

## **Boston Scientific Corp.: The Medical Device Industry**

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## **ABSTRACT**

*Boston Scientific Corporation was one of the world's largest medical device manufacturing companies dedicated to less-invasive therapies. Boston Scientific was a worldwide developer, manufacturer, retailer, and marketer of medical devices with approximately 16,000 employees and revenue of \$6.283 billion in 2005. For more than 25 years, Boston Scientific had advanced the practice of less-invasive medicine by providing a broad and deep portfolio of innovative products, technologies, and services across a wide range of medical specialties. Although the Company's profits had been growing over the years, sales had been starting to slow. Management had to develop an effective enterprise wide strategy to further grow the business. Boston Scientific had been internally focused on acquiring smaller firms over the past several years as well as forming strategic alliances. An opportunity for Boston Scientific to grow the business was global expansion into a new segment of the market.*

## **INDUSTRY & COMPETITIVE MARKET ANALYSIS: MEDICAL DEVICE SEGMENT**

The medical device segment of the Healthcare Industry was highly fragmented and complex. The industry consisted of many companies that provided products and services to various segments. The major segments of the industry were companies that provided Research and Development, Biomedical Engineering, Artificial Hearts/Ventricular Assist Devices, other implants, Artificial

Joints, Pacemakers, and Defibrillators. Other segments of the industry included products and services for cardiovascular, musculoskeletal, electromedical, wound management, and surgery management. Some examples of medical devices were pacemakers, stents, artificial joints, and other implantable products. The medical device market was rapidly expanding in the United States and internationally. The industry trend was the introduction of new products and improvement of current product lines to increase sales and profits. The demand for medical devices was influenced by an increasing patient population and the focus on health care cost containment and preventative therapies. The global medical device market was valued at over \$100 billion, of which \$43 billion was generated from the U.S. market. The U.S. was the largest medical device market and led the world in advanced medical technologies. Outside of the U.S., the market had grown significantly in recent decades. During the 1980s, foreign markets accounted for less than 25 percent of the global medical device industry but in 2005, it represented about 60 percent. Latin America and Asia excluding Japan were the fastest growing regions for medical devices. Western Europe was the second largest market and accounted for nearly 25 percent of the global medical device industry (Frost & Sullivan, 2005). The U.S. market for products utilized in arrhythmia management was valued at \$8.1 billion in 2003, and was projected to grow at a compound annual rate of 9.7 percent reaching an estimated value of \$20.5 billion in the year 2013. These devices included products such as arrhythmia ablation products, cardiac resynchronization therapy (CRT) systems, electrocardiography (ECG) systems, electrophysiology (EP) catheters, external defibrillators, implantable cardioverter defibrillators (ICDs), and pacemakers (Frost & Sullivan, 2005). Although there were many segments of the medical device industry, the major areas were Research and Development, Biomedical Engineering, Artificial Hearts/Ventricular Assist Devices, Implants, Artificial Joints, Pacemakers and Defibrillators and Stents.

### ***How the Industry Segment Works: The Business Process Model***

The medical device industry was very competitive in the healthcare equipment and services industry. The demand for all types of medical devices was continually growing. Products such as pacemakers and defibrillator were rapidly growing due to the increase in longevity in the population which meant an increasing number of very elderly patients. "These patients in particular were seeing the need for pacemakers and defibrillators," said Gardner, medical director of the Center for Heart and Vascular Health at Christiana Care Health System in Wilmington, Del. The market for implantable pacemakers and defibrillators was almost \$10 billion-a-year market which was the fastest growing medical technology. The market for stents as well as other medical devices was continuing to grow. This was fueled by research and development for cures or relief of diseases and other problems man kind is battling (Frost & Sullivan, 2005). In order to develop products and offer services the first step for a firm was to identify a medical ailment or problem which it believed through research, it could develop a product to help fight the problem. Since there were many medical problems mankind was facing, firms had to be innovative when developing a product that was low risk, cost effective and clinically effective when presented to a patient. The second step was research and development where the firms invested millions of dollars into research and then development of a product. During this process, many engineers, scientist, and other firms worked towards a goal of developing a product that was worthy of clinical trials and then production. Even after research and development, some products still did not reach the market due to various reasons such as ineffective clinical trails and side effects. The third step after research and development was making sure the product passed all laws and regulations. Examples of this process were drug eluding stents, implantable artificial hearts, heart valves, and other artificial products. As further

discussed in this study, all foreign and domestic products had to pass the Federal Drug Administration rules and regulations. These products then had to meet stringent safety measures, show positive results, and low side effects before being approved for clinical trials. After clinical trials and reports to the FDA, or other country's sanctioning governing body, then the product was approved for use in patients. The final step was the manufacturing of these products. There were strict laws governing the manufacturing and production of these products and the firms' plants were subject to tough laws, regulations, and inspections (FDA, 2006).

## **COMPARATIVE COMPETITIVE SITUATION**

The structure of the medical device industry had been changing due to acquisitions and mergers. Multinational manufacturers were consolidating in order to establish greater presence around the world. Some competitors were some of the largest medical device companies which had a number of subsidiaries such as Johnson & Johnson (e.g., Ethicon, DePuy, Cordis, J&J Medical, Critikon), Baxter (e.g., IV Systems, Edwards Division, Hyland Division, Clintec, Renal Therapy), and Tyco International (e.g., Kendall, Sherwood Davis & Geck, U.S. Surgical). Biomet Inc (BMET), Zimmer Holdings (ZMH), and Britain's Smith & Nephew (SNN). Other medium-size companies that were very strong competitors were Medtronic and St. Jude Medical in the cardiac rhythm market. The following sections discuss the leading firms in the industry.

Boston Scientific had stronger financial resources to devote to research and development than its competition. All companies were similar that they devoted resources to research and development for products toward all segments of the market. The major firms all had success in acquiring leading companies in the field of research and development of products. They all offered quality products, from physical characteristics, to size, performance and cost. Boston scientific ranking was similar to the other major competitors in terms of technology and operations. All firms complied with the Federal Drug Administration rules and regulations. Most of the firms were similar as they tried to stay ahead of each other with new technology. Boston Scientific ranked stronger in maintaining and expanding various production facilities globally. Global relationships and the manufacturing of products allowed for greater flexibility to meet customer's demands. Strong product development capability and the ability to develop continuing flow of new products made Boston scientific better than its competitors. Boston Scientific was able to meet customers evolving need and reach new customer segments faster than its competitors. Boston Scientific had good market intelligence that allowed it to reproduce other firm's technologies without patent infringements quickly. They were the same when compared to the major six competitors but were stronger against all the other competition. A flexible production process and organizational flexibility allowed it to make quick decisions to get products to market quickly. Boston Scientific had a strong management structure which had the ability to make decision quickly in order to get products to market quickly. Boston Scientific had target market access and industry expertise which allowed its groups to reach all segments of the market as well as offer products suitable to each market segment. It was better than the competition in some areas because of the wide product line offered by the company. Boston Scientific employed skilled engineers as well as used their research and development companies and or teams to develop new products desired for each segment of the market. It was as competitive with the top six competitors and was better than other firms with the employment of skilled personnel. Boston Scientific was better than the competition when it used mergers, acquisitions and strategic alliances to grow their business. It had the capital resources which was better than the competitors in the industry to pursue the leading firms in the industry that were developing new

products and technologies for the medical device industry. Boston Scientific had better innovative solutions to achieve synergies between the merged companies and was able to bring products to market quickly. There were various types of customers that were of interest to the firms. These customers include physicians, hospitals and medical centers, distributors and retailers. The primary customers for medical devices were physicians, hospital, medical centers, distributors, and retailers. The final consumers of these medical devices in the various markets were the patients being treated for various ailments and other problems which required these products for treatment. Boston Scientific had consumer loyalty and was able to provide products and services for all age groups. It compared evenly with the top six competitors and Boston Scientific was better than the other competitors in the market. Companies were able to attract customers because of the wide range of products offered as well as wide market acceptance of the products. Market acceptances of products were done by presenting data of clinical and actual trials of the products. Advertising was used to build a strong brand image and brand name thus attracting customers and increasing sales. The ability to offer multiple products at competitive prices allowed for the companies to have multiple revenue streams. The appropriate product lines for each segment of the market made the marketing mix effective. This allowed the sales forces to reach a worldwide audience from prospering countries to third world countries. Boston Scientific was able to meet the changing demands of the consumers such as demands of a new, more flexible and deliverable stent designed to offer improved performance in challenging anatomies. It had a clear advantage over competitors brand image, consumer loyalty and innovative capabilities. Research and Development performed internally was used to develop quality and innovative products for all segments of the industry. Boston Scientific approach to innovation combined with internally developed products and technologies it obtained externally through strategic acquisitions and alliances allowed it to be better than the competition. It was better than its competition because of acquisitions and alliances which expanded its ability to offer customers effective, quality medical devices that satisfy their interventional needs. Research and development was a large expense in the development of medical devices and other products. Research and Development performed internally was used to develop quality and innovative products for all segments of the industry. This gave all the firms the ability to develop many products which it could market and sell to all segments. Boston Scientific used new technology to keep pace with competition. It used new and improved technologies in its manufacturing plants as well as the production process. These new technologies enabled the firms to produce better performing products. Some of the technology include better performing drug eluding stents, longer lasting batteries in pacemakers and defibrillators. It was the same with the top six competitors in the ability to hire, train and keep high performing personnel. Boston Scientific was the same when compared with the top six competitors and better when compared against the other competitors in manufacturing.

### **THE COMPANY: BOSTON SCIENTIFIC CORPORATION**

Boston Scientifics' history began in the late 1960s, when co-founder John Abele acquired an equity interest in Medi-tech, Inc, a research and development company focused on developing alternatives to traditional surgery. Medi-tech's first products was a family of steerable catheters which were introduced in 1969 and used in some of the first less-invasive procedures. Versions of these steerable catheters were still used in procedures. In 1979, Abele and Pete Nicholas partnered to buy Medi-tech and together formed Boston Scientific Corporation. Driven by the needs of the medical community for innovative products, the company grew from revenues of approximately \$2 million in 1979 to more than \$2.67 billion in 2001 (Boston Scientific, 2006). The focus of Boston Scientific

Corporation was to develop less-invasive medical technologies that provided alternatives to major surgery and other medical procedures which were typically traumatic to the body. In less-invasive procedures, devices were usually inserted into the body through natural openings or small incisions and could be guided to most areas of the anatomy to diagnose and treat a wide range of medical problems. An example of less invasive and major surgery was the implantation of a pacemaker. This minimally invasive surgery usually was less than forty five minutes. The major revenue segment for Boston Scientific was the sale of stents. The worldwide coronary stent market resulted in sales of \$2.69 billion, as compared to \$2.35 billion in 2004, an increase of 14 percent. Worldwide Endosurgery Group had sales of \$1.228 billion, compared to \$1.088 billion in 2004, an increase of 13 percent. It also generated revenue from a new segment of the industry for worldwide neuromodulation group sales of \$148 million in its first full year with Boston Scientific. The overall sales in 2005 across various markets were: \$3,852 billion in sales in the United States, \$1,161 billion in sales in Europe, \$579 million in sales in Japan, and \$691 million in intercontinental sales (Boston Scientific, 2006).

### ***Mergers & Acquisitions***

Chief Executive Officer Jim Tobin was focused on Boston Scientific's acquisition strategy to grow market share and expand the corporation's portfolio. It pursued the leading firms in the industry that were developing new products and technologies for the medical device industry. In late 2005, Boston Scientific acquired Guidant which had a greater market value than its own. The acquisition of Guidant introduced the company into a new segment of the market for cardiac devices such as implantable defibrillators and pacemakers as well as gain other products lines, technology, and form strategic alliances. Guidant was a world leader in the treatment of cardiac and vascular disease with headquarters in various countries such as Japan, Europe Asia Pacific, Australia, and Austria. The Corporation had operation locations in the United States, Ireland, and Puerto Rico. It developed, manufactured, and marketed a broad array of products and services that enabled less invasive care. Due to its legal troubles of product recalls in 2005, worldwide implantable defibrillator sales decreased 6 percent to \$1.65 billion (Guidant Corporation, 2006). Guidant legal troubles started when the FDA completed an inspection in late 2005 of Guidant's cardiac rhythm management facilities in St. Paul, Minnesota. According to the FDA, a seal within the pacemaker devices could leak, allowing moisture to affect the electronic circuits. The problem could occur without warning and could lead to loss of consciousness, and possibly heart failure and death. This recall affected over 50% of the company's pacemaker products. Upon notification of the recalls which the FDA had classified as a Class I recall, meaning that there was a reasonable probability that the malfunctioning device will cause serious adverse health consequences or death. Due to this faulty manufacturing there were many lawsuits that totaled billions of dollars. The impact of the recalls caused sales declines in its major product markets which included coronary stents, implantable defibrillators, and pacemakers. In addition, in conjunction with the acquisition of Guidant, Abbott Laboratories had agreed to acquire Guidant's vascular intervention and endovascular businesses and agreed to share the drug-eluting stent technology it acquired from Guidant with Boston Scientific. This enabled Boston Scientific access to a second drug-eluting stent program that would complement the existing TAXUS coronary stent program. The transaction was subject to customary closing conditions, including clearances under the Hart-Scott-Rodino Antitrust Improvements Act and the European Union merger control regulation, as well as approval of Boston Scientific and Guidant shareholders. The U.S. implantable defibrillator sales declined 12 percent to \$1.23 billion. Worldwide pacemaker sales declined 13 percent to \$629 million and the U.S. pacemaker sales

declined 19 percent to \$346 million. Worldwide coronary stent sales of \$462 million declined 14 percent while the U.S. stent sales decreased 5 percent to \$247 million. Worldwide angioplasty system sales decreased 4 percent to \$436 million. Worldwide sales of cardiac surgery and peripheral, including carotid and biliary systems, increased 28 percent to \$373 million (Guidant Corporation, 2006). In 2004, Boston Scientific announced an alliance with Cameron Health, Inc., which was developing the next generation of leadless implantable cardioverter defibrillators (ICD). The ICDs, which were implanted under the skin, deliver high-energy electrical shocks to stabilize the heart's rhythm when it is beating in a rapid, uncontrolled fashion. Cameron had initiated clinical testing of its ICD technology outside the United States. It had discussions with the FDA about U.S. clinical trials beginning in 2006 (Boston Scientific, 2006). Boston Scientific had the capital resources to acquire and merge with other firms in the industry. It had the innovative solutions to achieve synergies between the merged companies and was able to bring products to market quickly. Many of these mergers were used to gain new technologies as well as patent rights to new products. The keys to success were accomplished through acquisitions such as the acquisitions of Tri-Vascular which cost over \$130 million. There was another \$73 million spent to acquire Advanced Stent Technologies, Inc. and \$45 million to the acquisition of Rubicon Medical Corporation.

## ***Products***

Boston Scientific Corporation's product offering was comprised of several product groups, which offered wide and innovative product lines. The core products within each group are discussed in the following section. Examples of products offered by Boston Scientific were drug eluting stents, catheters, surgical grafts, pacemakers, vascular closure products as well as endoscopic video imaging equipment. Products and technology were rapidly changing and improving as Boston Scientific kept pace introducing new and improved products to stay competitive. Example of changing technologies were stents, neuromodulation, and other products that were being improved and introduced to the market in months due to research and development. The product groups are described in Figure 2.

Electro-physiology	This division was a leading developer of medical technologies used in cardiac electrophysiology for the diagnosis and treatment of arrhythmias. The products offered by this division were catheters, electrical systems, introducers, and ultrasounds. The types of products offered by this group were catheters, advanced mapping catheters, fluid cooled ablation catheters, Irvine biomedical diagnostic catheters, steerable diagnostic catheters, and temperature ablation catheters. Some examples of electrical systems were advanced mapping and navigation systems called RPM™ Realtime Position Management® System and Temperature Ablation Systems called EPT-1000 XP™ Cardiac Ablation System. Examples of introducers were Soft Tip Sheaths named Convoy™ Advanced Delivery Sheaths
Inter-ventional Cardiology	This division was a leading developer of medical technologies used by interventional cardiologists to diagnose and treat cardiovascular disease and other cardiovascular disorders. Some of the products offered were balloons, stents, guidewires, and fluid management's devices. Examples of products were Ace™ Balloon Catheter, Graft Ace® Balloon Catheter, and Long Ace™ Balloon Catheter. Other products were drug-eluting stents such as TAXUS® Express <sup>2</sup> ™ Paclitaxel-Eluting Coronary Stent System, and Over the Wire stents called Express <sup>2</sup> ™ Coronary Stent System and Liberté™ Coronary Stent System.
Peripheral Interventions	This division was a leading developer of medical technologies used by interventional radiologists and vascular surgeons to diagnose and treat peripheral vascular and non-vascular disorders. Examples of products offered were Vena Cava Filters with product brands such as Over-the-Wire Greenfield® Vena Cava Filter. Other products included Guide Wires such as Amplatz Super Stiff™ Guidewires, Magic Torque™ Guidewires, Meier Guidewire, Platinum PLUS™ Guidewires, Thruway™ Guide Wire, V-18 ControlWire® Guidewires
Vascular Surgery	This division was a leading developer of medical technologies used by surgeons who performed vascular procedures to diagnose and treat peripheral vascular disorders. Some products offered were patches/fabrics and vascular grafts. The names of some of these products were Hemashield Platinum Finesse™ Ultra-Thin Knitted Cardiovascular Patch, and Trelex Natural® Mesh.
Neuro-	This division was a leading developer of less-invasive medical technologies used in endovascular neurosurgery

vascular	and interventional neuroradiology for the treatment of aneurysms and other types of cerebrovascular disease. Some products offered were a kind of stent called the Neuroform® microdelivery stent and the Tracker® infusion catheter
Oncology	This division was a leader in surgical/image guided medical devices for the diagnosis and treatment of tumors. Some examples of Oncology products were biopsy, venous, and drainage products. The names of products were ASAP™ Detachable Biopsy System with Channel Cut™ Needle, Surecut™ Biopsy Needles, Flexima™ Tight Loop All-Purpose Drainage Catheters, Tal MicroDrainage™ Set, Vaxcel® PICC with PASV® Valve Technology, and Vaxcel® Tunneled Central Venous Catheter.
Endoscopy	This division was a leading developer of medical technologies used by gastroenterologists, oncologists, pulmonologists and colorectal and general surgeons for the diagnosis and interventional or palliative treatment of diseases of the digestive and pulmonary systems. Examples of products were tissue acquisitions, Hemostasis and GI dilation. Products include Balloon Dilators named CRE™ Fixed Wire Balloon Dilators, CRE™ Wireguided Balloon Dilators, Rigidflex® II Achalasia Balloon Dilators. Other product brands were Bipolar Electrohemostasis Catheters with brands such as Gold Probe™ Electrohemostasis Catheters, Injection Gold Probe™ Bipolar Hemostasis Catheters. Biopsy Forceps brand names such as Radial Jaw® 3 Biopsy Forceps and Radial Jaw® 3 Hot Biopsy Forceps
Urology	This division was a leading developer of less-invasive medical technologies used by urologists and gynecologists to diagnose and treat diseases of the genitourinary tract, incontinence and pelvic floor reconstruction. Microwave therapy, nephrostomy products and Incontinence & Pelvic Floor Reconstruction. Some products included Mid-Urethral Slings named Advantage™ Transvaginal Mid-Urethral Sling System, Microwave Therapy products Prolieve™, Thermocoagulation System, Dilators and Sheaths Amplatz Type Renal Sheath Set
Gynecology	This division was a leading developer of medical technologies used by urologists, urogynecologists and gynecologists to diagnose and treat incontinence, pelvic floor reconstruction, menorrhagia and other women's health issues. Products included Ablation and Incontinence and Pelvic Floor Reconstruction. Examples of product brands were Mid-Urethral Slings named Advantage™ Transvaginal Mid-Urethral Sling System, Lynx™ Suprapubic Mid-Urethral Sling System, Obtryx™ Transobturator Mid-Urethral Sling System, Suturing Systems brands such as Capiro® CL Transvaginal Suture Capturing Device, Capiro® Open Access and Standard Suture Capturing Devices
Neuro-modulation	This division was a leading developer of microelectronic technologies that modulate nerve activity to treat disabling disorders, including deafness and chronic pain. Examples of product brands were the GDC 360° Coil System which was the latest innovation in minimally-invasive aneurysm treatment. The Matrix2 360° Coils featured an advanced complex-shape design to help reduce compartmentalization.

**Figure 2. Product Groups**

The Company had the ability to offer customers a wide line of products along with a wide distribution network. This strength enabled the firms to serve its customers as a one-stop supplier for products. An example was a customer could buy all needed medical devices such as stents, pacemakers, and artificial joints from one firm thus increasing the company's sales and market share. An additional strength was the quality of products to meet the customers' needs. Examples were pacemakers and the batteries that lasted a longer period of time and offered a long-term warranty. Global relationships and the manufacturing of products allowed for greater flexibility to meet customer's demands. Boston Scientific had strong product development capabilities and the ability to develop continuing flow of new products. This enabled the firms to meet customers evolving need and reach new customer segments. Boston Scientific had good market intelligence such as being able to reproduce other firm's technologies without patent infringements quickly. It was able to develop and create similar products to their competitors through market intelligence by reverse engineering products and use of other technologies. A flexible production process and organizational flexibility allowed it to make quick decisions to get products to market quickly. Boston Scientific had a strong management structure which was able to make decision quickly in order to get products to market quickly. It had target market access and industry expertise which allowed Boston Scientific to reach all segments of the market as well as offer products suitable to each market segment.

## ***Customers***

There were various types of customers that firms focused their interest on. The customers for medical devices were physicians, hospital, medical centers, distributors, and retailers. The final consumers of these medical devices were the patients being treated for various ailments and other problems which required these products. Physicians were responsible for presenting the patient with the options of products to be used in surgery through videotapes, pamphlets, and physical demonstrations. They also supplied all other information pertaining to the surgery such as side effects, recovery time, and safety records to the patient. The individual consumer was the final person responsible for choosing the product to be used during surgery. Boston Scientific was able to meet the changing demands of the consumers such as demands of a new, more flexible and deliverable stent designed to offer improved performance in challenging anatomies. It had competitive advantages over its competitors in most keys to success areas. It had a clear advantage over competitors brand image, consumer loyalty, and innovative capabilities. It had improved sales over the past year due to brand quality, consumer loyalty, and product effectiveness. One of the Company's strengths was its ability to connect with primary care givers and specialized care givers. These physicians marketed Boston's Scientific products to patients. Boston Scientific had consumer loyalty and was able to provide products and services for all age groups. Each patient age group was at a different life stage and therefore required different products. The older population was a prime target for pacemakers, stents, artificial joints, and defibrillators. Another opportunity lied in developing countries as well as third world countries. The international market presented a vast opportunity for Boston Scientific to expand its customer base. In foreign countries, it had to tailor products to the primary needs of the local providers, populations, and governments.

## ***Finance & Marketing***

To sustain its innovative capability, Boston Scientific continued investing in research & development as well as technology with mergers, acquisitions, and strategic alliances of companies leading in the field. Improvement on its technology helped it reduce cost and recalls. Its financial performance was sustained and improved by correcting manufacturing problems and reducing product recalls. Boston Scientific had strengths in all keys to success area of marketing. It had a competitive advantage against the major firms because of its innovative capability, financial resources, brand name, and innovative products. The strengths in marketing that gave it a lead in the industry was its strong brand name and financial resources to execute its marketing plan.

## ***Manufacturing***

Boston Scientific had ten production facilities in many countries such as Ireland and United States. These facilities produced the various products lines of Boston Scientific. Boston Scientific had a good production record but in 2005, there were letters from the FDA to CEO Jim Tobin addressing issues that were found at three sites inspected in the United States. The keys to success had included a high integrity and ethical standards for all production facilities. It complied with FDA regulations and exceeded defined FDA manufacturing and safety specifications during production at all plants around the world. Boston Scientific continued refining its manufacturing practices and had addressed all concerns the FDA had brought to its attention.



## ***Geographic Markets***

Most of the major firms in the industry had worldwide operations but Boston Scientific concentration had primarily been in the U.S. outside of North America, the Company's development, manufacturing, marketing, and sales were managed through its operations in Europe, Japan, and Asia Pacific, as well as representatives in 40 countries. Corporate headquarters was located in Natick, Massachusetts. Boston Scientific operated 21 technology centers worldwide (Boston Scientific, 2006). The strengths of Boston Scientific was to build infrastructure with additional facilities, such as opening an Endosurgery Group headquartered in Marlborough, Massachusetts, expanding facilities in Maple Grove, Minnesota, and opening a new distribution center in Kerkrade, the Netherlands. A major strengths for the Company was that it had the financial resources to operate internationally. Its financial success allowed the firm to serve new markets which grew the customer base. Its competitive strength in the industry was its ability to stay ahead of its competitors with new technology and clean manufacturing plants.

## ***Research and Development***

Boston Scientific was always working to deliver the next break-through product. Research and Development was a major part of Boston Scientific because it started the process of development of products. During this stage, it used highly skilled engineers along with its research firms to research and develop the uses and technology needed for various devices and products. These new products and procedures helped revolutionize patient care across dozens of therapeutic areas. Boston Scientific continued to push for progress in the many projects in its technology portfolio, while constantly scanning the horizon for promising leads on the next break-through procedure, the next technological leap and the next idea. Many of these products came from research in untapped and underserved markets such as spinal cord research (Boston Scientific, 2006). In 2005, Boston Scientific recorded over \$276 million of purchased research and development. It recorded \$25 million of purchased research and development in conjunction with obtaining distribution rights for new brain monitoring technology that Aspect Medical Systems, one of its strategic partners, was currently developing. This technology was designed to aid the diagnosis and treatment of depression, Alzheimer's disease and other neurological conditions. The most significant 2005 purchased research and development projects included TriVascular's abdominal aortic aneurysms (AAA) Stent-graft, and AST's Petal™ bifurcation stent. These two purchases collectively represented 73 percent of its 2005 purchased research and development. TriVascular's AAA stent-graft design reduced the size of the stent-graft by replacing much of the metal stent assembly with a polymer that is injected into channels within the stent-graft during the procedure (Boston Scientific, 2006). The strengths included the financial resources to finance research and development which was a large expense to develop medical devices and other products. This gave Boston Scientific the ability to develop many products which it could market and sell to all segments. An example of such resources was during the fourth quarter of 2005, management decided to re-design certain aspects of the stent-graft to enhance patient safety and to improve product performance. The re-design resulted in incremental costs and time to complete the project relative to those expected at the date of acquisition. Boston Scientific expected to launch the AAA stent-graft in the U.S. by 2011 and was to incur approximately \$200 million of research and development costs over the next five years to complete the project (Boston Scientific, 2006). Research and development performed internally was used to develop quality and innovative products for all segments of the industry. Boston Scientific's approach to innovation was achieved with internal developed products and

technologies as well as those it obtained externally through strategic acquisitions and alliances. Its acquisitions and alliances were intended to expand Boston Scientific ability to offer its customers effective, quality medical devices that satisfied their needs. The Company research and development program was largely focused on the development of next-generation and novel technology offerings across multiple programs and divisions. It expected to continue to invest aggressively in drug-eluting stent programs to achieve sustained worldwide market leadership positions. Further, it anticipated increased focus and spending on areas outside of drug-eluting stent technology. It believed the companies focus was to be primarily on technologies in which it had already made significant investments, including neuromodulation, endoscopic systems, carotid stenting, and bifurcation stenting, but may also extend into other medical device opportunities (Boston Scientific, 2006).

### ***Operations***

Boston Scientific employed a large number of expertly skilled employees worldwide. The firm had a competitive edge over major firms because of their pursuit of new technology. They also had the financial resources for large investment for research and development facilities to improve on current products as well as new products for new and existing markets. Many firms used new technology to keep pace with competition. It used new and improved technologies in the manufacturing plants as well as the production process. Its strengths in the keys to success area were it acquired corporations and employed their skilled employees to facilitate research & development. Boston Scientific ability to maintain and expand various production facilities globally provided for clinical trials of new and existing technology for treatment of some of mankind's serious ailments. This was a comparative strength of the company.

## **LOOKING TOWARDS THE FUTURE**

In 2005, Jim Tobin, President and Chief Executive Officer, had considered how to grow the company and increase profits for the future. The current trend in the industry was to acquire or merge with other leading companies in the industry. The first alternative under consideration was to merge or form alliances with other leading firms to increase market share. Boston Scientific would merge or form alliances through acquisitions, mergers, and strategic alliances with other leading firms such as Cameron Health Inc, Abbot Laboratories, and Stryker Medical to increase market share. The second alternative under consideration was to develop new products. The company would have to develop innovative products through research & development, mergers, acquisitions, and strategic alliances. These were the two alternatives Jim Tobin, President and Chief Executive Officer of Boston Scientific, had to evaluate and consider growing the company and increase profits for the future. Mr. Tobin would have to decide which alternative was most efficient and effective for Boston Scientific to achieve success and distinguish itself from the other competitors in the industry.

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