneurship. For example, one well-known policy encouraged researchers to spend up to 15% of their time pursuing projects of interest to them. Through such "bootlegging" activity, 3M has stumbled on literally scores of new products and technologies, but in the words of one early company leader, "You can only stumble if you're in motion."

Another value that supported innovation and experimentation was management's strong belief in supporting projects even when no large market potential was evident. From its early experience of developing profitable specialized adhesives to attach upholstery, trim, and running board mats for the auto industry, grew a policy which was expressed as "make a little, sell a little." This philosophy encouraged those with good ideas to pursue them, not only because niche markets were profitable, but also because many products and technologies subsequently found applications never dreamed of by the original entrepreneur. The development of a nonwoven material originally launched as a niche decorative ribbon product, for example, eventually spawned scores of other products straddling 19 divisions, from protective facemasks to surgical tape to Scotch Brite cleaning pads.
McKnight believed that such innovative development was feasible only in an organization in which people were given considerable freedom. He told his managers:

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. These are characteristics we want and should be encouraged as long as their way conforms to the general pattern of the operation.

To develop and retain such "good people," 3M managed its human resource practices in a way that ensured entrepreneurs were recognized and appreciated. A "dual ladder" career track allowed those who wanted to develop in research, engineering or marketing to progress while pursuing their professional interests. Achievement was rewarded not only by promotion but also by recognition. The greatest achievement for a 3M scientist, for example, was to be inducted into the Carlton Society, an honor reserved for those who had made the most exceptional scientific and technical contributions to the company. As the importance of team efforts increased, these too were recognized through the company's Golden Step Award Program.

Even more powerful than such formal awards was the informal recognition given to successful entrepreneurs through the oft-repeated stories of major accomplishments that converted mortals into semi-legendary figures. One of the common themes in the many stories of innovation that circulated through 3M was the way in which individual persistence and commitment triumphed over management indifference or organizational rejection. New employees soon heard about the persistence of Alvin Boese, who succeeded in perfecting nonwoven fibers by continuing his experiments in spite of three successive rejections of his proposals by management. Or how Philip Palmquist, the pioneer of 3M's reflective technology, defied orders to stop working on reflective sheeting, and by working in his lab at night, developed the technology that gave birth to the highly successful "Scotchlite" technology. Or how a project team working on a new generation of insulated clothing materials continued bootleg development despite management's attempts to stop it on the grounds that it was not an appropriate business for 3M. This lattermost story is likely to be told by CEO "Desi" DeSimone, who would most likely reveal to his listener that it was he who tried to stop the project, which nonetheless continued, culminating in 3M's highly successful Thinsulate brand of insulated outerwear.

But the company also recognized that risk taking would only continue if its management process permitted what McKnight called "well-intentioned failure." He preached:

Mistakes will be made, but if a person is essentially right, the mistakes he or she makes are not as serious in the long run as the mistakes management will make if it is dictatorial and undertakes to tell those under its authority exactly how they must do their job. Management that is destructively critical when mistakes are made kills initiative, and it is essential that we have many people with initiative if we are to continue to grow.

Through such strong ingrained values, 3M managers learned to ensure that when a project failed, those involved in it were not penalized, but were supported in their efforts to quickly move on to something new. And stories of how "failed" technologies eventually found applications were almost as numerous as more linear success stories. Most recently,
management made much of the development of an extremely weak adhesive by a scientist who was trying to create the opposite properties. Eventually, the “failed” development was picked up by another technologist who saw its weak sticking power as an asset, and ended up creating Post-it® notes.

Developing the Organizational Model

As its portfolio of products and technologies grew, 3M found operations increasingly difficult to manage. In 1944, McKnight experimented with a new organization form by creating an adhesives division and giving a division general manager full responsibility for its operation. The experiment succeeded, and by 1948 he was ready to reorganize the entire company into seven divisions, each with its own research lab, production operation, and sales force. Over the years, divisions proliferated, driven by the company’s growing product and market diversification, and by a management philosophy that retained its strong bias towards small entrepreneurial units. Ex-CEO Ray Herzog explained 3M’s “grow and divide” concept:

Over the years, we’ve discovered that when a division reaches a certain size, it has a tendency to spend too much of its time on established products and markets and a lesser amount on new products and businesses. When we break out new businesses and appoint a new management team, we find, almost without exception, that the new division begins growing at a faster rate. We also stimulate the established division to find other new products and markets to meet its growth objectives.

By the late 1960s, however, the proliferation of divisions could no longer be managed directly by the president, and the company decided to cluster divisions with related products and markets into groups. Under the “grow and divide” concept, management expected this hierarchy of organizational units to evolve organically. Promising product development projects would grow into departments, successful departments would be spun off as new divisions, and large divisions would become the basis for new groups.

While the “grow and divide” philosophy decentralized sales, production, and development to the operating level, McKnight and his successors also set stretching growth and performance targets to drive performance in the divisions. In addition to the objective of having 25% of sales come from new products, each division was expected to contribute to a very clear set of corporate financial performance targets: to generate annual inflation-adjusted growth in sales and earnings of 10%, pre-tax profit margins above 20%, and return on shareholders equity of 25%. Furthermore, management kept tight control over these operations through a strong corporate staff and a sophisticated control system. The corporate controller’s office provided top management with analysis of divisional performance, drawing on information provided by their staff member controller located in each division. And these standards and controls were applied uniformly as Herzog explained:

Just as important as our belief in flexible organization is our conviction that 3M’s growth and profitability should come not from a few of our product lines, but from each and every 3M profit center around the world. We recognize some of our businesses as established, but none as mature, and exempt none of them—not even the oldest—from striving to meet our standards for growth and profitability.
International Expansion

McKnight had long preached that if 3M didn't expand abroad, its competitors would, using international markets to build their strength to battle 3M at home. But despite the fact that he had obtained worldwide patent protection for Wetordry sandpaper, and had dispatched his eastern division sales manager to Europe to establish distributorships in the early 1920s, most of the company's overseas activities were channeled through the Durex Corporation, a holding company created jointly by 3M and eight other abrasives companies to manufacture and sell products in seven overseas countries. It was only after the court-ordered dissolution of Durex in 1951 that 3M began building its own overseas operations in earnest.

On the basis of its share of the old Durex companies, 3M created an International Division. After building this original group of six subsidiaries, the company started an aggressive expansion program ("the second round") under what became known as the FIDO principle—First In Defeats Others. Subsidiaries were usually started small, and built through self-generated and self-financed growth—an international extension of the "make a little, sell a little" principle. The parent company's influence on these autonomous subsidiaries was exerted through its seats on the local company's board, through its control over the products and technologies vital to the subsidiary's growth, and through the 3M planning and control process. Powered by entrepreneurial energy and stretched by ambitious growth targets, 3M managers began looking towards international markets as an obvious source of growth, and by 1973 overseas sales had passed the $1 billion mark.

3M at 75 Years

The 1977 Annual Report carried a bittersweet message. While announcing a growth in sales and earnings figures that seemed to signal an end to the downturn caused by the worldwide recession, it also reported the death of William L. McKnight, the company's spiritual leader. With sales of almost $4 billion, there was a sense of impending transition within 3M. In its typically frank manner, the company confronted the growing concerns in the management review section of its 1977 annual report: "Bigness can be an obstacle to growth, because in bigness you tend to lose communication. And when you lose communication, you lose the continuity of philosophy which is so important in 3M."

The free-ranging discussion also acknowledged that profitable growth in the future would not be as easy to achieve. First, economic slowdown and foreign competition were likely to slow domestic growth. Second, international expansion, a powerful growth engine for 25 years, would become more difficult. And finally, 3M's leadership acknowledged that the company's vital new product development capability had been operating less effectively in recent years. While the discussion concluded that many of the problems contributing to the innovation slowdown were now behind it, there was still a note of reservation in management's assessment. ("I think the flow of new products is good," said the CEO. "This isn't to say it couldn't be better.") This was not the usual expression of confidence and excitement with which top management normally described its innovative capacity.

As the company moved towards the 1980s, it seemed that the combination of external challenges and internal changes were likely to demand management's attention. In fact, the decade that followed proved to be one requiring substantial adjustment, restructuring, and even redefinition of some of 3M's past policies and practices.

Assuming the CEO’s job in 1980, 35-year 3M veteran, Lou Lehr, was immediately challenged by a renewed outbreak of inflation and global recession following the second “oil shock.” While trying to deal with the short-term performance pressure this created, Lehr also wanted to confront some of the long-term transition issues management had been facing. Among the important priorities he set for the company under his leadership were a major reorganization to allow more cross-unit coordination, a new emphasis on formal strategic planning, and the expansion and leveraging of 3M’s technological base.

Redesigning the Structure

One of Lehr’s first priorities was to assess management's ability to deal with the consequence of the company’s institutionalized entrepreneurship—an ongoing diversification process that had led to the addition of 15 new divisions and five new product groups during the previous decade alone. As 3M continued to exploit the rich interaction between its 85 basic technologies, its 40-odd major product markets, and its direct access to 50 countries worldwide, Lehr’s concern was that the company’s diversity which he termed “our greatest strength” was leading to “a fragmentation of effort.”

In 3M’s biggest reorganization in 30 years, the new CEO decided to collect the entire portfolio of 42 divisions and 10 groups into four business sectors based on their related technologies. (See Exhibits 3 and 4.) The primary objective, to facilitate the development and diffusion of technologies across closely related divisions, was supported by giving each sector its own laboratory. In the new configuration, the Central Research Laboratories were to concentrate on long-term basic research that would lead the company into entirely new businesses; the new sector labs had a mandate to focus on the core technologies that would drive medium term (five to ten year) growth in the businesses they supported; and the division labs were to continue to work on developing the new products and processes with immediate application or potential.

The new sector structure also allowed a gradual adjustment of 3M’s historical philosophy of creating fully-integrated, self-sufficient divisions. In a number of businesses, particularly those facing competitive price pressure (specialty chemicals, pressure-sensitive tape, and audio and videotape, for example), stand-alone manufacturing divisions were created to concentrate scale and to focus on productivity and quality improvements. And as management began emphasizing market development as much as product development, units like the Automotive Trades Division and the Commercial Office Supplies Division developed as specialized channels delivering products from numerous 3M divisions to a focused market.

Formalizing the Planning

At least as impactful as the structural change was the business planning responsibility given to the executive vice presidents named to head the new sectors. On a rotating basis, each headed up a new 12-person Corporate Strategic Planning Committee which oversaw the formal planning process modeled after the systems developed in GE in the early and mid-1970s. Designed as a classic “bottom-up/top-down” process, division plans were prepared in response to broad corporate strategy targets. After being reviewed and consolidated by successive
management layers, these became the basis for short-term corporate objectives that framed a
bottom-up, budget planning process in the second half of the year.

To provide an additional strategic perspective at the group level, some 20 Strategic
Business Centers (SBCs) were defined. Cutting across divisions, they could be as broad as the
Tape SBC, which encompassed industrial, consumer, medical, electrical, auto systems, and
diaper tapes; or as narrow as the photographic SBC, which corresponded to a single division.
These were the “thought centers” gathering the strategic information on markets and
competitors that became both an important input to the planning process and the basis for
setting their performance measures.

Particularly at the division level, managers found the new format-driven process
counter-cultural. Having become accustomed to informal planning on the basis of
opportunities they themselves perceived, and to being measured against industry, market and
competitive standards they themselves determined, many had neither the expertise nor the
enthusiasm to adapt during the first few cycles. Gradually, however, as the system moved
away from what one manager described as “planning by the pound,” line managers became
more accepting in their attitude and sophisticated in their approach. In the words of one
division manager, “By focusing attention externally, and particularly on competitors, it jolted
us out of our short-term, operational mentality.” A senior staff planning manager described
another benefit:

For the first time we were forced to evaluate lots of projects, products
and even whole businesses that just weren’t performing. Pretty quickly, we
cleaned out the scores of activities that had been struggling along for years. And
eventually, we were forced to confront some major problems such as our copier
business which we eventually spun off as a joint venture. In a company so
focused on expansion, cutting out businesses was an entirely new experience.

**Boosting Technology Investment**

As a chemical engineer whose development of surgical tape had led the company into
the health care business, Lehr was a strong believer in the need to maintain and expand 3M’s
technological base. As a result, he wanted to increase substantially an R&D budget that had
been squeezed by 3M’s need to borrow large amounts at high interest rates in the mid-1970s.
Over Lehr’s six years as CEO, 3M’s spending on R&D more than doubled from $238 million
(4.4% of sales) in 1979 to $507 million (6.5% of sales) in 1985, providing a new impetus to
innovation that boosted the key measure of sales from products introduced over the past five
years over the 25% level again.

The new organization structure, planning process, and funding policies had an
enduring impact on 3M’s product and process development. In 1993, a division vice president
explained:

Previously innovation was driven by management asking researchers,
“What rabbit can you pull out of the hat to meet our targets?” We relied on a
pool of technology, some talented people, and a supportive culture to create
innovations by spontaneous combustion. The individuals who came up with the
new products were heroes, no matter what the fit with existing businesses or
market access. So there were hundreds of initiatives—you could do anything.
But as development became more expensive and riskier, we needed the focus and discipline of the new structure and processes.

But Lehr didn’t want his new structures and planning process to stamp out individual efforts and serendipitous discoveries. To ensure research efforts unrelated to specific divisional priorities could still occur, he authorized the establishment of the Genesis program to provide individuals with up to $50,000 seed money to support further research on any promising idea. And to boost individual recognition in a time of more pressure for team projects, the Circle of Technical Excellence was created to recognize achievement through peer nomination.

Finally, in an attempt to build on the long established resource-sharing tradition that the technologists had mastered, Lehr launched an ambitious program called “Cooperating for Growth” which aimed at changing the company’s technically specialized sales forces into broad-based problem solvers able to provide links to 3M’s full range of products. Cross-division “sales clubs” were organized by region to allow specialists to meet over lunch on a monthly basis; general “trade fairs” and special customer “trade shows” were organized through the collaboration of multiple divisions; and one-on-one referral meetings or joint sales calls were encouraged. But despite the prodigious effort, most felt that the program had achieved only modest success.

Impact and Performance

Respected as a leader who communicated a strong vision of the future, Lehr’s actions were particularly bold in a difficult business environment. In contrast to 3M’s 14% average annual growth in both sales and earnings during the 1970s, in the first half of the 1980s the average annual sales growth fell to 5% while net income remained essentially flat from 1980 to 1985. A worldwide recession, a stubbornly overvalued dollar, and a major challenge by foreign competitors (particularly from Japan) all contributed to the problem. These were the challenges that would confront Allen “Jake” Jacobson, the bottom-line focused veteran who took over as CEO in early 1986, vowing to deal with “a storm of competition we can’t run away from.”


Among the most valuable parts of the legacy Lehr left to Jacobson was a technology base broadened and strengthened by the addition of more than 20 new technologies. Several, such as microreplication and microporous membranes, seemed to have broad and immediate product application, and as the product pipeline filled, the percentage of sales from new products increased, passing 30% by 1988.

On the liabilities side, however, 3M’s cost of goods sold had increased from 54.7% in 1979 to 60.5% by 1985, accounting for almost the entire drop in net income from 21.2% to 14.0% of sales. (See Exhibit 1.) This increasingly uncompetitive cost structure had already forced the company to withdraw from or spin-off several operations including such core businesses as audio tapes and copying machines. As competitive pressures increased both in its old line businesses like abrasives and office supplies, as well as newer fields like magnetic media, Jacobson concluded that 3M had to make some major changes to its traditional strategies.
Increasing Productivity and Competitiveness

In 1985, as president of 3M’s U.S. operations, Jacobson had initiated a program that he dubbed “J35”—the J stood for Jake and the 35 stood for his five-year target percentage reduction in manufacturing labor content and manufacturing cycle time—and when he became CEO the following year, he made the targets worldwide. At the same time, the disciplined planning process was forcing managers to recognize and respond to growing external pressures on both selling prices and raw material costs. Together these external and internal forces were reshaping the way 3M managers thought about competitive strategy. Chuck Harstad, division vice president for the Commercial Office Supply Division (COSD) explained:

Historically, our drive for profit and our preference for developing premium-priced products aimed at market niches meant that we were not comfortable competing on price. As a result, we never fully developed our manufacturing competencies. And when competitors followed us, we would refuse to confront them—it was always easier to innovate our way into a new niche. By the mid-1980s we had begun to change that and develop new strategies that were revolutionary within 3M culture.

Viewing the highly profitable Post-it note product as competitively vulnerable, Harstad and his COSD management team revolutionized their approach by redefining the strategic objective as maintaining a 90% global market share. Confronting the need to reduce costs and adopt more aggressive competitive strategies, they decided, for example, to challenge lower-priced American competitors like Avery and Ampad by introducing a Highland brand product line and pricing it at half the level of the original Post-it note. By entering into a co-labeling agreement with a major German distributor which had previously been importing a Japanese product, they not only cut off market access for the Japanese, they also acquired a strong ally with whom they could challenge an emerging German competitor.

This new strategic approach required a major change in management mentalities at multiple levels. Within the division, there was initial skepticism that a 90% share objective was achievable. And among higher level managers, there was resistance when Harstad presented his co-labeling strategy. But despite one top manager’s comment that he hoped the contract would never be signed, in classic 3M style they allowed the division to make its own decision.

Other divisions, particularly those selling mature products like sandpaper, or operating in highly competitive segments like videotape, were learning that market share and unit cost measures were as important as new product percentage and net profit. In Harstad’s words, “We learned how to compete—how to focus on competitive objectives, not just internal projects.”

A More Disciplined Development Process

While Jacobson was determined to continue Lehr’s commitment to funding R&D at a rate about twice that of the average U.S. industrial company, he also began to emphasize the need to convert such investment into a more effective source of competitive advantage. In particular, he wanted the company to become more focused in its choice of project development, and faster in bringing new products to market.
Again, the roots of this approach could be traced to divisions which had felt the competitive need to change. For example, in the mid-1980s there was concern in the Occupational Health and Safety Division (OHSD) that its business relied almost entirely on its original 20-year-old dust and mist respirators. In an attempt to reduce its eight- to nine-year lead time in bringing new products to market, division management created Action Teams composed of technology, production, and marketing specialists, and charged them with the responsibility of developing and delivering new products. Within a couple of years, these teams had brought several major new OHSD products to market, and other divisions were reporting similar fast development successes using cross-functional teams.

As group vice presidents began transferring these practices across divisions, Jacobson supported and accelerated the process by highlighting the successes as models for the corporation. The team approach received a major boost with the construction of a major new facility in Austin, Texas, designed specifically to facilitate cross-functional interaction and encourage teamwork. Some like David Kolander, vice president of OHSD, felt that there had been a fundamental shift in 3M's management:

The day of the individual entrepreneur is over at 3M. Whenever an issue arises now, we create teams. In OHSD, we have 12 Action teams to work on product development, 15 "Challenge 95" teams to effect cost reduction and process improvement, six Strategy teams to analyze the needs of each of our product market segments, and various others to meet specific needs. We still like to talk about the brilliant inventor who converts his innovation into a new business, but I can’t think of one of our 50-odd divisions that is led by an inventor. Today’s leaders must be able to develop and manage teams.

As well as ensuring that new products moved to market more quickly, the company also began to adopt a more disciplined approach to defining, selecting, and funding projects. Chuck Reich, vice president of the Dental Products Division, described the change:

Previously a scientist could work on a project for years, with money just dribbling out to support it and management not really knowing how much had been invested or what the potential was. Today we try to do a lot more sorting out early. We ask for a product positioning statement right up front, and if it’s not clear, it won’t be funded. So now, instead of running 100 programs as we did before, our division is focused on 12, from which we should have 10 successes.

A division's selection of projects was further controlled and refined by a technical audit process managed by the Corporate Technical Planning and Coordination group. Established in the 1960s to track 3M's diverse R&D activities, the technical audit had become a much more sophisticated and important management tool in the 1980s, serving to monitor the project selection process and help allocate R&D resources among sectors. Using a data base containing over 25 years of information on hundreds of projects, the corporate group had developed detailed models that helped them predict the likely success of a program based on an analysis of technical factors (such as assessed strength of technology and manufacturability), business factors (such as financial potential and competitive position), and administrative factors (such as audited organization, planning, and staffing). Focusing primarily on high-stake development programs, an audit team reviewed the current work of each lab every two or three years, reporting their findings and recommendations to the lab and division management. The team's
credibility stemmed from the fact that it was a peer evaluation—half of its 12 members typically came from the lab being audited, while the others were drawn from corporate technical staff and from other 3M labs familiar with the technology under review.

In a corporate initiative called “Pacing Programs,” each division was asked to identify the handful of development programs that could “make a major difference” in terms of volume impact, or could “change the basis of competition” for their business. The 100 or so new product and process programs identified were then given corporate priority for both funding and management attention. However, there was some concern that the new emphasis on focus, speed, and discipline had cost the system some of its freedom and flexibility. One division vice president said:

There is clearly less freedom in the labs than there was 10 or 15 years ago, and that means it’s less fun for the researchers. As a result, there are more motivation and morale issues to deal with today. The other impact of the greater efficiency is that it’s hard for most people to find the 15% of their time to work on their own ideas, and I wonder how much room we have left for serendipity.

Focus on Customers and Markets

Another major priority for Jacobson was to ensure that the company’s technological capabilities did not overwhelm its customer sensitivity and market focus. He continued Lehr’s emphasis on quality defined in terms of meeting customer expectations, but characteristically attached a productivity measure to it—a 35% reduction in the cost of quality, which he added to the J35 targets for 1990.

Like Lehr, Jacobson also tried to increase 3M’s effectiveness in what he described as “resource sharing.” In place of Lehr’s ambitious but only modestly successful “Cooperating for Growth” program, the company initiated a more internally-focused emphasis on “related selling.” The objective was to reinforce and broaden the role of specialized distribution units in selling products from multiple divisions through specialized channels such as office supply dealers, automotive body shops, or hospital purchasing offices.

But it was in the area of international market expansion that Jacobson saw the opportunity for the most immediate improvement. With market penetration at only half the U.S. rates, overseas sales accounted for only 37% of total sales in 1985. Jacobson encouraged major investments in offshore technical resources and manufacturing capabilities in an effort to expand overseas sales to a target level of 50% of the company’s total.

Impact and Performance

When he retired in October 1991, “Jake” Jacobson looked back with some pride at the company’s achievement. The 10% average annual sales growth had been greatly aided by the international expansion, and in each year between 1986 and 1990, 3M had exceeded its goal of accounting for 25% of its sales from new products—in fact, for the last three years the percentage had exceeded 30%. Furthermore, over the five-year period, earnings per share growth averaged 15.6% per annum against a corporate objective of 10% or better. On the J35 productivity targets, the company had achieved a 35% reduction in labor content, a 40% drop in the cost of quality, and a 21% cut in manufacturing cycle time over his five-year tenure.
All this had required substantial financial investment. Annual R&D investment had been maintained in the range of 6.5% to 6.6% of sales, amounting to more than $3.5 billion over five years. Aggressive capital investment during the period, particularly in plant modernization, had totaled $4.9 billion. Nonetheless, return on stockholders' equity averaged 20.9% between 1986 and 1990, compared to the corporate target of 20%-25%, while return on capital employed averaged 25.2% against the objective of 27%. With such a performance, the company again made Fortune's list of "America's Ten Most Admired Companies," its sixth appearance in seven years. In addition, 3M was named R&D Magazine's Corporation of the Year, and on his retirement, Jacobson was named Manager of the Year by the National Management Association.

But because many of the changes implemented during the 1980s had challenged and even overturned some of the company's established practices, some voiced concern about the future. One senior manager reflected on the uncertainty:

We are trying to maintain opportunities for the classic individual entrepreneur, but the more carefully planned, team-oriented approach seems to be diminishing the centrality of the innovative genius. In addition, the need for bigger technology bets and for greater speed to market has made the small-scale "bootlegging" approach and the incremental "make a little, sell a little" philosophy less common in many of our businesses. And we are not spinning off new, self-sufficient divisions like we did in the 1960s and 1970s. In fact, our "divide and grow" approach seems to have been replaced by a reverse tendency to consolidate organizational units and specialize them by function.

Other observers questioned whether all the changes were sufficient to convert 3M into a successful innovator in the high tech businesses it had entered. Commenting on the continued poor performance of 3M's memory technologies business, an industry consultant suggested: "This is a business of rapid decisions, short product life cycles and tough managements, and 3M can't compete in an industry like that." Forbes magazine concluded:

The company's well-deserved reputation as an innovator rests largely on incremental improvements in slow moving markets such as adhesive tapes, films, abrasives and coatings, where its proprietary technology tends to hold up well. It simply isn't geared to businesses where today's hot seller can be tomorrow's inventory glut.

Whether these doubts had any basis in fact would be an issue for "Jake" Jacobson's successor to answer.


On November 1, 1991, Livio "Desi" DeSimone, a 34-year 3M veteran, succeeded Jacobson as CEO. The 54-year-old was described in one report of his appointment as "a textbook example of the quintessential 3M CEO." Joining as an engineer, DeSimone gradually progressed into more managerial positions, largely on international assignments, becoming

managing director of 3M’s Brazilian company in the early 1970s. After overseeing the Latin American area in the late 1970s, he spent the next decade in senior corporate positions heading each of the company’s four business sectors. A high energy, consensus builder, he was known as a manager who got results, but with a much looser style than his extremely focused, discipline-oriented predecessor.

Asked to describe his own management approach, he said he would try to combine the attributes of his three predecessors: Ray Herzog’s charismatic motivating style, Lou Lehr’s ability to bring the best out of an individual, and “Jake” Jacobson’s discipline, focus and objectivity. However, he recognized he would be leading an organization that was quite different from the company he joined in the 1960s. DeSimone reflected:

The old 3M model isn’t dead, but in recent years a greater command and control capability has been overlaid on it. It’s simply another variable for management to use. Autonomous action by people in the organization is still the key. But now we have a better architecture for emergency intervention.

Senior management’s role is to create an internal environment in which people understand and value 3M’s way of operating. It’s a culture in which innovation and respect for the individual are still central. If you have a senior management who have internalized the principles, you create a trust relationship in the company. The top knows it should trust the process of bottom-up innovation by leaving a crack open when someone is insistent that a blocked project has potential. And the lower levels have to trust the top when we intervene or control their activities. It all depends on good communication.

Our job is really one of creation and destruction—supporting initiative while breaking down bureaucracy and cynicism. It’s also one of balancing freedom and control. Don’t forget that even in the McKnight era, there was strong monitoring and financial standards that allowed him to intervene in a crisis.

Like Lehr, DeSimone moved quickly to reorganize, regrouping the company’s businesses from four sectors into three. He also continued Jacobson’s productivity initiatives with new five-year targets aiming for a reduction in unit manufacturing cost of 10% in real terms, and a 35% reduction in cycle time, and re-energized and refocused Lehr’s quality initiative as a program committed to total customer satisfaction.

But perhaps the most dramatic new challenge he set for 3M was in raising the ante for faster, more efficient product development. While retaining the company’s three aggressive financial goals (10% earnings growth, 27% ROCE, and 20%-25% ROE), he increased its best known objective of achieving 25% of sales from products introduced within the past five years. In the future, the target would be 30% of sales from products introduced within the last four years to reflect the new strategic imperative to develop and bring innovations to market faster. He backed this objective with an increase in R&D funding to $1 billion in 1992, a level representing 7.2% of sales.

The task facing DeSimone was substantial. Following annual sales and earnings growth of around 13% in the 1970s and almost 8% through the 1980s, the new decade had begun sluggishly for 3M. In the midst of a worldwide economic slump, sales for the first three years of the 1990s grew at an annual rate of less than 5%, while earnings remained essentially flat. And
performance against the other two key financial goals was also disappointing: the 1992 return on equity of 18.8% had fallen below the 20% target rate for the past two years, while the ROCE had dropped even more dramatically after 1989, plunging more than eight percentage points to 19.7%, far short of the 27% target.

As the company became larger and more diverse, some observers had begun to ask even more fundamental questions about 3M’s ability to maintain its unique ability to drive growth through innovation. With $14 billion in sales and almost 90,000 employees spread across 47 product divisions and national companies in 57 countries, some felt that 3M had become too large, too diverse, and too widely dispersed to be managed effectively. It was a challenge which DeSimone would have to face.
Exhibit 1  Eleven-Year Financial Summary: 1981-1991 (Dollars in millions except per share data)

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<tr>
<td>Net sales</td>
<td>$13,340</td>
<td>$13,021</td>
<td>$11,990</td>
<td>$11,323</td>
<td>$10,004</td>
<td>$9,056</td>
<td>$8,117</td>
<td>$7,947</td>
<td>$7,039</td>
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<td>Income before income taxes and minority interest</td>
<td>1,877</td>
<td>2,135</td>
<td>2,099</td>
<td>1,985</td>
<td>1,646</td>
<td>1,393</td>
<td>1,122</td>
<td>1,277</td>
<td>1,112</td>
<td>1,014</td>
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<td>Effective tax rate</td>
<td>36.8%</td>
<td>37.4%</td>
<td>39.3%</td>
<td>40.4%</td>
<td>42.9%</td>
<td>43.2%</td>
<td>40.3%</td>
<td>42.1%</td>
<td>40.0%</td>
<td>37.8%</td>
<td>41.6%</td>
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<td>Net Income</td>
<td>$1,154</td>
<td>$1,308</td>
<td>$1,244</td>
<td>$1,154</td>
<td>$918</td>
<td>$779</td>
<td>$664</td>
<td>$733</td>
<td>$667</td>
<td>$631</td>
<td>$673</td>
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<tr>
<td>Per share</td>
<td>5.26</td>
<td>5.91</td>
<td>5.60</td>
<td>5.09</td>
<td>4.02</td>
<td>3.40</td>
<td>2.89</td>
<td>3.13</td>
<td>2.83</td>
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<td>Annual growth in earnings per share (%)</td>
<td>(11.0)%</td>
<td>5.5%</td>
<td>10.0%</td>
<td>26.6%</td>
<td>18.2%</td>
<td>17.6%</td>
<td>(7.7)%</td>
<td>10.6%</td>
<td>5.8%</td>
<td>(5.6)%</td>
<td>0.7%</td>
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### Financial Ratios

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<tr>
<td>Percent of sales</td>
<td>60.4%</td>
<td>58.8%</td>
<td>57.9%</td>
<td>57.9%</td>
<td>58.5%</td>
<td>59.1%</td>
<td>59.5%</td>
<td>59.1%</td>
<td>58.1%</td>
<td>58.8%</td>
<td>57.3%</td>
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<tr>
<td>Selling, general and administrative expenses</td>
<td>24.9</td>
<td>24.4</td>
<td>24.2</td>
<td>24.3</td>
<td>24.7</td>
<td>24.6</td>
<td>24.9</td>
<td>24.3</td>
<td>24.7</td>
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<tr>
<td>Operating income</td>
<td>14.7</td>
<td>15.8</td>
<td>17.9</td>
<td>17.8</td>
<td>16.8</td>
<td>16.3</td>
<td>14.6</td>
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<td>16.2</td>
<td>15.9</td>
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<td>Income before income taxes and minority interest</td>
<td>14.1</td>
<td>15.4</td>
<td>17.5</td>
<td>17.5</td>
<td>16.4</td>
<td>15.4</td>
<td>13.8</td>
<td>16.1</td>
<td>15.8</td>
<td>15.4</td>
<td>17.7</td>
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<tr>
<td>Net income</td>
<td>8.7</td>
<td>10.0</td>
<td>10.4</td>
<td>10.2</td>
<td>9.2</td>
<td>8.6</td>
<td>8.2</td>
<td>9.2</td>
<td>9.5</td>
<td>9.6</td>
<td>10.3</td>
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<tr>
<td>Return on capital employed</td>
<td>20.2</td>
<td>24.5</td>
<td>26.6</td>
<td>26.8</td>
<td>24.4</td>
<td>23.2</td>
<td>20.0</td>
<td>23.7</td>
<td>22.4</td>
<td>21.0</td>
<td>25.2</td>
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<tr>
<td>Return on average stockholders' equity</td>
<td>18.7</td>
<td>22.7</td>
<td>23.1</td>
<td>21.6</td>
<td>19.1</td>
<td>18.2</td>
<td>17.2</td>
<td>19.4</td>
<td>18.3</td>
<td>18.0</td>
<td>20.1</td>
</tr>
<tr>
<td>Current ratio</td>
<td>1.7</td>
<td>1.7</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.2</td>
<td>2.4</td>
<td>2.4</td>
</tr>
<tr>
<td>Debt/equity ratio</td>
<td>23%</td>
<td>24%</td>
<td>26%</td>
<td>14%</td>
<td>15%</td>
<td>20%</td>
<td>24%</td>
<td>22%</td>
<td>16%</td>
<td>16%</td>
<td>17%</td>
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### 10-Year Compound Growth Rates

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<tbody>
<tr>
<td>Sales</td>
<td>7.2%</td>
<td>7.7%</td>
<td>7.9%</td>
<td>9.0%</td>
<td>9.4%</td>
<td>9.7%</td>
<td>9.8%</td>
<td>10.2%</td>
<td>10.7%</td>
<td>12.1%</td>
<td>13.6%</td>
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<tr>
<td>Earnings per share</td>
<td>6.2%</td>
<td>7.6%</td>
<td>7.5%</td>
<td>8.7%</td>
<td>8.2%</td>
<td>8.3%</td>
<td>9.7%</td>
<td>9.0%</td>
<td>8.0%</td>
<td>9.5%</td>
<td>11.9%</td>
</tr>
<tr>
<td>Cash dividends per share</td>
<td>7.6%</td>
<td>7.5%</td>
<td>0.0%</td>
<td>7.8</td>
<td>8.1</td>
<td>9.5</td>
<td>10.0</td>
<td>10.5</td>
<td>12.1</td>
<td>12.8</td>
<td>12.5</td>
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### Other Information

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<tbody>
<tr>
<td>Cash dividends paid</td>
<td>$686</td>
<td>$647</td>
<td>$578</td>
<td>$481</td>
<td>$425</td>
<td>$412</td>
<td>$403</td>
<td>$398</td>
<td>$388</td>
<td>$376</td>
<td>$352</td>
</tr>
<tr>
<td>Per share</td>
<td>3.12%</td>
<td>2.92%</td>
<td>2.60%</td>
<td>2.12%</td>
<td>1.86%</td>
<td>1.80%</td>
<td>1.75%</td>
<td>1.70%</td>
<td>1.65%</td>
<td>1.60%</td>
<td>1.50%</td>
</tr>
<tr>
<td>Stock price at year end</td>
<td>95.25%</td>
<td>85.75%</td>
<td>79.63%</td>
<td>62.00%</td>
<td>64.38%</td>
<td>58.31%</td>
<td>44.88%</td>
<td>39.31%</td>
<td>41.25%</td>
<td>37.50%</td>
<td>27.25%</td>
</tr>
<tr>
<td>Stockholders' equity per share</td>
<td>28.72%</td>
<td>27.80%</td>
<td>24.15%</td>
<td>24.58%</td>
<td>22.24%</td>
<td>19.53%</td>
<td>17.49%</td>
<td>15.40%</td>
<td>15.77%</td>
<td>15.05%</td>
<td>14.68%</td>
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<tr>
<td>Total assets</td>
<td>11,083</td>
<td>11,079</td>
<td>9,741</td>
<td>9,240</td>
<td>8,532</td>
<td>6,520</td>
<td>7,900</td>
<td>6,960</td>
<td>6,314</td>
<td>5,760</td>
<td>5,514</td>
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<td>Capital expenditures</td>
<td>1,326</td>
<td>1,275</td>
<td>1,137</td>
<td>886</td>
<td>742</td>
<td>727</td>
<td>805</td>
<td>745</td>
<td>557</td>
<td>608</td>
<td>561</td>
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<td>Research &amp; development</td>
<td>914</td>
<td>865</td>
<td>784</td>
<td>721</td>
<td>650</td>
<td>586</td>
<td>520</td>
<td>454</td>
<td>396</td>
<td>349</td>
<td>396</td>
</tr>
<tr>
<td>Number of employees at year end</td>
<td>88,477</td>
<td>89,601</td>
<td>87,584</td>
<td>85,569</td>
<td>85,144</td>
<td>84,496</td>
<td>88,003</td>
<td>69,179</td>
<td>85,702</td>
<td>87,360</td>
<td>91,410</td>
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<tr>
<td>Average shares outstanding</td>
<td>218.6</td>
<td>221.4</td>
<td>222.2</td>
<td>226.0</td>
<td>228.8</td>
<td>229.3</td>
<td>229.9</td>
<td>233.9</td>
<td>255.3</td>
<td>285.1</td>
<td>234.7</td>
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Exhibit 2  3M's Technology Tree
Exhibit 3  3M Organization Prior to 1981 Reorganization

Stockholders
EXECUTIVE COMMITTEE

CHAIRMAN OF THE BOARD AND CHIEF EXECUTIVE OFFICER

BOARD OF DIRECTORS

FINANCE COMMITTEE

PRESIDENT U.S. Operations

PRESIDENT International Operations

MARKETING

ENGINEERING AND MANUFACTURING

FINANCE

LEGAL AFFAIRS

PUBLIC RELATIONS AND PERSONNEL

RESEARCH AND DEVELOPMENT

PURCHASING AND TRANSPORTATION

ABRASIVES, ADHESIVES, BUILDING SERVICE AND CHEMICAL GROUP

INDUSTRIAL ABRASIVES

AUTOMOTIVE TRADES

HARDWARE-Paint TRADES

BUILDING SERVICE AND CLEANING PRODUCTS

ADHESIVES, COATINGS AND SEALERS

COMMERCIAL CHEMICALS

CHEMICAL RESOURCES

ADVERTISING SERVICES AND PROTECTIVE PRODUCTS GROUP

TRAFFIC CONTROL PRODUCTS

TRAFFIC CONTROL MATERIALS

SAFETY SYSTEMS

INDUSTRIAL MINERAL PRODUCTS

DECORATIVE PRODUCTS

NATIONAL ADVERTISING COMPANY

ELECTRICAL PRODUCTS GROUP

ELECTRO-PRODUCTS

INDUSTRIAL ELECTRICAL PRODUCTS

PRELIER ELECTRICAL INSULATION COMPANY

TECHNICAL CERAMICS

ELECTRONIC PRODUCTS

GRAPHICS SYSTEMS GROUP

DUPLEXING PRODUCTS

MICROFILM PRODUCTS

VISUAL PRODUCTS

PAPER PRODUCTS

3M BUSINESS PRODUCTS SALES INC.

HEALTH CARE PRODUCTS AND SERVICE GROUP

HEALTH CARE PRODUCTS

MEDICAL PRODUCTS

SURGICAL PRODUCTS

RIKER LABORATORIES, INC.

PHOTOGRAPHIC PRODUCTS GROUP

PHOTOGRAPHIC PRODUCTS

DYNACOLOR CORPORATION

PRINTING PRODUCTS

INDUSTRIAL GRAPHICS

RECORDING MATERIALS GROUP

MAGNETIC AUDIO/Visual PRODUCTS

DATA RECORDING PRODUCTS

FILM AND ALLIED PRODUCTS

LINSOON

TAPE AND ALLIED PRODUCTS GROUP

INTERNATIONAL GROUP

EUROPE

AUSTRALIA-ASIA

CANADA

LATIN AMERICA

AFRICA
Exhibit 4  3M Organization After 1981 Reorganization