3M TAIWAN: PRODUCT INNOVATION IN THE SUBSIDIARY[1]

Chya-Yi Liaw (Emily) wrote this case under the supervision of Christopher Williams solely to provide material for class discussion. The authors do not intend to illustrate either effective or ineffective handling of a managerial situation. The authors may have disguised certain names and other identifying information to protect confidentiality.

In 2004, Tao-Chih Chung, departmental head of the health care business division of 3M Taiwan, initiated a project intended to exploit local market needs for 3M's hydrocolloid dressing, a technology that had existed within the company for many years without any practical applications. 3M hydrocolloid dressings were sterile wound dressings consisting of a hydrocolloid adhesive covered by an outer, clear adhesive film impermeable to liquids, bacteria and viruses.[2] The product was regarded as a medical material in Taiwan, sold only to hospitals and drug stores affiliated with clinics.

A product development review was conducted to examine the product's potential in the local market. The local project team suggested marketing the material as an acne treatment. The product would be known as Acne Dressing. There was no standardized solution for acne treatment in Taiwan. If launched, Acne Dressing would be a new and innovative product in the local market as well as 3M's first application of hydrocolloid dressing technology. Since there were no similar products in the market, the project team had limited information: potential sales and volume estimations were largely speculative. With little previous experience in product development and no similar products to base development on, Chung had to decide whether or not to proceed with the product launch.

3M OVERVIEW

3M, formerly known as The Minnesota Mining and Manufacturing Company, was founded in Two Harbors, Minnesota in 1902. Five businessmen planned to mine a mineral deposit for grinding-wheel abrasive but the deposits proved to be of poor quality. The company quickly moved to nearby Duluth and focused on sandpaper manufacturing. Although the company was dedicated to manufacturing industrial products from the beginning, it gradually diversified into consumer markets. 3M became one of the world's most innovative and recognized companies with widely-known brands such as Scotch, Scotch-Brite, Nexcare, Post-it and Comment.

[1] *This case has been written on the basis of published sources only. Consequently, the interpretation and perspectives presented in this case are not necessarily those of 3M or any of its employees.*

[2] *"Product Information, 3M Tegaderm Hydrocolloid Dressing," 3M, http://www.3m.com/product/information/Tegaderm-Hydrocolloid-Dressing.html, accessed on July 5, 2011.*

Headquartered in St. Paul, Minnesota. 3M had gradually extended its global presence in the United States, Europe, the Middle East, Africa and Asia Pacific. In 2004, 3M generated US$20 billion in sales and US$2.9 billion in revenue.[3] International sales represented 60 per cent of total sales (see Exhibit 1). The company had 189 sales offices worldwide, with 15 in the United States and 174 internationally. By December 31, 2004, the company employed 67,071 people, with 32,648 employed in the United States and 34,423 (approximately 51 per cent) located internationally.[4]

THE 3M WAY TO INNOVATION

Innovation and product development constituted an important part of 3M's activities. 3M invested approximately US$1.1 billion (5-6 per cent of sales) per annum in research development[5] and had 1,000 scientists and engineers dedicated to developing new ideas.[6] Most of the researchers in the United States were based in corporate research laboratories in St. Paul, Minnesota. Research and development activities included scientific research, application of scientific technology to the development of new products, technical support to customers and internal development of patents.

3M managed its operations in seven business segments: health care; industrial; display and graphics; consumer and office; electronics and communications; safety, security and protection services; and transportation (see Exhibit 2). The health care segment had the highest sales among all segments, accounting for more than 20 per cent of total sales (see Exhibit 3). Each business segment leveraged its own unique sales channels, customers, technologies, manufacturing facilities and selling processes. To encourage efficient distribution of business resources, the seven business segments shared common or related 3M technologies to facilitate innovation and product development.

Business segments were further segmented into divisions. Each product line represented an individual division that possessed its own sales, marketing and technical support staff. For example, the health care segment was comprised of a variety of divisions that included medical and surgical supplies, skin health and infection prevention products, pharmaceuticals, drug delivery systems, dental and orthodontic products, health information systems, microbiology products and closures for disposable diapers.[7] Each division was managed as an individual entity; this small, decentralized structure minimized bureaucracy and empowered business units to concentrate on new ideas and their own customer bases.[8]

3M's approach to innovation evolved from a distinctive corporate culture created by William L. McKnight. McKnight joined the company as an assistant bookkeeper in 1907. He quickly rose in the company and became president and chairman of the board of directors.[9] McKnight's management philosophy was described in 1948:

> As our business grows, it becomes increasingly necessary to delegate responsibility and to encourage men and woman to exercise their initiative. This requires considerable

[3] *3M 2004 Annual Report, Standard & Poor's NetAdvantage, www.netadvantage.standardandpoors.com.proxy1.lib.uwo.ca:2048/NASApp/NetAdvantage/index.do, accessed July 5, 2011.*
[4] *Ibid.*
[5] *John Dwyer, "Dare you play R&D roulette," Work Management, September 26, 2008, p.16-18, www.worksmanagement.co.uk/features/dare-you-play-rd-roulette/15585/, accessed on June 25, 2011.*
[6] *"R&D Before All at Hewlett Packard, 3M and GE," Strategic Direction, 20 (10), October 2004, p. 15-17.*
[7] *3M 2004 Annual Report, Standard & Poor's NetAdvantage, http://www.netadvantage.standardandpoors.com.proxy1.lib.uwo.ca:2048/NASApp/NetAdvantage/index.do, accessed on July 5, 2011.*
[8] *Ernest Gundling, The 3M Way to Innovation: Balancing People and Profit, Tokyo; New York: Kodansha International, 2000, p. 70.*
[9] *A Century of Innovation: The 3M Story, 3M, 2002, p. 9.*

> 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 mistakes 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 is essential that we have many people with initiative if we are to continue to grow. [10]

These ideals promoted a company culture that emphasized innovation, risk taking and teamwork. As such, pursuing ideas that did not have immediate impact and learning from mistakes became an important part of 3M's culture of innovation; failure was seen as a learning experience.

McKnight's management philosophy affected many aspects of management at 3M. The company adopted a "15 per cent rule": employees in any area of the company could use 15 per cent of their working hours to pursue their own ideas or projects and had no obligation to report on progress of these ideas.[11] The 15 per cent rule empowered employees while encouraging managers not to over-manage operations (provided essential duties were performed adequately), promoting a corporate culture of freedom and innovation.

Each year, 3M allocated US$50,000 to the company's Genesis Grant program — a program designed to fund innovative projects that may not receive funding through 3M's normal channels.[12] Project teams competed for grants by presenting their ideas to their peers. In this way, each staff member played an important role in building an innovative climate. Additionally, 3M unofficially practiced lifetime employment.[13] This job stability enhanced risk taking and allowed long-term career planning that could work for the company's benefit. The spirit of cooperation and teamwork within the organization derived from the fact that employees did not have to worry about looking for another job eventually.

Management at 3M had long realized that interaction with customers was an excellent way to garner new ideas and business solutions. In one of his early roles as a sales manager, McKnight had observed that salesmen were prime sources of innovative ideas due to their frequent interactions with the customers who used their products. Through constant interaction, the company identified users' problems and developed solutions accordingly; for example, in developing a material that limited the spread of skin infection, the company consulted its major users, including doctors and make-up artists, for ideas about how to use the product and apply it to the skin.[14]

3M's key growth driver was its investment in technologies. Technical innovation at 3M was based on more than 40 technological platforms (see Exhibit 4). The company also combined many of these technologies in order to invent new products that addressed different customer needs. This single set of assets was shared amongst all the business segments at 3M in order to allow free access to the company's technologies.

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[10] *"McKnight Principles," 3M, http://solutions.3m.com/wps/portal/3M/en_WW/History/3M/Company/McKnight-principles/, accessed June 25, 2011.*
[11] *Tim Stevens, "3M reinvents its innovation process," Research Technology Management, 47 (2), 2004, p. 3-5.*
[12] *Felipe Lara-Angeli, "Encouraging innovation: Lessons from the 3M experience," China Staff, 13 (4), Apr 2007, p. 10-12.*
[13] *彭芃萱, 你不知道的3M: 透視永遠能把創意變黃金的企業傳奇 (Things you don't know about 3M), Business Weekly Publications, 2010, p.253-256.*
[14] *Ruth Mortimer, "Customer Innovation: Inspirational Customers," Brand Strategy, London, July 12, 2005, p. 24.*

3M recognized innovation through both formal and informal mechanisms. The company had a tradition of celebrating important personnel in innovation (and motivating employees) by putting up photos and descriptions of early company success stories in 3M office hallways. In addition, 3M developed several programs and awards to recognize its most valuable employees. The most prestigious recognition was election into the Carlton Society, named after the company's first head of research and development (R&D).[15] Introduction into the Carlton Society was the highest form of peer recognition at 3M. The award recognized individuals who made extraordinary contributions to 3M's science and technology. The Golden Step Award recognized teams whose new products achieved US$5 million in sales within three years of product launch.[16] Alpha Grants rewarded innovations in administrative, marketing and non-technical areas. Other 3M awards recognized achievements in areas such as technical excellence, engineering achievement and process technology.[17]

3M'S INNOVATION ACROSS BORDERS

In 1929, 3M made its first move towards international expansion by expanding to Europe.[18] By 2004, the company had a presence in more than 60 countries with geographic coverage in the United States, Europe, the Middle East, Africa and Asia Pacific. Within the United States, the company had 15 sales offices in 12 states and operated 58 manufacturing facilities in 22 states. Internationally, 3M had 174 sales offices and operated 74 manufacturing and converting facilities in 29 countries.[19] 3M products were sold through numerous distribution channels, including direct sales to users as well as sales through wholesalers, retailers, distributors and dealers around the world.

There were seven distinct but interrelated areas of innovative activities within 3M's global operations: sales and marketing techniques; product packaging; product adaptation; commercialization of new technologies; acquisition of technical information; co-design; and original inventions.[20] In many of 3M's subsidiaries, management's focus was on bringing the company's existing resources to meet local customer needs rather than inventing new technologies. Initially, the standard pattern was for new products to be developed by company headquarters and tested in the American market; once the product launch proved successful, the products would then be gradually introduced to subsidiary customers.[21] However, as the company continued to expand globally, subsidiaries were given more power and freedom to initiate local product developments that addressed customer needs.

3M cultivated global innovation through its organizational structure. The company followed a matrix management structure in which each international operation reported to the international operations authority for its respective country as well as its corresponding business segment. This organization structure intersected with and was balanced among all 3M's business subsidiaries; furthermore, all business units had their own reporting lines.

3M supported the exchange of personnel between countries and headquarters as a way to enhance the transfer of information and create better personal ties towards innovation. Each country's managing

[15] *Ernest Gundling, Op cit, p. 95.*
[16] *Pedro Conceição, Dennis Hamill and Pedro Pinheiro, "Innovative Science and Technology Commercialization Strategies at 3M: A Case Study," Journal of Engineering and Technology Management, 19 (1), 2002, pp. 25-38.*
[17] *Ernest Gundling, Op cit, p.95.*
[18] *"Historical timeline," 3M, http://solutions.3m.com/wps/portal/3M/en_WW/History/3M/Company/timeline/1920-profile/, accessed on June 20, 2011.*
[19] *3M 2004 Annual Report, Standard & Poor's NetAdvantage, http://www.netadvantage.standardandpoors.com.proxy1.lib.uwo.ca:2048/NASApp/NetAdvantage/index.do, accessed on July 5, 2011.*
[20] *Ernest Gundling, Op cit, p.123-134.*
[21] *Ibid.*

director was frequently an expatriate from another region or country. Sending staff to headquarters was another important part of 3M's expatriate strategy. If a potential innovator within a subsidiary needed information, his or her personal network became a powerful search engine. When a question emerged that had been answered by another 3M employee before, personal contacts could save the time and effort of information searching and speed the exchange of information.

Communication was another essential part of 3M's success. To facilitate communication between staff in technical expertise, marketing, sales, manufacturing and customers, the company encouraged networking activities that would ensure coordinated actions. Technical forums provided opportunities to share technology, best practices, policies and procedures; for example, the European Management Action Team (EMATs) Forum regularly brought together relevant personnel from the United States and European subsidiaries to share information and make decisions.[22] Lectures and problem-solving discussions were also held during the forums. These meetings enabled subsidiaries to present their thoughts and facilitated cooperation and accelerated pace in markets in which there were significant growth opportunities.

Among all geographic areas, the Asia-Pacific region contributed to approximately 25 per cent of 3M's sales.[23] Asia Pacific was an extremely high-growth region for the company. In 2002, 3M's Asia-Pacific sales grew 12.7 per cent, compared to the company's 1.6 per cent overall growth; and in 2003, the region grew 26.3 per cent, compared to the company's 11.6 per cent.[24] In the early 2000s, 3M invested heavily in its Asian facilities. The company began relocating its R&D and manufacturing facilities for high-end optical components from Austin, Texas, to Singapore in 2002.[25] 3M extended its business model at the headquarters and established a co-location of manufacturing with development and product customization capabilities at the Singapore laboratory. An Optoelectronics Centre of Excellence was also established at the Singapore facility. In 2005, the company announced an investment of US$40 million to create its third-largest R&D centre (after Minnesota and Japan) in Shanghai.[26] The new centre in China served as an important platform for 3M's technological innovation activities on a global scale.

3M TAIWAN: AN OVERVIEW

Taiwan had a population of 23 million people[27] and an area of 35,801 square kilometres (km).[28] Strategically located in the middle of a chain of islands stretching from Japan in the north to the Philippines in the south, and only 160 km from the southeast coast of the Chinese mainland, Taiwan was a natural gateway to East Asia.

Established in 1969, 3M Taiwan was based in Taipei City with offices in Taichung and Kaohsiung, a logistics centre in Taoyuan and a plant and R&D centre in Yangmei City, Taoyuan.[29] In 2005, 3M Taiwan Optronics Corporation was established as the only manufacturer of prism sheet films in Taiwan.

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[22] *Ernest Gundling, Op cit, p. 137-138.*
[23] *3M 2004 Annual Report, Standard & Poor's NetAdvantage, http://www.netadvantage.standardandpoors.com.proxy1.lib.uwo.ca:2048/NASApp/NetAdvantage/index.do, accessed on July 5, 2011.*
[24] *3M Annual Reports, 2002-2003, Standard & Poor's NetAdvantage, www.netadvantage.standardandpoors.com.proxy1.lib.uwo.ca:2048/NASApp/NetAdvantage/index.do, accessed on July 5, 2011.*
[25] *"3M Opens Optoelectronics Lab," Light Reading, April 26, 2002, www.lightreading.com/document.asp?doc_id=14508, accessed on Jun 25, 2011.*
[26] *"3M sets up its third largest R&D center in Shanghai," People's Daily Online, August 25, 2005, http://english.peopledaily.com.cn/200508/25/eng20050825_204613.html, accessed on June 24, 2011.*
[27] *"Taiwan population," AsiaRooms.com, http://www.asiarooms.com/en/travel-guide/taiwan/taiwan-overview/taiwan-population.html, accessed on June 22, 2011.*
[28] *Ibid*
[29] *"3M Taiwan," 3M Taiwan, http://solutions.3m.com.tw/wps/portal/3M/zh_TW/about-3M/information/more-info/history/local/, accessed on June 28, 2011.*

3M Taiwan sold more than 30,000 products locally, with product coverage of electrical devices, transportation, health care, information, security systems, automotive, construction and home improvement.[30] The company had approximately 1,000 employees. In 2002, 3M Taiwan had been ranked among the top 10 in sales performance of the 60 3M subsidiaries.[31] 3M Taiwan was also one of the company's most innovative subsidiaries. Products such as Magic Mop, 3M Polarizing Task Light (3M's first lighting product) and Filtrete Ultra Clear Air Purifier had been developed in 3M Taiwan and had been bestsellers around the world.[32]

3M Taiwan managed its operations under eight business segments: health care; industrial; display and graphics; consumer and office; electronics and communications; safety, security and protection services; transportation; and electronic key account. The additional electronic key account segment was created by the subsidiary to facilitate serving major electronic customers.[33] As was consistent with 3M's corporate approach, each business segment in 3M Taiwan leveraged its own sales, customers, technologies, manufacturing facilities and selling processes.

THE EVOLUTION OF 3M TAIWAN

3M initially positioned 3M Taiwan as a sales office in 1969. A small office with several people, 3M Taiwan sold products directly imported from headquarters. When sales became stable, headquarters began to involve the subsidiary in simple product processing. For example, Scotch Brite pads for kitchenware cleaning were imported from the headquarters as jumble roll materials. The materials were cut by 3M Taiwan before being sent to local third-party agents and distributors for packaging and selling.[34]

In the late 1970s, the Taiwanese government launched 10 major construction projects, including rail electrification, construction of the North Link railroad, development of nuclear energy, construction of a steel mill at Kaohsiung and construction of the new port of Taichung.[35] The need for infrastructure materials provided the perfect opportunity for 3M Taiwan. The subsidiary persuaded local government to adopt some of the company's traffic control products, such as reflective materials (used in road signs, number plates on vehicles, emergency exit markings and display and graphics technologies).[36] 3M Taiwan also cooperated with the government to establish construction procurement regulations and procedures, as well as standards for roadway signage systems.

In the 1980s, the Taiwanese government promoted strategic industries with a high level of technology and low energy consumption. The Industrial Technology Research Institute (ITRI) and, later, the Hsinchu Science-based Industrial Park — which had been called the Taiwanese "Silicon Valley" — were established during this period, with a focus on R&D in information technology (IT) and biotechnology.[37]

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[30] *張鴻, " 帶頭衝, 也要懂得適時放手 (Leaders should learn how to keep an eye closed)," Manager Today, June 2007, www.managertoday.com.tw/?p=889, accessed on June 28, 2011.*

[31] *李筑因, "美商3M台灣子公司24小時創意不休息 (Creativity never stops at 3M Taiwan)," Career, August 2008, http://future.sce.pccu.edu.tw/reading/digi_reader/pages/new_kp_dtl.aspx?publication_cls_id=A004&publication_dt_uid=dc7431fa-d04e-4c1d-804d-30e760fd0ab1, accessed on June 24, 2011.*

[32] *彭芃萱, 你不知道的3M: 透視永遠能把創意變黃金的企業傳奇 (Things you don't know about 3M), Business Weekly Publications, 2010, p.27.*

[33] *Ibid.*

[34] *Ibid.*

[35] *"Taiwan-Economic development," Encyclopedia of the Nations, http://www.nationsencyclopedia.com/Asia-and-Oceania/Taiwan-ECONOMIC-DEVELOPMENT.html, accessed on June 22, 2011.*

[36] *張鴻, " 帶頭衝, 也要懂得適時放手 (Leaders should learn how to keep an eye closed)," Manager Today, June 2007, www.managertoday.com.tw/?p=889, accessed on June 28, 2011.*

[37] *Sara Robinson, "Taiwan's chip plants left idle by earthquake," The New York Times, September 22, 1999, www.nytimes.com/1999/09/22/business/taiwan-s-chip-plants-left-idle-by-earthquake.html, accessed on July 11, 2011.*

The national policy to promote R&D encouraged 3M Taiwan to transform from manufacturing to product development.

After 15 years of operating in Taiwan, a new national manager was appointed at 3M Taiwan. Kenneth Yu was expatriated from headquarters to Taiwan in 1984. Yu transformed 3M Taiwan into a subsidiary that went beyond simply meeting basic goals set by headquarters by conducting product development as well. Within four years, 3M Taiwan's sales increased sevenfold.[38] Yu made several changes to the subsidiary. Knowing that sales were critical to expanding the business, Yu started offering a dynamic selling skills course that was required for sales, marketing and technical service staff. The course was developed based on the standard operations procedures for sales employees at headquarters. By translating the material according to local language and practices, Yu created eight steps to help sales employees approach and learn from customers.[39] This systemized approach established a company culture based on customer needs. By requiring staff from different divisions to take the course together, Yu strengthened teamwork and ties between divisions. The relationships among 3M Taiwan's researchers, marketers and salespeople were thus closely linked.

Projects such as "a marketer's dream" and the "advanced growth program" were launched to facilitate creative ideas from the team.[40] Product managers with ideas on product development or brand management were given permission to apply for company-level sponsorship, even without approval from their departments. The projects encouraged employees to pursue new concepts or applications of existing technology without being limited by financial concerns.

3M Taiwan gradually improved its ability to apply products with U.S. specifications to local needs (including making changes in format, thickness/solidity and formula and sourcing materials locally rather than buying and shipping them from headquarters); however, Yu believed that the subsidiary could do more. First, manufacturing facilities were extended to meet the increase in local sales. In 1987, the company set up its first large-scale manufacturing plant in Taoyuan. Additionally, the Kaohsiung Customer Centre was built to provide service and direct contact with customers in southern Taiwan.

The Yangmei plant was established in 1992 as a relocation of the Taoyuan plant. The strategic placement of new manufacturing facilities provided a tremendous boost to subsidiary innovation by making it easier to modify existing products and create customer-focused applications. A total of nine production lines, including tapes, electrical products, consumer products, surface mount suppliers and optical contrast films, were established at the Yangmei plant to facilitate the process of local product development.[41] Products manufactured in Yangmei included a variety of tapes, electrical products, Scotch-Brite products, original equipment manufacturer (OEM) tapes, 3M carrier tapes, automotive graphics, 3M blackout films, contrast enhancement film die-cutting, pad conditioner and dark retro-reflecting stripes.[42] Following this first phase of development, Yangmei's research laboratory was opened in 1993 for technical and R&D development. By strategically locating the research laboratory and manufacturing facilities together, 3M Taiwan could update product manufacturing with the latest technical developments. With substantial sales growth, the second and third factories opened in 1995 and 1997 to support the manufacture of multiple product lines. 3M's Yangmei plant (29,792 square metres) served as the subsidiary's major

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[38] *彭芃萱, 你不知道的3M: 透視永遠能把創意變黃金的企業傳奇 (Things you don't know about 3M), Business Weekly Publications, 2010, p.98.*
[39] *Ibid.*
[40] *Ibid.*
[41] *"3M Yangmei, Taiwan," 3M Taiwan, http://solutions.3m.com.tw/wps/portal/3M/zh_TW/Yangmei/Plant/, accessed on June 28, 2011.*
[42] *"Products & services," 3M Yangmei, Taiwan, http://solutions.3m.com.tw/wps/portal/3M/zh_TW/Yangmei/Plant/Facility /Products/, accessed on June 28, 2011.*

manufacturing and R&D site and Taoyuan (12,500 square metres) functioned as the primary logistical centre (see Exhibit 5).[43]

Taiwan's increasing industrialization and rapid growth during the 20th century had sometimes been referred to as the "Taiwan Economic Miracle."[44] In particular, the economic ties between Taiwan and China grew significantly. Many Taiwanese manufacturers in the labour-intensive, electronics and IT industries set up manufacturing plants in China to take advantage of its cheap labour.

3M categorized 3M Taiwan as part of the Chinese region of Asia Pacific, together with China and Hong Kong. The more established operations in 3M Taiwan provided the company with resources to enter the newer, high-growth market in China. While Taiwanese companies moved operations to China, 3M followed its Taiwanese customers to China by establishing 3M manufacturing and sales operations there. As such, 3M started working directly with domestic Chinese enterprises, which further expanded its business activities in China. Building on the similarity of culture and language between Taiwan and China, it was much easier for 3M to import best practices from Taiwan to facilitate expansion into China. For example, "consumer and office" was the most innovative business segment in Taiwan; therefore, in 2004, Cheng-Kuan, Lin, department head of the consumer and office division of 3M Taiwan, was expatriated to China to lead the "consumer and office" business segment there.[45]

ACNE DRESSING DEVELOPMENT

While building a fire on a family and colleagues camping trip in 2004, Chung accidentally burnt his arm. Luckily, one of his colleagues was a nurse. After cleaning the wound with distilled water, she covered it with a piece of 3M hydrocolloid dressing.[46] After two days, Chung removed the hydrocolloid dressing pad to find that his arm had completely recovered — with no apparent scarring. Chung saw the potential for this product to be very successful if applied to the right market.

Hydrocolloid dressing was one of 3M's health care products. It was a sterile wound dressing consisting of a hydrocolloid adhesive covered with an outer adhesive film that was impermeable to liquids, bacteria and viruses. The product was indicated for partial- and full-thickness dermal ulcers, leg ulcers, superficial wounds, abrasions, first- and second-degree burns and donor sites (see Exhibit 6). In 2004, 3M hydrocolloid dressing products were regarded as medical materials sold only to hospitals and drugstores affiliated with clinics; the product was not available to local retailers. For the first time, after seeing how the dressing improved his burnt arm, Chung wondered if 3M could develop any new products from the company's existing hydrocolloid dressing technology.

With Chung's support, a project team was formed which consisted of employees from different divisions within the 3M health care business segment. At the outset, headquarters sent a U.S.-based engineer to 3M Taiwan to provide training on the product and demonstrate how the product was sold in the United States. In one of the meetings the engineer accidentally cut himself with a pair of scissors. A deep wound appeared on his hand, bleeding. The engineer opened a hydrocolloid dressing sample and placed the

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[43] *"3M Yangmei, Taiwan," 3M Taiwan, http://solutions.3m.com.tw/wps/portal/3M/zh_TW/Yangmei/Plant/, accessed on June 28, 2011.*
[44] *"Taiwan's Economy," AsianInfo, www.asianinfo.org/asianinfo/taiwan/pro-economy.htm, accessed on June 27, 2011.*
[45] *彭元萱, 你不知道的3M: 透視永遠能把創意變黃金的企業傳奇 (Things you don't know about 3M), Business Weekly Publications, 2010, p.110.*
[46] *Ibid, p.28-29.*

small, round dressing on the wound. Soon after, he stopped bleeding.[47] The engineer's actions reminded a project team member of an earlier conversation with a medical instrument retailer. The retailer had told him that nurses were the primary consumers of 3M hydrocolloid dressings, as they often cut the product into small pieces and used it for superficial skin blemishes.[48] The team realized that there was marketable potential in applying the product to acne treatment.

Any product development idea in 3M Taiwan needed to go through a corporate-wide evaluation system, known as the new product implementation system (NPIS). All product development ideas had to successfully complete the full NPIS review process before being launched. NPIS evaluated the new product through seven stages: idea, concept, feasibility, development, scale up, launch and post-launch.[49] The review process helped to justify and evaluate the feasibility of the product development idea using figures such as potential sales, three- to five-year sales volume estimates, benefits that the product would bring to the existing product line, price setting, etc.[50] By evaluating in stages, 3M could use multiple operations (both internal and external) to diagnose potential risks that may occur in different areas. In addition, while the company's policy was to encourage innovative ideas, not all ideas could proceed. NPIS enabled the company to achieve better cost control through funding only those product development ideas with high potential in the market.

The Taiwanese project team soon engaged in the NPIS procedure for Acne Dressing. First, the marketing division evaluated the sales potential of the product. A marketing survey was deployed to see whether existing acne-treatment products were of local consumer interest. The result was positive. Because of the humid subtropical climate in Taiwan, acne had long been a problem for the age group between 15 and 35. There was no standardized solution for acne treatment in Taiwan though many different treatments existed. 3M Micropore Surgical Tape was widely used by teenaged consumers for acne treatment because the tape was breathable, hypoallergenic and affordable. In addition, the idea of do-it-yourself home health care was becoming particularly popular in Taiwan as consumers began to pay more attention to personal health care.[51] Many over-the-counter products became available in local drug stores, including Cosmed, SASA, and Watson. Since there was no standardized approach for acne treatment, 3M's marketing department saw the situation as an excellent opportunity to exploit the market and segregate a new market demand for the company's Acne Dressings.

In the next stage of development, the technical aspects of the Acne Dressing product were evaluated. The local technical service and financial divisions became involved in identifying ways to transform 3M hydrocolloid dressings into marketable Acne Dressing products, including establishing the estimated dimensions and size of the product and the associated costs of manufacturing.[52] The review then proceeded to the packaging and distribution segments. These departments evaluated the potential cost and design for packaging and distribution of the product, working towards designs that would attract consumers in the age group of 15 to 35.

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[47] *彭芃萱, 你不知道的3M: 透視永遠能把創意變黃金的企業傳奇 (Things you don't know about 3M), Business Weekly Publications, 2010, p.31.*

[48] *呂馨玲, "別人的難題, 3M的致富商機 (Other's challenge, 3M's opportunity)," Cheers, Jan 2010, http://career11.mac.nthu.edu.tw/job/campintro/company/007/990107b.html, accessed on July 20, 2011.*

[49] *彭芃萱, 你不知道的3M: 透視永遠能把創意變黃金的企業傳奇 (Things you don't know about 3M), Business Weekly Publications, 2010, p.184-186.*

[50] *邱莉玲,"創新要有聚焦、量化標準來管 (Innovation must be focused and managed quantitatively)," China Productivity Centre, February 14, 2006, http://library.cpc.org.tw/express/0217/example02.htm, accessed on July 4, 2011.*

[51] *Ibid.*

[52] *彭芃萱, 你不知道的3M: 透視永遠能把創意變黃金的企業傳奇 (Things you don't know about 3M), Business Weekly Publications, 2010, p.184-186.*

The NPIS process involved not only local interdepartmental communication but also information exchange with 3M headquarters. The Taiwanese project team reported their findings to company headquarters for feedback in each review stage. In the local technical service evaluation stage, headquarters warned that product development for Acne Dressing might be challenging. Since 3M hydrocolloid dressings were professional, clinical materials, they might prove too costly to apply to over-the-counter acne-treatment products, which were often relatively low in price.[53]

Headquarters' role in product development idea evaluation was variable. In most product applications based on 3M existing technologies, headquarters' involvement was minimal. 3M relied on the corporate-wide product development review appraisal and local project team judgments in determining product development potential. For technology-related product developments, however, the role of headquarters was essential. In the development of 3M's Dual Brightness Enhancement Film (DBEF) and Brightness Enhancement Film (BEF) products, for example, the technical service division of 3M Taiwan worked closely with headquarters' laboratory on detailed data analysis and product-testing experiments.[54] Headquarters' role became dominant in technology-related product advancement because more technical support was needed and it was likely that these products would eventually be applied globally.

After months of product evaluation, the Acne Dressing product development project successfully completed the review process. During the review procedure, the project team realized two major challenges that might threaten subsequent development and market launch of the product. Firstly, local customers were accustomed to using traditional acne-treatment methods such as anti-acne facial washes, acne-vanishing creams, acne-control facial masks and pore-toning creams. If developed and launched, Acne Dressing would be a brand new product in the local market — one that would likely necessitate educating consumers in order to expose them to the new product and change their buying behaviour accordingly. Secondly, since there were no similar products in the Taiwanese market, the project team had only limited information to use for further decision-making processes. However, the project team ultimately reached the consensus that Acne Dressing had extremely high market potential and was a feasible idea to develop and launch locally. Optimistic about their conclusions, the team decided to report their findings to Chung.

DECISIONS FACING CHUNG

Now, in early 2005, T.C. Chung, function head in the health care division in 3M Taiwan, was in the dilemma of whether to proceed with Acne Dressing product development with the company's existing technology- 3M Hydrocolloid Dressing. Until that point, there had been no product applications based on Hydrocolloid Dressing technology in 3M anywhere in the world. Although the local project team was confident on the market potential of Acne Dressing, major challenges remained.

With no previous experience in product development, Chung had to decide how to proceed with the idea with limited data in hand. Should the team carry on with the project? If so, what options did the local project team have? What kind of resources and support should the local health care business segment seek from headquarters for product development? Should the local product development collaborate with other subsidiaries?

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[53] *彭苡萱, 你不知道的3M: 透視永遠能把創意變黃金的企業傳奇 (Things you don't know about 3M), Business Weekly Publications, 2010, p.32.*
[54] *Ibid, p.142-145.*

Exhibit 1

PERFORMANCE BY GEOGRAPHIC AREA

Net Sales by Area (millions)	2004 Sales	2004 % of Total	2003 Sales	2003 % of Total	2002 Sales	2002 % of Total	2001 Sales	2001 % of Total
United States	$7,878	39.4	$7,581	41.6	$7,426	45.4	$7,523	46.8
Asia Pacific	5168	25.8	4335	23.8	3431	21.0	3043	18.9
Europe, Middle East and Africa	5070	25.3	4624	25.4	4035	24.7	3960	24.6
Latin America and Canada	1844	9.2	1651	9.0	1392	8.5	1494	9.3
Other Unallocated	51	0.3	41	0.2	48	0.4	34	0.4
Total Company	$20,011	100.0	$18,232	100.0	$16,332	100.0	$16,054	100.0

Source: Annual report 3M 2001-2004, Standard & Poor's NetAdvantage, http://www.netadvantage.standardandpoors.com.proxy1.lib.uwo.ca:2048/NASApp/NetAdvantage/index.do, accessed on July 5, 2011.

Exhibit 2

3M'S SEVEN BUSINESS SEGMENTS

Business Segment	Major Products
Health Care	Medical and surgical suppliers, skin health and infection prevention products, pharmaceuticals, drug delivery systems, dental and orthodontic products, health information systems, microbiology products, and closure for disposable diapers
Industrial	Tapes, coated and nonwoven abrasives, adhesives, specialty materials, supply chain execution software solutions, and filtration products
Display and Graphics	Optical films and lens solutions for electronic displays, touch screens and touch monitors, reflective sheeting for transportation safety, and commercial graphics systems
Consumer and Office	Sponges, scouring pads, high-performance cloths, consumer and office tapes, repositionable notes, carpet and fabric protectors, construction and home improvement products, home care products, visual systems and consumer health care products
Electro and Communication	Packaging and interconnection devices, insulating and splicing solutions for the electronics, telecommunication and electrical industries
Safety, Security and Protection Services	Personal protection products, safety and security products, energy control products, commercial cleaning and protection products, floor matting, and roofing granules for asphalt shingles
Transportation	Automotive components, coated and nonwoven abrasives, tapes, abrasion-resistant films, structural adhesives, specialty materials for the transportation industry, and paint finishing and detailing products

Source: Annual report 3M 2004, Standard & Poor's NetAdvantage, http://www.netadvantage.standardandpoors.com.proxy1.lib.uwo.ca:2048/NASApp/NetAdvantage/index.do, accessed on July 5, 2011.

Exhibit 3

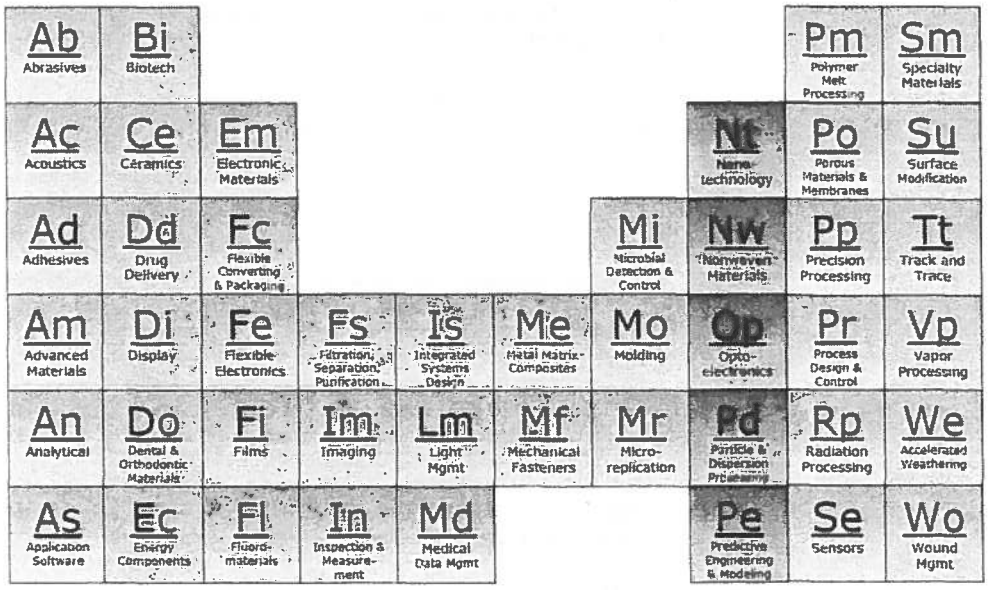
BUSINESS SEGMENT PERFORMANCE

(Dollars in millions)	2004 Net Sales	2004 % of Total	2003 Net Sales	2003 % of Total	% change Net Sales
Business Segments					
Health Care	$4,230	21.1	$3,995	21.9	5.9
Industrial	3,792	19.0	3,354	18.4	13.1
Display and Graphics	3,406	17.0	2,962	16.2	15.0
Consumer and Office	2,861	14.3	2,607	14.3	9.7
Safety, Security and Protection Services	2,125	10.6	1,928	10.6	10.2
Electro and Communications	1,876	9.4	1,818	10.0	3.2
Transportation	1,683	8.4	1,538	8.4	9.4
Corporate and Unallocated	38	0.2	30	0.2	
Total Company	$20,011	100.0	$18,232	100.0	9.8

Source: Annual report 3M 2003-2004, Standard & Poor's NetAdvantage, http://www.netadvantage.standardandpoors.com.proxy1.lib.uwo.ca:2048/NASApp/NetAdvantage/index.do, accessed on July 5, 2011.

Exhibit 4

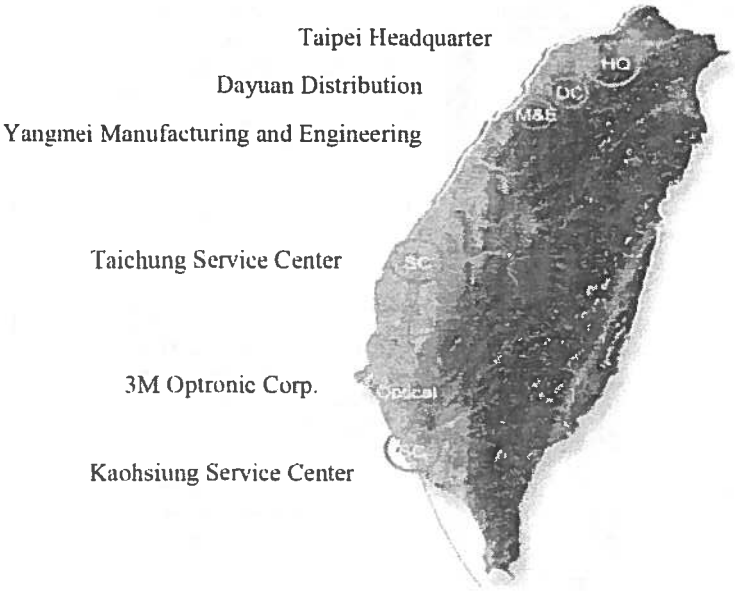
3M TECHNOLOGY PLATFORMS



Source: 彭凡喜, 你不知道的3M: 透視永遠能把創意變黃金的企業傳奇 (Things you don't know about 3M), Business Weekly Publications, 2010, p.230.

Exhibit 5

3M TAIWAN FACILITY LOCATIONS



Source: "Company information,"3M Taiwan, http://solutions.3m.com.tw/wps/portal/3M/zh_TW/about-3M/information/more-info/contact-us/, accessed on June 28, 2011.

Exhibit 6

3M HYDROCOLLOID DRESSINGS

Product Assortment	Product	Technical Specs
3M™ Tegaderm™ Hydrocolloid Dressing 90001		2-3/4 inch×3-1/2 inch (7cm×9cm) Hydrocolloid Dressing, Oval, Film border, Designed for long wear time. Overall size 4 inch×4-3/4 inch (10cm×12cm)
3M™ Tegaderm™ Hydrocolloid Dressing 90002		4 inch×4 inch (10cm×10cm) Hydrocolloid Dressing, Square
3M™ Tegaderm™ Hydrocolloid Dressing 90003		4 inch×4-3/4 inch (10cm×12cm) Hydrocolloid Dressing, Oval, Film border, Designed for long wear time. Overall size 5-1/8 inch×6 inch (13cm×15cm)
3M™ Tegaderm™ Hydrocolloid Dressing 90004		5-1/2 inch×6-3/4 inch (14cm×17cm) Hydrocolloid Dressing, Oval, Film border, Designed for long wear time. Overall size 6-3/4 inch×8 inch (17cm×20cm)
3M™ Tegaderm™ Hydrocolloid Dressing 90005		6 inch×6 inch (15cm×15cm) Hydrocolloid Dressing, Square
3M™ Tegaderm™ Hydrocolloid Dressing 90007		5-1/2 inch×4-7/8 inch (13.9cm×12.3cm) Hydrocolloid Dressing, Sacral Design, Film border, Designed for long wear time. Overall size 6-3/4 inch×6-3/8 inch (17.1cm×16.1cm)

Source: "3M Product Catalog," 3M, http://solutions.3m.com/wps/portal/3M/en_US/3MSWC/Skin-WoundCare/ProductDirectory/Catalog/?PC_7_RJH9U52300OBC0IEI3TR643482_nid=65H4WS9TPBbeB385P3RT67gl, accessed on July 9, 2011.