A STRATEGIC ANALYSIS OF A HEALTHCARE IT PROVIDER

by

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ABSTRACT

Since being acquired by McKesson Corporation in 2002, Medical Imaging Group (MIG) has enjoyed three consecutive years of success and growth. Over the course of this time, MIG's revenue has tripled, while headcount has doubled. However, as MIG faces increasing competition and rapid changes in industry boundaries, it must react quickly to maintain its competitive advantage. This paper presents an analysis of MIG, and the Picture Archiving Communication Systems (PACS) industry in which the group competes. By comprehensively analyzing various elements of the strategic position of MIG, this paper will make recommendations regarding a new strategy for the business to enjoy sustained growth.

DEDICATION

To my dearest parents.

ACKNOWLEDGEMENTS

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LIST OF ABBREVIATIONS AND ACRONYMS

ALI   Advanced Light Imaging Technologies Inc.

CBI   Computerized Breast Imager

CRM   Customer Resource Management software

DICOM Digital Imaging and Communications in Medicine

EHR   Electronic Health Record

EMR   Electronic Medical Record initiative

ERP   Enterprise Resource Planning software

HIMSS Healthcare Information and Management Systems Society

HIPAA Health Insurance Portability and Accountability Act

HIS   Hospital Information System

HL7   Health Level 7

HMI   Horizon Medical Imaging™

HRM   Horizon Radiology Manager™

IHE   Integrating the Healthcare Enterprise initiative

MIG   McKesson's Medical Imaging Group

MPT   McKesson Provider Technologies

OMS   Optical Memory Subsystem

PACS   Picture Archiving Communication System

RFP   Request for Proposal

RIS   Radiology Information System

ROI   Return on Investment

RSNA Radiological Society of North America

ALI	Advanced Light Imaging Technologies Inc.
SCAR	Society for Computer Applications in Radiology
SLA	Service Level Agreement
UI	User Interface
VOC	Vendor of Choice

1 INTRODUCTION

McKesson's Medical Imaging Group is in need of redefining its strategy to sustain the rapid growth it has experienced over the past few years. After being acquired by McKesson Corporation in 2002, the Medical Imaging Group (MIG) has enjoyed three consecutive years of success and growth. Over the course of this time, MIG's revenue has tripled, while headcount has doubled. However, as MIG faces increasing competition and rapid changes in industry boundaries, it must react quickly to maintain its competitive advantage.

This paper presents a strategic analysis of McKesson's Medical Imaging Group (MIG), and of the industry in which the group competes. By comprehensively analyzing various elements of the strategic position of MIG, this paper will make recommendations regarding a new strategy for the business to enjoy sustained growth. This paper consists of five chapters. Chapter 1 provides an overview of MIG and its parental company, which yields the organizational context of this study. Chapter 2 presents an industry definition and analyzes the key competitive forces that operate within the industry. Moreover, based on the analysis, chapter 2 provides an overall assessment of the attractiveness of the industry and key issues facing firms in the industry. Chapter 3 examines the strategy fit and the value chain of MIG. Chapter 4 discusses the key issues MIG itself faces. Lastly, Chapter 5 draws from all of the information in the preceding chapters and to make a recommendation based on the analysis.

1.1 McKesson's Medical Imaging Group

McKesson's Medical Imaging Group (MIG) is a business unit of a larger organization called McKesson Provider Technologies (MPT), one of the three core business segments of McKesson Corporation in San Francisco, CA. MIG, based in Richmond, BC, employs 480 professionals and provides radiology information and medical imaging management solutions that automate workflow and eliminate the use of film and paper in hospitals and clinics. MIG's core product is the Picture Archiving Communication Systems (PACS). Recently, MIG has added to its portfolio by developing and marketing a product called the Radiology Information System (RIS).

MIG, previously known as A.L.I. Technologies, Inc. (ALI), possesses over 16 years of experience in PACS and is recognized as an industry leader PACS technology. ALI was founded by Chris Hanna, Len Grenier, and Peter van Bodegom in 1985. Chris Hanna, who holds a Ph.D. in Pharmacology, was President and CEO of the company. Len Grenier, whose specialty is in lasers and optics, was the Vice President of Engineering. Peter van Bodegom, a CA with a national accounting firm, was responsible for the company's finances. Shortly after the company's founding, Donald McIntosh, an Edmonton radiologist, joined the company as Vice President of Medical Direction. Together, they developed a new thermal imaging modality for mammography, which would later be called the Computerized Breast Imager (CBI). Hence, the company was named ALI, an acronym for Advanced Light Imaging. ALI was funded by a venture angel, Milton Wong, whose investment in the company was motivated by "...an acute

need to understand his wife Fei's diagnosis of breast cancer in 1982."[1] Being the founding investor, Milton Wong, an Order of Canada recipient and chancellor of SFU since 1999, became the Chairman of the ALl board.

The concept of CBI was to replace ionizing x-ray mammography with non-ionizing infrared imaging. Use of infrared imaging makes it possible for women to be screened more frequently for breast cancer without the fear of developing cancerous tumors from the screening procedure. While the technology showed some promise, it was discovered, during clinical trials, that the underlying process is not capable of detecting every form of cancer that a conventional mammogram detects. This presented a technological impasse, one that rendered the product non-viable.

However, during the development of the CBI imaging technology, ALI had created subsystems for the device to store and organize the digital images it had captured. Whenever the prototype breast imaging system had been demonstrated, many of the clinical observers commented on how useful such a system would be if it were coupled with image acquisition devices already in use. With this in mind, the founders of ALI Technologies decided to take the subsystem they had developed and make it the core of a completely new product: a digital image management system for ultrasound devices.

Ultrasound was selected as their niche market for a number of reasons. First, this was a market that was not being served well by acquisition vendors. In addition, ultrasound devices were ubiquitous, and the number of exams performed was climbing steadily.

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[1] Julie Ovenell-Carter, "Making Good Things Happen," 2002 aq magazine. Retrieved July 3, 2005 from: http://www.sfu.ca/aq/archives/nov02/wongprint.html.

Finally, the technical parameters of ultrasound images (e.g. number of images per exam, resolution and pixel depth of images, etc.) were considered very tractable to the technology ALI had at hand.

Two years after its inception, ALI developed the Optical Memory Subsystem (OMS). OMS is a stand-alone device that attaches directly to the ultrasound unit in lieu of a portable film printer or video cassette recorder.

By 1990, ALI had begun work on transforming this product into a network-capable device that allows images to be centrally stored and viewed at any station on demand. By the end of 1992, ALI Technologies had created a product that the medical imaging community called a PACS (Picture Archive and Communication System). This new product was released as the ALI UltraPACS.[2] ALI was the first company to develop PACS based on personal computer/client-server technology to help hospitals capture, view, store, and manage images from ultrasound devices. The first installation was completed in June of 1992 at BC Women's Hospital in Vancouver, Canada.

The key events of ALI's products developments are summarized as follows:

- 1985 Computerized Breast Imager (CBI)
- 1987 Optical Memory Subsystem (OMS)
- 1988 Mini PACS
- 1991 Networked Mini PACS
- 1993 UltraPACS with WAN

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[2] Information provided by Allan Noordvyk, Engineering Director of System Analyst and User Interface Design, and Warren Edwards, VP of Engineering.

- 1994 DICOM support, Teaching files

- 1995 ALI WinView, ALI WebSERVER

- 1996 ALI Diagnostic Reporting, Business alliances

- 1997 ALI UltraPACS 3.0, ALI NewPORT, Prodigy

- 1998 ALI UltraPACS 4.0 (NT), Multimodality

- 1999 ALI UltraPACS 4.1 (NT), ALI DataStore, Cardiology

By the end of 1993, ALI has grown to employ 14 people. Yet, the company was in serious book deficit, and existing management had reached the point of investment fatigue with the ALI board. To raise more capital, Greg Peet, then President and CEO of ALI, took the company public on the Vancouver Stock Exchange. A few years later, Peet listed ALI on the Toronto Stock Exchange. During this time, ALI continued to respond to changes in the PACS market and reinvest itself along the way. The company had developed the fifth generation of its PACS software, marketing it under the ALI UltraPACS branding. Moreover, it had evolved the product from ultrasound modality applications to meet the requirements for complete enterprise-wide PACS for all multi-modality applications.[3]

In 1998, ALI would face new market challenges. Changes in the industry would see ALI's products be assessed for much broader applications than they were originally designed for. The healthcare sector was demanding a solution capable of helping healthcare providers manage all of the medical images from all departments. In the following year, ALI expanded into the market for enterprise-scale image management

[3] Geof Wheelwright, "The Big Deal," from October 2002 issue of BCBusiness. Retrieved July 3, 2005 from: http://www.bcbusinessmagazine.com/displayArticle.php?artId=241

systems, serving all radiology imaging modalities, in anticipation of the shift in the market towards large-scale system solutions. This required developing an in-depth understanding of radiological departmental workflows for many more modalities and ensuring the scalability, reliability, and performance of ALI UltraPACS would be able to meet the more rigorous and complex conditions in such large-scale solutions.

During the dot-com and tech sector stock market boom at the turn of the century, ALI struggled to raise capital for the growth and operations of the company. ALI was, by comparison, one of the less glamorous stock picks during NASDAQ's 'glam-stock' era. Coupled with Y2K concerns in hospitals that saw their budgets spent towards resolving legacy problems, ALI had gone from being a profitable company to being in the red. ALI's share price slid to less than $5 by early 2001, down significantly from its lofty $20 position in 1998.

Amidst all of these events, and given the business dynamics that forced ALI to compete against the likes of GE, Siemens, Agfa and Kodak in offering a broad-based solution in healthcare, Peet, Grenier and the ALI board knew industry consolidation was likely and began to consider several different strategies. The goal was to find new business for the company and to actively seek out potential suitors for what was, again, a fast-growing company. By the end of 2001, ALI's stock price had appreciated four-fold, back to the $20 plateau. In July of 2002, ALI was acquired by McKesson Corporation and subsequently renamed as the Medical Imaging Group. The acquisition deal settled on a price of $43.50 per share. As a result, the deal valued ALI at $536 million, putting it in

the B.C. business record books for being the largest all-cash technology acquisition in B.C. history.

After the acquisition, MIG, becoming part of a bigger organization, went through the necessary post-acquisition integration process. During the 18-month integration period, MIG achieved the lowest staff turnover rate in ALI's history. However, MIG's competitors slandered and intimidated imaging clients, by alleging that MIG would degrade its customer support once it became part of a larger organization. Fortunately, client anxiety did not materialize as customers have not observed any apparent changes in the quality of services brought about by the transition. Peet stayed on with MIG and served as McKesson's Vice President and General Manager of the Medical Imaging Group until the summer of 2004. Grenier was phased out and left the company soon after the acquisition. Currently, Rod O'Reilly, who is also VP Operations for MIG, has stepped up to serve as McKesson's VP and General Manager of MIG after Peet's departure.

1.2   McKesson Corporation

McKesson Corporation, a Fortune 16 corporation with 24,000 employees, provides information and care management products and services designed to reduce costs and improve quality across the healthcare industry. McKesson solutions empower healthcare professionals with the tools they need to deliver care more effectively and efficiently. Founded in 1833, McKesson ranks as the 16th largest industrial company in the United States, with annual revenues of exceeding $50 billion. McKesson Corporation, along with the support function groups within the businesses, supports the company in meeting

its mission and business objectives. The corporation is made up of these groups: Legal, Finance, Human Resources, Business Development, and Corporate Information Technology. The corporate headquarters are located in San Francisco, CA. John Hammergren is chairman and CEO of McKesson Corporation.

There are three core business segments in the company: McKesson Pharmaceutical Solutions, McKesson Medical-Surgical Solutions, and McKesson Provider Technologies. Pharmaceutical Solutions contributed about 95% of the McKesson's $80.5 billion net revenues in 2005, Medical-Surgical Solutions makes up the other 4%, and Provider Technologies the remaining 1%. The corporate organizational chart is given in Figure 1.
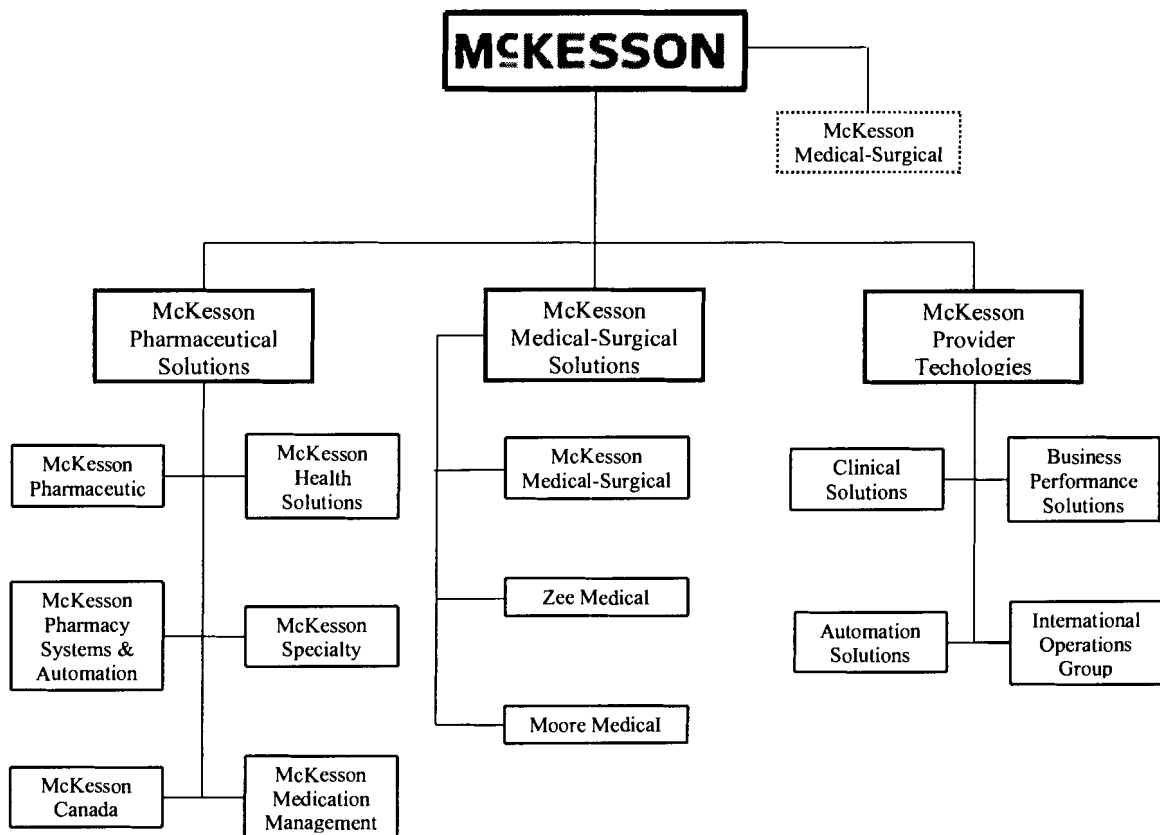
Figure 1: McKesson Organization Chart

Pharmaceutical Solutions, the largest of the three business segments, generates $76 billion in annual sales through the distribution of pharmaceuticals, health and beauty products, and supply management systems. Pharmaceutical Solutions provides branded, generic, and over-the-counter pharmaceutical drugs to more than 40,000 customers in three primary segments: retail chains, including pharmacies, food stores and mass merchandisers; independent delivery networks; and other care providers, including hospitals, health systems, and integrated delivery networks. McKesson Pharmaceutical Solutions, headquartered in San Francisco, CA, includes the following business units: McKesson Pharmaceutical, McKesson Medical Management, McKesson Specialty Pharmaceutical, McKesson Medication Management, McKesson Pharmacy Systems, McKesson Automated Prescription Systems, and McKesson Canada.

McKesson Medical-Surgical Solutions offers a full range of medical-surgical supplies and logistics and management services across the entire continuum of care. As the US's largest distributor to nursing homes, physician offices, and surgery centers, this business distributes more than 150,000 products and serves more than 85,000 customers. McKesson Medical-Surgical is based in Richmond, VA.

McKesson Provider Technologies is a leader in software, hardware, automation, services, and consultation to hospitals, physician offices, and home healthcare. Its solutions are designed to improve patient safety and reduce the cost and variability of care, improve healthcare efficiency, and better manage revenue streams and resources. McKesson Provider Technologies, located in Alpharetta, GA, is comprised of McKesson Clinical Solutions, McKesson Automation Solutions, McKesson Business Performance Solutions,

and McKesson International Operations Group. MIG is a business unit of McKesson Clinical Solutions.

Some of the products and services that McKesson Clinical Solutions offers are Ambulatory Care Management, Emergency Care Management, Homecare Management, Mobile Care Management, Order Management, and, after the acquisition of ALI, Medical Imaging Management. Prior to the acquisition, McKesson was not involved in the medical imaging realm. As the healthcare sector demanded a broad-based enterprise solution for healthcare information technology, McKesson sought the right kind of consolidation to expand and complement its existing offerings. The ALI product line, UltraPACS, now known as Horizon Medical Imaging ^{TM}, expands McKesson's Horizon Clinical ^{TM} suite to include medical images, making it the most comprehensive offering available today. Horizon Clinical is McKesson's next-generation, integrated suite of solutions for physicians and other clinicians in multiple care settings. "With the growing use of digital technology in medical exams, healthcare organizations must find more effective ways to manage electronic images, integrate them with other forms of patient information and enable anytime, anywhere access by clinicians," said Graham King, former president of McKesson Information Solutions at the time of the acquisition. "With the combined capabilities of ALI and McKesson, we can automate and streamline workflow to 'close the loop' on quality and costs at every step in the process—from the

time a test is ordered until the image is interpreted and the results are distributed to the referring physician."[4]

1.3   MIG's Products Offerings

The core product that MIG develops is a Picture Archiving Communication System (PACS).   As the industry begins moving towards an electronic healthcare enterprise solution, MIG has already developed and has been marketing another product for two years—Radiologist Information System (RIS).

1.3.1   Horizon Medical Imaging [TM]

Horizon Medical Imaging [TM] (HMI) is the name the MIG's PACS is branded under. PACS is a system that helps hospitals capture, view, store, retrieve, distribute, manipulate, and manage medical images electronically. It plays an important role in the migration of imaging facilities towards a 'film-less' and 'paper-less' environment.[5]

The core purpose of PACS is to boost efficiency in healthcare by eliminating costs associated with film and hard-copy archives. Moreover, the implementation of PACS has led to many improvements for patient care, including shorter hospital stays, decreased waiting times, and faster diagnoses.   PACS increases the efficiency of imaging departments by simplifying workflow, enhancing productivity, and making information

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[4] McKesson Press Release, "McKesson Completes Acquisition of Industry-Leading PACS Solution; A.L.I. Technologies Rated No. 1 in PACS on KLAS Top 20: Mid-Year Report Card," July 8, 2002. Retrieved July 3, 2005 from: http://www.mckesson.com/releases/2002/070802_221890159.html

[5] Before PACS was implemented in hospitals, films were developed for the scanned images. Arrays of filing cabinets were used to store all of the hospital patients' records in a film room. Radiologists read the images at light boxes where the films are hung by technicians according to the paradigm established. While diagnosing the images, radiologists used recorders to dictate any findings. Transcribers then listened to the audio recordings and transcribed them into preliminary written reports for review. Lastly, final reports were sent back to referring physicians for their follow ups.

accessible to multiple users simultaneously. These are the factors driving hospitals to adopt PACS in an effort to increase productivity, reduce fixed and scalable costs, improve patient care, and streamline the flow of mission-critical medical information to the appropriate users. Another goal of PACS is to integrate the healthcare enterprise.

Until recently, the concept of PACS has been associated almost exclusively within the realm of radiology. The diagnostic workstations, workflow models, network architecture, and storage archives which make up PACS have been designed primarily with the needs of radiologists and radiological technologists in mind. However, there has been growing demand for consolidation strategies across healthcare organizations that include other departments and information systems. The demand is driven by the need to increase clinical staff productivity and the need to make patient information within the healthcare organization immediately accessible, which makes the use of PACS invaluable in clinical decision-making.

In order to integrate PACS into the rest of the healthcare data matrix, PACS vendors and other service providers are steadily moving toward industry standardization based on the Digital Imaging and Communications in Medicine (DICOM) standard and Health Level 7 (HL7) standard in an initiative known as "Integrating the Healthcare Enterprise" (IHE).[6] The Digital Image Communication in Medicine (DICOM) standard provides a common language to transfer healthcare information between PACS and other medical imaging equipment, such as modalities, image viewers, and storage systems. The Health Level 7

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[6] Frost & Sullivan, "Enabling Picture Archiving Communications Systems with EMC Automated Networked Storage Solutions—A Frost & Sullivan White Paper Sponsored by EMC", 2003. Retrieved February 19, 2005 from: http://binary.techinfocenter.com/gems/techinfocenter/pacsfrost.pdf.

(HL7) standard provides a common language to communicate clinical information between PACS and other healthcare information systems including Hospital Information Systems (HIS) and Radiology Information Systems (RIS).

Healthcare professionals and administrators envision vital information to be passed seamlessly between systems, across departments and made available in real time at the point of care. The healthcare industry requires a framework for information sharing that meets the needs of care providers, patients, and is accepted by the vendors that builds these systems. Standards are the basis of such a framework; however, they alone do not solve the problem. Standards have gaps, open to interpretation and are at times compromised for convenience. The complex and ever-changing information domain of a healthcare enterprise makes it difficult to map a standard. Currently, the efforts to fill the gaps between standards and systems implementation has, until now, required expensive, custom integration. To close this gap, a process for building a detailed framework for the implementation of standards is required. IHE provides this process.

IHE's objective is to make this vision a reality by standardizing systems integration; therefore, removing barriers to optimal patient care. Integration with legacy systems that do not comply with DICOM and HL7 standards requires tremendous customization efforts and costs. IHE is an initiative undertaken by medical specialists and other care providers, administrators, information technology professionals, and the industry to improve the way computer systems in healthcare share information. Spearheaded by the Radiological Society of North America (RSNA) and the Healthcare Information and Management Systems Society (HIMSS), IHE brings the users and developers of

healthcare information and imaging systems together. IHE promotes the coordinated use of established communications standards, such as DICOM and HL7, to address specific clinical needs in support of optimal patient care. Systems developed in accordance with the IHE standard communicate better with each other, are easier to implement, and enable care providers to use information more effectively. [7]

HMI is a DICOM and HL7 compliant PACS.

1.3.2   Horizon Radiology Manager [TM]

Market changes have impacted PACS sales such that many customers request quotes of an integrated RIS/PACS suite. Also, MIG finds that imaging beyond the radiology department at a facility requires workflow management as a key to finalize the sale. To fill the need, MIG has started a RIS development project that acquires, modifies, maintains, installs, and supports this new product; a next generation workflow manager that uniquely positions McKesson as the continuing leader in medical imaging workflow management.

RIS is a computerized system for managing the business and record-keeping functions of a radiology department, such as scheduling, billing, and patient information. It may be connected with, and can be a part of, an overall hospital information system (HIS), but such connectivity is not necessary for its operation. RIS is capable of managing digital images, but again, such functionality is not vital to its operation as a business management system.

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[7] Integrating the Healthcare Enterprise FAQ.

Horizon Radiology Manager ™ (HRM) is a workflow management system for tracking and managing patients, films, and supplies to improve the administrative and clinical workflow of radiological departments in all sizes of hospital enterprises and clinics. A Web-based, feature-rich solution, Horizon Radiology Manager has a full range of application modules for acute care and outpatient radiology departments, including order management, mammography, electronic signature, film management, claims preparation, system administration, and management reporting tools. Optional modules include Scheduling across departments and Reporting for transcription and digital dictation to improve workflow. HRM is targeted for any department or referring user that acquires images or views clinical data or management statistics associated with the acquisition of images.

HRM is available as either a standalone solution or a component of Horizon Radiology™, McKesson's comprehensive image-enabled enterprise medical image and information management suite. HRM can be integrated with HMI PACS solution, which is installed in more than 700 facilities of varying sizes. The integrated RIS/PACS suite increases the productivity and lowers the cost of billing, scheduling, reviewing images, dictating, transcribing, signing, distributing, and accessing clinical images and reports in all disciplines—anywhere, anytime. The result is a feature-rich solution to address all medical imaging needs across the enterprise.

HRM interacts with the Horizon Medical Imaging (HMI) system via HL7 interfacing, primarily for passing and sharing patient data.

1.3.3   Revenue Streams

The majority of MIG's revenue streams are generated from its HMI sales. HMI revenue makes up about 96% of MIG's total revenue. Being a new product, HRM revenue makes up the remaining 4%. As HRM continues to mature, it is forecasted that its revenue will double by the end of 2006, and will quadruple by 2008. Meanwhile HMI sales are predicted to steadily grow to over 150 million in three years.

This paper will analyze the PACS industry in the North American market that MIG is active in, and where the major market share of the whole PACS industry worldwide lies.

2 PACS INDUSTRY[8]

The PACS market is highly competitive in North America, with revenues totaling $1.0 billion in 2003. Between 2002 and 2003, sales of PACS grew at an annual rate of 15.8%. This market is expected to reach $2.0 billion in 2010, while cumulative revenues from 2004 will reach $11.27 billion. In other words, the compound annual growth rate (CAGR) of the PACS market between the years 2003 and 2010 is projected to be 10.4%.[9]

Throughout the history of the market, most purchasers of PACS solutions have been large hospitals with over 300 beds. Due to high implementation costs, the adoption of turnkey PACS systems was initially restricted to healthcare facilities conducting at least 500,000 imaging procedures annually. However, as this end-user segment approaches saturation, the future of the market is expected to lie increasingly with smaller facilities. The fastest growth is occurring in community hospitals (100-249 beds) and high-volume imaging

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[8] Frost & Sullivan, "North American Turnkey Radiology PACS Market," A754-50, June 2004.

[9] According to TekPlus, the global PACS market is growing at double-digit growth rates between 2001 and 2005. The largest market penetration is in USA and parts of the Western Europe; and the slowest penetration is in some parts of Africa and Asia. Source: TekPlus, "Global Picture Archiving and Communication Systems (PACS) Market," Retrieved February 19, 2005 from: http://www.tekplus.com/TP0171B03V01.html.
According to HBS TekPlus, revenue from the North American and Western European PACS market is $0.71 billion in 2001. Revenue is expected to grow to $1.57 billion in 2005 with a compound annual growth rate of 22.1%. Source: TekPlus, "North America & European Picture Archiving and Communications Systems Market (PACS)," Retrieved February 19, 2005 from: http://www.tekplus.com/TP0031M02V01.html

centers[10]. Logically, the main opportunities in the PACS market are among community hospitals and high-volume imaging centers.

PACS upgrades have also become a major sub-segment of the market. It is estimated that about 500 facilities implemented their PACS six to ten years ago. These facilities are finding that their systems have become obsolete due to exploding image volumes, higher bandwidth and storage needs, and new developments in PACS software functionality. As a result, many of these facilities are replacing their old PACS with the newest systems.

According to Frost & Sullivan, there were 376 PACS installations in 2003. This raises the total installed base to 1,249 among hospitals and 280 among imaging centers. However, there are over 5000 hospitals in the United States and Canada that have yet to implement radiology PACS. The majority of these hospitals are medium and small community-based hospitals with less than 300 beds. Market penetration in hospitals is at 17.7% in 2003, and expected to rise to 59.6% by 2010. Similarly, penetration in imaging centers is at 8.9% in 2003, and expected to rise to 25.0% by 2010. Currently, the average price of a PACS is $2.3 million, but the trend shows average prices to be decreasing. Prices range between $150,000 and $4,000,000, but the range is lowering. Data from a PACS census conducted by IMV is summarized in Table 1: PACS Market as of 2003.

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[10] An imaging center is generally a stand-alone business or clinic that often performs radiology imaging on outpatients only. Their principal function is providing imaging and reporting services to referring physicians. Imaging Centers are highly competitive, focused on ROI and the ability of a product to assist them in gaining customers.

	Non-Hospitals	100-199 Beds	200-399 Beds	400+ Beds	Total
PACS census respondents	195	482	834	377	**1,888**
PACS census universe	520	785	1,205	525	**3,035**
Sites with PACS by end of 2003	46%	26%	35%	58%	**39%**
	240	*204*	*421*	*305*	*1184*
Sites planning to buy PACS for years 2003 through 2005+	31%	51%	55%	56%	**50%**
	161	*400*	*663*	*294*	*1518*

Table 1: PACS Market as of 2003[11]

2003 revenues from the top six PACS vendors combined to comprise over 84.4% of total PACS revenues. The top six vendors, in order based on the size of their market shares, were: GE Healthcare, Siemens Medical, Fujifilm Medical, Agfa Healthcare, Philips Medical, and McKesson Medical Imaging. In fact, more than half of market revenues, 54.7%, were controlled by the top three vendors. However, market domination is showing a tendency of decreasing. One important factor to note is that, among the top six vendors, MIG is the only dedicated healthcare information technology provider. The other five top players are either global multi-modality medical equipment manufacturers or global X-Ray film manufacturers. The economies of scope, therefore, lend significant advantages for MIG in terms of market penetration. This will be examined further when the five basic competitive forces are discussed.

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[11] IMV Medical Information Division, "2002/03 PACS Census Market Summary Report," April 2003, pp III-1, III-2, IV-2, IV-3.

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Although smaller PACS vendors represent but a fraction of the market share, these companies are emerging and finding niche markets by exploring alternative purchase schemes and financing plans. Because the majority of the virgin PACS market is primarily among smaller hospitals and imaging centers, the concept of "fee-per-use" payment, or the application service provider (ASP) model is slowly gaining ground. The representatives of this group of contenders are Stentor Inc., Amicas, and Emageon. In particular, Stentor was awarded for PACS Customer Value Enhancement by Frost & Sullivan in 2004. Stentor implements innovative growth strategies that focus on guiding its risk-adverse or budget-limited customers to implement radiology PACS by phases, through its solutions on a fee-per-study application service provider (ASP) model.[12] Nevertheless, according to the IMV PACS census, GE is still, by far, the most frequently considered vendor for planned PACS acquisitions, even among the small hospitals and imaging centers.[13]

The key PACS industry participants and their products in the North American market are tabulated below in Table 2: Key Industry Participants and Their Products.

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[12] Frost & Sullivan, "North American Turnkey Radiology PACS Market," A754-50, June 2004, p.2-30.
[13] IMV Medical Information Division, "2002/03 PACS Census Market Summary Report," April 2003, p.IV-16

Company	Primary PACS Product Line
Afga Healthcare	IMPAX
GE Healthcare	Centricity
Siemens Medical Solutions	SIENET
Philips Medical Systems	Inturis
Eastmen Kodak Company	DIRECTVIEW
Fijifilm Medical Systems	Synapse
McKesson Medical Imaging	Horizon Imaging
VitalWorks-Amicas, Inc.	Vision Series PACS
BRIT Systems, Inc.	Roentgen Files
Merge eFilm	FUSION
Cerner Corporation	ProVision
Emageon-Ultravisual	Intelligent Visual Medical System
eMed Technologies	eMed Matrix
Stentor	iSite
IDX Systems Corporation	ImageCast
DR Systems, Inc.	Dominator

Table 2: Key Industry Participants and Their Products

PACS is fundamentally a service industry and not a hardware-oriented industry. PACS vendors have moved away from proprietary hardware-software solutions to design software to run on standard IT hardware platforms, including off-the-shelf workstations, displays, servers, and storage systems.

Threat of New Entrants

Low, decreasing
(-) High initial investment
(-) Intensive learning and R&D effects
(-) High branding and reputation recognition
(-) Personal/direct sales to break in to market place
(-) Bundling
(-) Strong relationships with suppliers
(-) Moderate to low industry profits
(+) High market growth

Bargaining Power of Customers

High, stable
(+) Researched purchase by sophisticated customers
(+) High total costs
(+) Use of bids
(+) Differentiation narrowing
(-) Lack of buyer concentration
(-) High switching costs

Rivalry Among Existing Competitors

High, increasing
(+) Customers sensitive to PACS price
(+) Limited product differentiation, differentiation narrowing
(+) Different cost structures and pricing models
(-) High market growth
(-) Branding
(-) High switching costs

Threat of Substitutes

Low, negligible
Remaining the status quo

Bargaining Power of Suppliers

Medium, stable
(-) Standard off-the-shelf hardware products
(-) Abundant third-party software vendors
(+) Software engineers with domain knowledge in demand
(+) Skilled labour shortage
(+) Domain experts in demand

Figure 2: Five Basic Competitive Forces in the PACS Industry[14]

[14] Adapted from Dr. Ed Bukszar's class notes "EMBA Strategy Seminar", Spring 2005, Simon Fraser University, and adapted from Michael E. Porter, "How Competitive Forces Shape Strategy," Harvard Business Review, March-April, 1979.

2.1   Threat of New Entrant (Low—Decreasing)

The threat of new entrants is not only very low, but also decreasing. The significant initial research and development costs block entry into the PACS industry. Moreover, rapid technological changes and expanding customer requirements for PACS continually raise the bar for new entrants looking to enter the market. New PACS vendors can benefit from mergers and acquisition activities to leverage the success rate. However, the success rate is low because, given the mission-critical nature of PACS, brand-name recognition and strong client portfolios are important criteria for PACS vendor selection. All of these factors act as barriers for new entrants.

(-) High initial investment

PACS software products represent millions of dollars worth of investments by PACS vendors in software development and technology acquisition. Moreover, the process of domain knowledge acquisition, product design and development, regulatory approval, and clinical trials can take years before a PACS can be sold on the market.

(-) Intensive learning and R&D Effects

The minimal requirements for a product to be competitive are increasing. Initially, PACS focused solely on radiologist workflow. PACS vendors are being challenged to broaden and integrate their portfolio of clinical solutions. PACS are now required to be capable of interfacing with other information systems in hospitals in order to automate the information flow necessary for total image life cycle data management. Meeting this

challenge could also require vendors to become intimately acquainted with multiple clinical and administrative departments throughout the hospital.

Rapid technological advancements in medical scanners demands PACS handle newer types of images and information, display increasing number of images, and improve responsiveness for radiologists and other users, enabling them to navigate large studies. This creates strains on both R&D and financial resources to meet the expectations of handling exploding image volumes and new developments in PACS software functionality.

(-) High branding and reputation recognition

PACS has grown well beyond being an early adopter product. Most of the remaining target customers are averse to risk. Apart from the lack of financial resources, smaller, community-based facilities were also hesitant to make the shift to employ new imaging technologies such as PACS. PACS is a mission critical project that affects patient healthcare. A malfunctioning PACS can easily jeopardize patient well-being, particularly in the emergency department. Moreover, in the replacement market, hospitals are less tolerant to problems and issues that may obstruct hospital operations.

Therefore, hospitals prefer to turn to a PACS vendor that possesses a track record of being able to deliver the product and successfully fulfill its contractual commitments. Often, brand-name recognition can provide and strengthen the prestige and credibility of the PACS provider. Hospital preferences for branded products extend to the notion of

support longevity, as recognized names yield the intangible quality of a company that will continue to be in business.

(-) Personal/direct sales to break in to market place

PACS solutions are sold almost exclusively through direct sales organizations. Because of the complexity of PACS implementation, the PACS market is not based on a transactional business model. The relationship between the PACS vendor and the end user does not end once the solution has been configured and installed. In fact, this is just the beginning of the relationship. In this sense, it is more fitting to say that PACS customers purchase a relationship, and not just a product. This poses an entry barrier for new players who have not yet built those relationships with hospital networks.

(-) Bundling

Dominant PACS vendors use their other product offerings as leverage in the PACS market. For example, a PACS can be provided at no cost to hospitals with the purchase of new medical scanners. With three of the top six PACS sellers being global multi-modality medical equipment manufacturers, such practice is not uncommon. New entrants that do not possess product bundles will have difficulties penetrating the market.

(-) Strong relationships with suppliers in order to provide integrated solutions

To provide a competitive product, PACS vendors need to integrate other tools and add-ons that are often developed by specialized software application vendors. Software applications to perform 3D rendering from two dimensional images and image fusion are

high-demand functionalities that PACS vendors often outsource. New entrants and startups usually do not have the connections with these specialized software suppliers.

(-) Moderate to low industry profits

Gross margins in the PACS industry are about 10-20%, with profit margins being approximately a single digit percentage. Speculations are circulating in the industry that very few PACS vendors are actually making sustainable profits in the PACS market. Low industry profits combined with fierce price competition are factors discouraging new entrants from entering the market.

(+) High market growth

As discussed previously, the growth rate is predicted to be in double digits over the next few years. Thus, the PACS market is a high growth one.

2.2   Rivalry Among Existing Competitors (High—Increasing)

Intense rivalry exists among competitors in the PACS market. This rivalry is mainly due to the narrowing in differentiation between different PACS. The competition is further intensified by competitors engaging in price wars by offering bundled products and alternative purchasing schemes. Vendors like GE Healthcare and Agfa Healthcare, who use other products they sell to provide bundled offerings, are big winners in the market. Emerging PACS vendors, despite being small upstarts, are able to find success in catering to niche markets by offering alternative purchase schemes and financial plans through a "fee-per-use" system or the Application Service Providers (ASP) business model.

(+) Customers sensitive to PACS price

As adoption of PACS by large hospitals becomes saturated, the main opportunities for growth in the market will lie with the middle and lower tier consumers. While large and prestigious hospitals have sufficient funds to finance PACS implementation, community hospitals and imaging centers are unlikely to have the financial resources to pay for a complete package up front. This challenges PACS vendors to provide robust solutions to meet the needs of smaller facilities within their budget limits, or risk losing the opportunities in this expanding market segment.

(+) Limited product differentiation, differentiation narrowing

Most industry participants agree that the differences in viewing functionality and performance between software packages of the major PACS vendors have become negligible. This has resulted from the tendency for radiologists to read diagnostic images fairly uniformly. While some preferences will differ from physician to physician, the main requirements are generally agreed upon. This has led to a reasonably standardized set of functionalities and product features across multiple PACS vendors. Nevertheless, different PACS products vary in user friendliness or usability of standard features.

(+) Different purchase schemes and pricing models

To approach price sensitive customers, PACS vendors who also offer other medical equipment sell their products in bundles. In such cases, the price of PACS is often negligible. These vendors are, after all, interested in securing the more lucrative service

contract. Independent PACS vendors, generally, approach facilities with a plan that can be phased in over a period of several months or even years, and offer alternative financing plans that allow purchasers to spread the cost of the PACS over installments. The innovative strategies that independent companies have been using to gain market share are poised to have a major effect on the competitive landscape of the industry. Small PACS vendors, such as Stentor, Amicas, and Emageon-Ultravisual, are offering alternative purchasing schemes and financing plans that are attractive to community hospitals and high-volume imaging centers; these are where the main opportunities in the PACS market lies.

(-) High market growth

The market is currently in a growth stage and the trend sees the growth increasing. Even after the market reaches saturation, growth in the PACS market is expected to be continuously sustained by the replacement market, unlike most consumer products that have a bell-shape product life-cycle.

(-) Branding

Due to the nature of PACS, branding helps customers distinguish differences between PACS services and product offerings from different vendors. Brand recognition reduces the rivalry among existing PACS vendors.

(-) High switching costs

High switching costs decrease the rivalry among competitors by locking customers to their current vendor. However, the trend for clients remaining loyal to a single PACS vendor is declining. When customers pursue divergent implementation and upgrade paths, they become willing to switch to a PACS vendor that is able to provide a more flexible platform; one that enables future upgrades and lessens migration costs and complications. Yet, as the majority of vendors are becoming DICOM and HL7 compliant, high switching costs will, once again, discourage end-users from switching to a competitor's product.

2.3   Bargaining Power of Suppliers (Medium—Stable)

The overall bargaining power of suppliers is medium. Although there are experienced engineers in demand, the advent of the Internet and global network access means demand can be met by global outsourcing. Given time and adjustments by the human resource market, trained personnel are able to fill in the needs.

(-) Standard off-the-shelf hardware products

The hardware platform that PACS runs on comprises of standard, off-the-shelf IT products. Thus, there are multiple hardware vendors to choose from. For example, LCD display vendors include Planar, BarcoView, Image Systems, Sony, Eizo, Data-Ray, and National Display Systems.

(-) Abundant third-party software vendors

Software vendors specializing in software tools plugged into PACS are flourishing in the market. Therefore, their bargaining power is low. However, there are still switching costs, albeit small, when changing from one vendor to another.

(+) Software engineers with domain knowledge in demand

It is always difficult to find experienced software engineers with domain knowledge in the workforce. However, most PACS vendors have amassed records of their knowledge and know-how in internal documentation. Software engineers can be trained with said documentation. Furthermore, the need can be met by outsourcing globally, or by establishing partnerships with universities in research projects. It is important to note, however, that the latter two cases present increases in coordination costs.

(+) Skilled labour shortage

There is a demand for engineers who possess a high level of experience and expertise with PACS installation. As in the above case, personnel are trained for a few months when they are first hired.

(+) Domain experts in demand

Dominant PACS vendors usually have their own domain experts who provide information on the requirements and specifications for PACS. Otherwise, radiologists and clinical technicians are hired full-time or part-time to provide consultation services

and to transfer their domain knowledge to the company. Domain experts have little bargaining power because of the availability of domain experts from local hospitals, healthcare industries, and research groups at universities.

2.4   Bargaining Power of Customers (High—Stable)

Customers possess high bargaining power in the PACS industry. One factor contributing to their bargaining power is the high costs involved in the deal. Moreover, because differentiation between PACS by different vendors is narrowing, customers are afforded more choices without having to sacrifice distinctive features.

(+) Researched purchase by sophisticated customers

PACS has existed for about a decade. During this time, radiologists, PACS and IT administrators, clinicians, and other hospital personnel have conducted varying levels of research on PACS and have received various levels of exposure to PACS functionalities. Customers are educated and sophisticated in their knowledge of PACS, enabling them to effectively negotiate the terms and conditions that would otherwise be set by PACS vendors.

(+) High total costs

The average price of a PACS is about $2.3 million. Although the trend calls for prices to continue sliding, it is still considered a sizeable sum relative to hospital budgets. If, however, a PACS is being considered as a potential package purchase, along with other

medical supplies and systems, such consideration gives the potential customer tremendous bargaining power.

(+) Use of bids

Increasingly, hospitals are requesting that PACS vendors submit bids or provide quotes for their products. Customers use the bids to increase their power, or use quotes to negotiate the best price and product offerings they can get.

(+) Differentiation narrowing, homogeneous services with low differentiation

As PACS feature sets provided by different vendors become less differentiable, the ability to substitute one PACS by another becomes easier. This increases the bargaining power of customers.

(-) Lack of buyer concentration

Most hospitals and imaging centers make independent PACS purchase decisions. This lack of buyer concentration reduces the bargaining power of customers. However, this is not a factor that significantly affects bargaining power because the revenue stream from each PACS installation is just too great to be ignored.

(-) High Switching costs

It is very rare for customers to switch PACS vendors. Only in cases where customers are *very* dissatisfied with their existing PACS, or when they need to upgrade an obsolete

system, do customers consider a switch of vendors. Switching costs are very high, due mainly to the high implementation costs of PACS installation and the time consuming purchasing process. Moreover, once users are accustomed to the user interface of a particular system, switching to a different product will invariably cause an initial decrease in productivity.

2.5   Threat of Substitutes (Low—Negligible)

Without PACS, hospitals and clinical imaging centers must revert to the use of film and paper workflow. Such a system is not an economically viable solution as the imaging volume at a facility has no doubt grown to a substantial size. On the other hand, imaging facilities that have low imaging volumes may find a negative return on investment of installing PACS. The considerable cost of PACS implementation continues to keep the possibility of implementing a PACS out of reach for a large number of institutions. While the largest and most prestigious hospitals have the funds available to finance ambitious PACS, film-less image management, and electronic medical records projects, community-based hospitals are not likely to be able to increase the financial resources that they bring to the table. The vast majority of PACS implementations today are direct or outright purchases. Few buyers opt for standard leasing.[15]

However, the decision to invest in a PACS is slowly moving away from mere cost justification. There are countless software savings and benefits that cannot be accounted for in the business model, like improved patient care. A fully-integrated PACS can reduce hard dollar costs and improve productivity through workflow improvements.

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[15] Frost & Sullivan, "North American Turnkey Radiology PACS Market," A754-50, June 2004, p.2-26.

When presented with the role of medical imaging in the delivery of healthcare as an institutional management issue, such as showing how a PACS implementation aligns with the enterprise's electronic medical record (EMR) initiative, decision makers will see that the medical images and radiology reports archived digitally on the PACS will later be incorporated in the EMR. As a result, they will be more willing to allocate institutional funds and support investing in a PACS.

Nevertheless, by far, the most successful way to gain approval for a PACS implementation is to present an accurate financial view of the PACS plan using the ROI tool. In a for-profit environment, any expenditure must result, directly or indirectly, in increased revenues or a reduction in operating expenses substantial enough to offset the cash outlay in a relatively short period of time. In a nonprofit environment, financial justification must, at minimum, demonstrate an improvement in the use or allocation of resources.[16]

2.6   Assessment of Industry

Overall, the PACS industry is not an attractive industry for new entrants because competition is very intense. The requirements for initial upfront investment and R&D efforts are high, but profit is low if companies wish to remain competitive in pricing. For existing contenders that are gaining market share, however, it is an attractive industry to be in. As the market continues to grow in double-digit rates over at least the next few years, the growth is expected to be sustained by the replacement market. Moreover, as PACS becomes an enterprise resource to hospitals and imaging centers, healthcare

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[16] Gary Reed, "Issues and Recommendations for Cost Justifying a Medical Image Archive," Integration Resources, Inc. Retrieved July 3, 2005 from: http://www.irpacs.com/savings1.htm.

information technology providers and medical equipment manufacturers will have no choice but to expand into the PACS industry in order to make their product portfolio more comprehensive, allowing them to compete and continue to exist in the market. In fact, the trend will lead to changes in industry boundaries.

Based on the industry analysis in the preceding sections, the key success factors in the industry are: ability to provide a continuing stream of value-added product enhancements including a higher level of interoperability between the PACS, RIS, and HIS; proven track records of successful PACS installations and of providing cost effective solutions to customers; and good reputation of providing customer service and after-sales support. Moreover, as the industry consolidates, another key factor for success is whether the contender is able to strategically analyze its approach so as to provide a comprehensive IT solution to building electronic health records (EHRs), as opposed to selling discrete healthcare products. Bundling offer, a strategy often used by dominant PACS vendors, is one way to achieve that.

3 INTERNAL ANALYSIS OF MIG

The generic strategy of McKesson Medical Imaging Group, as shown in Figure 3: Strategic Fit Chart of McKesson Medical Imaging Group, is mainly one of differentiation. However, there is continuing pressure to push the strategy towards one that is cost-based as PACS becomes a commodity and the market approaches maturity. According to a market report complied by Frost and Sullivan, the PACS market has grown well beyond the early adopter phase.[17]

	Cost Based Low Cost / Adequate Quality	1	2	3	4	5	6	7	8	9	10	Differentiation High Quality / Adequate Cost
Product Strategy	Rapid Follower								x			Innovative
R & D Expenses	Low R & D							x				High R & D
Structure	Centralized								x			Decentralized
Decision Making	Less Autonomy					x →						Autonomy
Production and Installation	Economies of Scale							← x				Economies of Scope / Flexible
Labour	Mass Production									x		Highly Skilled / Flexible
Marketing	Comparative / Push						x					High Cost / Pioneering / Pull
Risk Profile	Low-Risk							x →				High-Risk
Capital Structure	Leveraged									x		Conservative

Figure 3: Strategic Fit Chart of McKesson Medical Imaging Group[18]

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[17] Frost & Sullivan, "North American Turnkey Radio ogy PACS Market," A754-50, June 2004, pp.1-7.
[18] Adapted from Dr. Ed Bukszar's class notes "EMBA Strategy Seminar", Spring 2005, Simon Fraser University.

MIG's organizational capabilities and competence lie in its product expertise, deployment, and customer support. As MIG expands into the market for enterprise-scale image management systems serving all radiological imaging modalities, it has gained an in-depth understanding of the workflows of radiology departments for many modalities. Moreover, MIG's competence includes providing cost effective ways to integrate third-party systems while offering a high degree of interoperability. These strengths ensure that the scalability, reliability, and performance of MIG's PACS will handle the more rigorous and complex conditions in large-scale solutions. Adding to its strengths in the market is MIG's ability to provide customers with quick and personalized service. All these factors combine to give MIG a competitive advantage over many players in the market.

3.1 Strategic Fit Analysis

It is unwise for a business unit such as MIG to select a strategy unless it fits well with the rest of organization. MIG's business model was founded on the strategy of differentiating itself as a supplier by means of exceptional product development and customer oriented support. Culturally, the company is well positioned to execute this strategy. Strategic fit is achieved when strategy, organizational capability, core competence, and the market are in synch. Strategic fit leads to a competitive advantage for the company in its industry.

3.1.1 Product Strategy: Innovative

MIG's core product strategy is technological innovation, achieved by providing cutting edge features in its PACS. The next generation of PACS, making its market debut in

spring, 2005, provides advanced features like sequencing of images, adaptive loading of large image files, and integrating third party software on-the-fly. These new features have never been offered by any player in the industry before. As always, fast user response performance sets MIG apart from its competitors. In providing such cutting edge features, MIG's innovative ways of using technology gives the company a competitive advantage.

Unfortunately, MIG has lagged behind by not providing a complete Web-based product line. Resource constraints and MIG's focus on the high-end PACS market have detracted from MIG's ability to develop its Web-based solutions. However, strictly speaking, Web-based solutions are more of a marketing, deployment, and cost issue as opposed to being an innovative feature. As the market shifts to Web deployment and image distribution over the Internet, MIG needs to improve this aspect of its product and service offering.

In any industry, there are "Rapid Followers" and "Innovators". Big players like GE and Siemens are, comparatively, less innovative than MIG. GE and other big companies are competing using their brand power and leveraging sales with their core scanner products. Startups and small companies like DR Systems, Stentor, and Amicus represent the other side of the coin. These companies' innovations lie in their product strategies, implementing unique licensing models and Web-based deployment, with less emphasis on innovations in technology.

3.1.2   R&D Expenses: High

At MIG, R&D accounts for approximately 40% of overall expenses, which equates to 12% of overall revenues. Industry averages peg R&D expenses at about 8% of overall revenues. Clearly, 12% is an aggressive figure. By percentage, MIG's competitors spend less on R&D, although they are bigger companies in scale. In fact, GE's R&D expenditure in absolute dollar value is less than MIG's corresponding expenses. Competitors of MIG's with relatively high R&D expenses are the startups and small companies.

McKesson Corporation does not impose an expense limit on MIG, provided that it meets its revenue target. As such, there are variables that MIG can play with in making decisions regarding expenses. The majority of MIG's R&D expenses are budgeted to new and next generation product developments, with the remaining funds spent on product maintenance and enhancement. This practice of high R&D spending on new technology and product development is an integral part of MIG's differentiation strategy.

3.1.3   Structure: Decentralized

MIG is modeled after a decentralized organizational structure. This structure consists of five departments, with each department overseen by a vice president. The departments are: (1) Product Management, responsible for product planning and product marketing in MIG; (2) Engineering, responsible for the engineering and technological direction of the company; (3) Operations, responsible for the sales operations, logistics, and marketing functions; (4) Service, responsible for manufacturing, production, installation, service,

information systems, and training; and (5) Sales, responsible for sales management.

MIG's organizational chart is presented below:


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                    ┌─────────────────┐
                    │  McKesson VP    │
                    │  & MIG GM       │
                    └─────────────────┘
  ┌──────────┬──────────┤         ├──────────┬──────────┐
┌────────┐ ┌──────────┐        ┌──────────────┐ ┌─────────────┐ ┌───────────┐
│Manager,│ │Financial │        │  Manager,    │ │ Marketing   │
│  HR    │ │ Analyst  │        │ Financial Ops│ │             │
└────────┘ └──────────┘        └──────────────┘ └─────────────┘

                         ┌─────────────┐
                         │ Executive   │
                         │ Assistant   │
                         └─────────────┘

┌──────────┬──────────────┬──────────────┬──────────┬──────────┐
┌────────┐ ┌────────────┐ ┌──────────┐ ┌──────────┐ ┌──────────┐
│  VP    │ │VP Product  │ │   VP     │ │VP Service│ │ VP Sales │
│Operations│ │Management │ │Engineering│ │          │ │          │
└────────┘ └────────────┘ └──────────┘ └──────────┘ └──────────┘
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- Sales Support Ops   ▪ Product Mngt   ▪ SW Development   ▪ Service (Call Centre)   ▪ Sales Activities
- Logistics   ▪ Field Marketing   ▪ SW Test   ▪ Production & Install
                       ▪ Channel Business   ▪ System Engineering ▪ HRM Implementation
                                            ▪ System Performance ▪ Service Contracts
                                            ▪ Product Integration ▪ Information Systems
                                            ▪ Quality & Regulatory ▪ Field Services

Figure 4: MIG Organizational Chart

Each department is an independent unit that operates according to its own processes and reporting structure. Departments are authorized to make decisions concerning their own operations. In particular, structural decentralization in the R&D Department permeates even further, right down to the project level. Operating within the boundaries set forth by company standards and guidelines, each project team manages its own resources to meet their project objectives and deadlines. A decentralized structure serves MIG well in implementing its differentiation strategy. It allows each unit of the organization to mitigate risks and make necessary changes quickly as the need arises. However,

decentralization challenges departments to reduce overhead generated from common data and resources that could otherwise have been shared.

3.1.4 Decision Making: Moderate Autonomy

MIG is highly autonomous with respect to operation decisions and product related decisions. Management and leads are entrusted and empowered to make decisions that are in their area of responsibility and expertise. For example, technical leads recommend and make decisions for the resolution of technical issues and software architectures of the project they are involved with. The director of software architecture may review and approve technical design on an as needed basis. Systems analysts and user interface designers make decisions on how the system should look and behave under certain conditions. Such autonomy is granted to and assumed by the staff because MIG employs highly skilled professionals.

However, MIG has become less autonomous with regards to the making of business decisions after the departure of Greg Peet, former President and CEO of ALI. For example, MIG is incapable of determining which market to pursue. For ALI, entering the PACS market was not a strategic decision, but one driven by technology and, later, by sales. Now that MIG is a part of McKesson Corporation, it relies solely on the parent company to identify and define its market. The current state of affairs is a result of MIG executives being apprehensive about making company-defining decisions. As new managers and executives bring their experience and expertise in making business decisions to the company, MIG will gravitate towards autonomous business decision making.

McKesson Corporation and McKesson Provider Technologies have always given MIG free reign to make its own decisions, including business ones, in the medical imaging markets. MIG now needs to shift its mindset and culture, and aggressively take up ownership of its fate.

3.1.5   Production and Installation: Economies of Scope and Flexibility

With detailed manufacturing and installation procedures completed, focus shifts to the production stage. Although the production process does not require skilled workers to build the machines, it is a labor intensive endeavor. But, just as no hospital is exactly the same, there are no two identical PACS installations. Therefore, the installation process requires skilled personnel to customize the PACS, on site, at the configuration level. In enterprise solutions, much customization is required. Workers must possess the knowledge for connecting the system to not only various medical devices, like CT scanners, but also other third party systems.

Because of rapidly changing technologies and in an effort to reduce inventory costs, MIG adopted the build-to-order model in production and installation. Often, customers demand their new PACS to be installed over specific weekends and in as short a time as possible. Hence, production and installation staff must be flexible with their working schedules. Production and installation operations that involve this level of customization and demand for flexibility cannot be achieved in a mass production fashion. Consequently, as MIG expands its customer base, the number of installation sites for it to service also increases, forcing production and installation to grow proportionally. This has imposed a serious deployment issue to the growth of the business.

Aside from reacting to the marketing hype created for Web-based PACS products, MIG urgently needs to build its own next generation Web-based products in order to solve part of its deployment problem. As mentioned above, Web-based products have a different licensing scheme. Clients usually provide their own hardware (i.e. computers). In these cases, MIG will allow a client to download the software from a Web server maintained by MIG. However, such licensing formats will reduce, tremendously, the requirements on production and installation in building the workstations.

3.1.6 Labour: Highly Skilled and Flexible

As with Production and Installation, other departments at MIG also require highly skilled labor. In some cases, clinical domain knowledge is a must for project operations. For example, on the image processing development team, most team members have a post-graduate level education in mathematics, physics, or medical imaging. Due to the nature of this business, the majority of employees at MIG have acquired relevant domain knowledge in various degrees before they are hired or even trained for the job.

Employees in MIG are rather flexible, too. Employee transfer between departments and project teams is not uncommon at MIG. In addition, most R&D senior managers also participate in sales activities and service supports.

3.1.7 Marketing: Comparative and Push

As PACS becomes a commodity, the marketing of PACS takes on a "push" promotional strategy. The PACS market is very competitive. There is a saying that goes, "A PACS is a PACS." Standard PACS features, such as magnifying glass, zoom, pan and, annotations, are commonly provided by all PACS vendors. The subtle differences lie in a

system's ease of use or usability of features. With that being the case, MIG's marketing strategy depends heavily on word-of-mouth advertisement, providing comprehensive post-sales support, ensuring customer satisfaction, installing systems at luminary sites, and prestigious sales activities. Although the fastest growing market segment is among the smaller hospitals and imaging centers, with a mission critical project like PACS implementation, the marketing strategy remains heavily reliant on customer references and satisfaction reports. With the release of the next generation of PACS, MIG marketing requires some pioneering and "pull" effort on its innovative features. The concepts of sequencing, sorting of images according to rules based on how radiologists read them, and adaptive loading of images, are typical examples which fall into this category. Clients and potential clients are show demonstrations and given explanations about these advanced features in the context of a typical radiologist's workflow. Without the pulling effort, clients might not be aware of or appreciate the benefits new features can provide.

3.1.8   Risk Profile: Moderate Risk

Overall, MIG faces moderate business risk. At the moment, MIG is very profitable. However, as the PACS market becomes saturated, risk will increase if MIG does not change its strategy to become a market driven company, and not one driven by sales.

A market driven company analyzes the trend of the market and positions itself accordingly. In this industry, a healthy company generates 70% of its revenue from its products and services, while maintenance contracts account for the remaining revenues. MIG's current situation reflects this scenario. However, MIG needs to identify its long

term vision to determine whether or not it is prepared to handle the new replacement market that will arise as a result of market saturation. If MIG decides to focus on the replacement market, then it will need to strategize and plan for pursuing such a market. For example, MIG will need to begin budgeting labor and R&D expenses for projects dealing with data migration from obsolete systems to new ones. The lack of a compelling vision will lead the company to rely increasingly on sunset projects that do not hold any potential for future revenue generation.

The associated risks regarding new innovations are high. With respect to incremental innovations and improvements that prove difficult in terms of recapturing costs, a cost and benefit analysis needs to be carefully examined before launching the undertaking. Risks are arising due mainly to the difficulty in keeping customer satisfaction. As such, customer expectations are difficult to manage, and complicated by rapidly evolving technology. In a competitive market such as PACS, R&D costs need to be recuperated from multiple, subsequent sales. Thus, customer satisfaction becomes a priority.

Opportunity costs should also be considered. Five years ago, MIG began development of its next generation PACS from the ground up. This was a high risk undertaking, although the risk has been mitigated over the last five years by the fact that new developments are outpacing the rate of changes in healthcare technology. However, the situation could have been disastrous if MIG were to be faced with a growing feature list that it could not keep up with. Management must, therefore, constantly and periodically reevaluate the costs and benefits of the new development. They must be impartial and capable of

exercising sound judgment should the need to abandon a doomed development arise, so that resources are freed for higher return investments.

Another factor that increases risk is the high cost of production and installation that relies heavily on skilled labor. Although downward pressure on PACS pricing is increasing, the release of the next generation of PACS will not change the risk profile appreciably before competitors catch up with differentiating features.

3.1.9   Capital Structure: Conservative

Because it is part of a $70 billion, Fortune 16 company, MIG has a very conservative capital structure. MIG does not have any debts and is not leveraged. In fact, MIG generates approximately 50% of the profits and revenues for McKesson Clinical Solutions, the business segment of McKesson Provider Technologies.

The financial position of the corporation, as of the 2005 financial year ending on March 31, is summarized below (in millions of dollars)[19]:

Working capital	$3,539.7
Total assets	18,775.0
Total debt, including capital lease obligations	1,210.5
Stockholders' equity	5,275.1
Property acquisitions	139.9
Capital employed	6,485.6
Debt to capital ratio	18.7%

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[19] McKesson Corporation, 2005 Annual Report, p.25.

Net debt to net capital employed　　　　　　　　　　(12.8)%

Based on the above data, McKesson Corporation, and hence MIG, has a conservative capital structure.

3.1.10　Strategic Fit Assessment

The degree of strategic fit in the organization, overall, is high. This is evident based on the continual growth of the company's market share and profits in the last few years.

A key determinant of fit in MIG's differentiation strategy is in its ability to provide product innovations to satisfy unmet needs, creating value in its products, and developing new technologies. These product innovations have been backed by high R&D expenses. To remain competitive in the PACS market as a differentiator requires constant investment in technological innovation and product enhancement. Moreover, MIG's skilled and flexible workforce in its other departments complements its strategy for competing based on product differentiation. MIG's strategical strengths are also fueled by support from sales force specialization; from efficiency in distribution to personalized after sales customer service.

Although it is not currently an issue, MIG's handicap in making business decisions might cause it to lose strategic fit as the market saturates. Business decisions should be made based on understanding the market conditions and trends. Having a long term vision is the foremost concern that MIG must consider. It is, after all, the long term vision that drives the market strategy and, in turn, the product strategy. MIG needs to change its strategy to become a market driven organization, as opposed to being a sales driven organization.

MIG possesses a proven track record when it comes to delivering mission-critical applications, such as PACS, to a very demanding customer base. Now, being a part of McKesson Corporation that has strong healthcare IT presence in the industries, MIG should leverage the excellent assets provided by the parent corporation in an effort to generate additional business opportunities.

3.2   Culture

Throughout the history of ALI, the company has faced many challenges. They range from finding a niche market and developing a viable, marketable product, to fighting for survival with its book accounts, to surviving the IT stock bubble burst, to growing the company in the expanding industry. Responding to all of the challenges coming its way has shaped the foundation of ALI's culture, and that culture survives in MIG.

ALI has always valued each and every customer it deals with. Responding to a single customer's request for an elegant solution in solving unique problems was an accepted method of operation. In this way, MIG has been shaped to be a very customer centric company.

With limited funding, resources, and having to constantly work within constraints, ALI has always encouraged every employee to "think outside the box"; to exhaustively explore affordable solutions for the businesses of the company. Moreover, management has always held the view that all staff members should provide an honest effort in ensuring that those seeking help will be helped appropriately, and that everybody was willing to go the extra-mile in helping around.

In the early years of ALI's history, it was difficult to formulate a strategic plan because the industry, in its infancy, was constantly changing. The Project Management Office (PMO) was not established until a few years ago. Fire fighting and crisis management were necessary skills. ALI's business was all about excellence in the delivery of professional services. It took warriors to work at ALI. It required relentless effort, dedication, ingenuity, responsiveness, and vision from staff members. These challenges of ALI shaped the culture and characteristics of MIG to be fast paced, exciting, demanding, and rewarding.

3.3   PACS Industry Value Chain

By looking at how work is organized at MIG and analyzing how things here are done differently than they are done by competitors, it sheds lights on the areas where MIG generates its competitive advantage. The PACS industry's value chain and the footprint of MIG's value chain are given in Figure 5 and Figure 6, respectively.

					In-House
R&D	Regulatory Clearance	Clinical Trials	Marketing & Sales	Production & Installation	Service
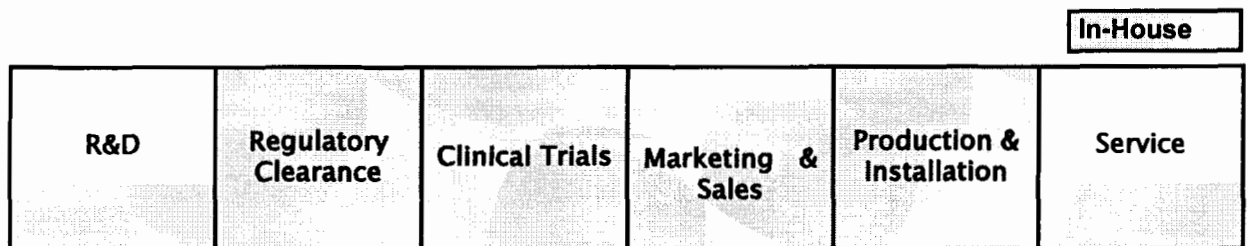
Figure 5: The PACS Industry Value Chain[20]

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[20] Adapted from Dr. Ed Bukszar's class notes "EMBA Strategy Seminar", Spring 2005, Simon Fraser University.

					In-House
R&D	Regulatory Clearance	Clinical Trials	Marketing & Sales	Production & Installation	Service

Figure 6: McKesson Medical Imaging Group's Footprint

Comparatively, MIG's footprint is dominant in the R&D and Service categories while most dominant players of the industry tend to outsource these areas. The exact portions of in-house effort in these areas are very difficult to verify.

3.3.1 Research and Development

As a turnkey solution, PACS has moved away from a hardware oriented industry to a service industry based on intellectual capital and mission-critical expertise. PACS vendors are expected to sell standardized software modules that can be installed and operated either by a hospital's in-house IT staff or by a third-party IT integrator, using off-the-shelf hardware solutions. Therefore, when referring to Research and Development (R&D) effort in this industry, it is understood to be mainly in software.

Dominant players like GE Health, Siemens Medical Solutions, and Philips Medical Systems, are global multi-modality medical equipment manufacturers. Because their core competence is not in software development, which tends to be mathematically intense and performance demanding, the majority of their software development is outsourced. For example, Siemens once outsourced its core software development to India. They are now gradually bringing the development back, in-house, due to the high coordination costs of outsourcing. GE's software developments are outsourced to India

and Cedara, an OEM PACS software supplier in Canada. Philips and Hitachi, both traditionally IT hardware vendors, also outsource some components to Cedara.

In the PACS industry, OEM suppliers, like Cedara, perform R&D that specializes on the core of PACS and imaging software development. They then sell the software to PACS vendors with minimal customization required. Usually, the user-interface remains unchanged, needing only to re-brand the software so as to convey the look and feel of their particular brand. MIG also sells parts of or complete PACS under different labels. It sells its in-house developed DICOM library, and it privately re-labels its PACS to QSR, a value added reseller, and to Spectrum, another value added reseller to a group of hospitals. Moreover, MIG is an OEM for Camtronics' PACS. Yet, revenues generated from MIG's OEM activities are negligible when compared to its total business revenues.

Startups and small PACS companies usually start research and development in areas where their core competence lies. Similarly, MIG, at one time a startup called ALI, conducts most of its R&D in-house. MIG outsources development of specialized tools and libraries that require expertise which are not cost effective to develop in-house. These components tend to be either very stable, like the 3D library and data compression/decompression library, or optional plug-ins, which are not packaged in standard offerings, such as Fusion, CAD integration, and Orthopedic templates.

One potential weakness of having such a large component of in-house R&D is the heightening of fixed costs. However, outsourced software developments have higher coordination costs and may have a higher variable cost due to licensing agreements and royalties. Moreover, outsourced R&D loses the control over software changes that is

required for adapting to rapidly changing requirements and requests from customers. This may be a contributing factor that leads to a tendency for big players to be slow in addressing customer requests for changes. This will be looked at again in later sections.

3.3.2 Regulatory Clearance

Because PACS are intended for use in officially interpreting diagnostic images, they are classified as Class II medical devices. To market a PACS in North American markets, PACS vendors need to obtain the following regulatory clearance based on the risk level associated with Class II devices:

- Canadian Medical Devices Regulations, Schedule 1101:1998;
- ISO 9001:1994 "Quality Systems - Model for Quality Assurance in Design, Development, Production, Installation, and Servicing"
- ISO 13485:1996 "Quality Systems - Medical Devices - Particular requirements for the application of ISO 9001" and;
- U.S. Food and Drug Administration 21 CFR Part 82:1996 "Quality System Regulations".

Each clearance process can take anywhere from one month to six weeks. When submitting a request for regulatory clearance, the system needs to be running at or near its production grade.

Recently introduced, the Regulatory Health Insurance Portability and Accountability Act (HIPAA) has had an influence on PACS decision-making and implementation. All PACS vendors are updating their software to meet HIPAA requirements.

3.3.3 Clinical Trials

For a new release of a PACS, it is required to be run in a clinical environment for a period of about six weeks. Clinical trials are performed at participating hospitals or imaging centers where the new system will be used for the image diagnostic purposes it is intended for. All irregularities and user feedback are collected and reported during the trial. If the issues are clinically liable, they must be fixed and verified at the participating facility before the trial ends. At the end of the trial, the facility's management will sign off on the trial report that signifies the system is acceptable for general availability in a clinical setting.

An imaging facility that participates in the clinical trial enjoys a discounted rate on the PACS with its latest technologies and improvements. Due to the risks involved with new products (e.g. new technologies may not be sustainable with extensive usage), facilities that have moderate patient throughput and are new to PACS are found to be more tolerant of problems and more willing to participate in trials.

3.3.4 Marketing and Sales

The major objective of marketing in the PACS industry is to establish brand awareness through promotional activities and advertising. Most dominant players in the PACS industry have in-house marketing departments to fulfill their marketing needs. With smaller PACS companies, management and administration staff assume the role of a marketing department. PACS manufacturers often attend trade shows and conferences like SCAR, RSNA and HIMSS to increase their brand awareness and to introduce their solutions and products.

Due to the complex nature of the solutions being sold, not to mention the considerable costs that go into every implementation, PACS solutions are sold almost exclusively through direct sales organizations. However, smaller competitors have experimented with the limited use of independent distributors in order to penetrate the middle and lower segments of the market. The complexity of the purchasing process is due chiefly to the lack of a "standard" set of features for PACS. Each PACS offering is tailored to meet specific needs by providing a number of different options. For example, the ultimate configuration of the PACS, as well as the final price, is likely to depend on the needs of the facility with respect to: imaging volume, number of workstations, types of hardware and software chosen, number of sites to be included, and whether or not enterprise image distribution and Web deployment are part of the package.[21]

Most of the hospitals and clinical imaging centers of considerable size request bids, in the form of request proposals, to initiate their PACS purchase process. A Request for Proposal (RFP) is an invitation from an organization to a group of vendors to submit their bids for supplying hardware, software, and services. The RFP includes questions on the product/service of interest, vendor's background, customer references, and a cost quotation for the specific product/service. Since a RFP attracts multiple groups of vendors, they encourage each vendor submitting a proposal to offer its products at a competitive price. All vendor RFP responses are evaluated against one another using a set of criteria predetermined by the buyer, including: cost, reputation, product ability, product reliability, vendor's background, and the vendor's customer base. RFPs are

[21] Frost & Sullivan. "North American Turnkey Radiology PACS Market" A754-50, June 2004, p.2-9.

announced either by direct invitation from hospitals, or by advertisement in the local or national newspapers.

Typically, the top two vendors are chosen in what is called the "Best of Few" stage. These two vendors will then continue to compete by conducting onsite demos and/or existing customer site visits, and also negotiate fine line items provided in the RFP (primarily costs associated with the bid). Once a single vendor is chosen, this vendor is deemed VOC or "Vendor of Choice". Negotiations continue until a final contract is formed between the vendor and buyer.

PACS is now seen as more of an enterprise resource than just a radiology resource as clinicians in other departments gain greater access to PACS through enterprise image distribution. As a consequence, PACS buying decisions are, increasingly, moving out of the radiology department and into the administrative suites, with representation from multiple departments within the hospital. This factor is expected to pose a significant challenge for certain industry participants, particularly for smaller vendors who do not have extensive experience with executive level negotiations.[22]

3.3.5 Production & Installation

This category includes a wide range of activities undertaken by the PACS vendor before, during, and after PACS installation. The primary activities included in implementation services are system configuration, pre-testing, hardware installation, software loading, creating interfaces between the PACS and other healthcare IT systems, and verification

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[22] Frost & Sullivan, "North American Turnkey Radiology PACS Market," A754-50, June 2004, p.2-25.

of the total system.[23] This is carried out by an implementation team of engineers and technicians, usually over a time frame of one to several weeks, depending on the size of the system project.

Once the system goes "live", the PACS vendor must train staff on how to use all of the features of the system, and provide ongoing monitoring and maintenance of the system to ensure that images are being routed and stored in accordance with established protocols.[24]

3.3.6   Service

PACS vendors generally bundle a maintenance and support contract with the sale of each new turnkey PACS implementation. The services typically included in these contracts are specified in each PACS vendor's service level agreements (SLAs). Under the terms of an SLA, the PACS vendor usually guarantees a high level of system availability. Additional specifications in the SLA usually stipulate that the PACS vendor will guarantee the proper functioning of all hardware components, including workstations, storage archives, and servers, and to immediately replace or repair components that do fail. The typical length of a PACS maintenance and support contract is five years. For community-based hospitals that cannot carry large financial burdens, many vendors have created flexible billing schedules for this portion of the contract, including yearly, quarterly, monthly, and even pay-per-usage billing schemes.[25]

Service is another area where there is a combination of in-house capabilities and external third-party service agents in the industry. Dominant PACS vendors are believed to have

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[23] Ibid., p.2-5.
[24] Ibid., p.2-10.
[25] Frost & Sullivan, "North American Turnkey Radiology PACS Market," A754-50, June 2004, p. 2-6.

sub-contracted the operation of their call centers out. However, this is hard to confirm, because vendors do not advertise the outsourcing of their call centers. Conversely, MIG has its own 24-hour help desk support as the first level of dealing with customer inquiries.

3.4   MIG's Firm-Level Value Chain Analysis

Most of the support activities in MIG are provided by McKesson Corporation, as depicted in Figure 7 on McKesson Imaging Group Value Chain shown at the end of this chapter. In this way, MIG can focus on the operations that lead to the delivery of PACS solutions and provide services to customers.

MIG's core competences are in its product development, R&D, production and installation, and after sales service. In its 2003 PACS report for North American markets, Frost and Sullivan awarded MIG for Market Penetration Leadership. The award is given to the company that has demonstrated excellence in capturing market share within its industry, and has exhibited strategic excellence in product innovation, marketing, and sales strategies that resulted in the largest gain in market share between 2001 and 2003.[26] In the following sections, MIG's activities will be described to show how work is organized, particularly for the areas where the firm generates its competitive advantages.

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[26] Frost & Sullivan, "North American Turnkey Radiology PACS Market," A754-50, June 2004, p. 2-35.

3.4.1 Support Activities

3.4.1.1 Firm Infrastructure

The firm's infrastructure provides the backbone and environment that supports primary activities. Accounting in MIG is limited to its expenses handling and cost center budget management. In filing its taxes and filing for the Scientific Research and Experimental Development (SR&ED) Tax Incentive Program, MIG provides raw information to the parent corporation where corporate accountants and consultants compile and file for submission. As part of accounting consolidation, accounts receivables are also followed up by McKesson Corporation. Sales and inventory use SAP to enter and track order status for completing the sales.

Being under McKesson Corporation, financial management and investor relations are handled completely by the corporation. Similarly, regarding media news and press releases, MIG provides content for advertising in medical imaging journals, periodicals, and magazines like Imaging Diagnosis and AuntMinnie, so that McKesson can advertise a complete IT solution to hospitals and imaging centers. Legal services and patent filing are also provided by the corporation with the content supplied by MIG. Corporate legal personnel compile documents, including for sales contracts, sub-contracting work, licensing of software, and property lease.

Moreover, McKesson Corporation is responsible for the information systems of the whole corporation, including MIG's. The primarily responsibilities of MIG's Management of Information System (MIS) Department are maintaining local and global network access for both voice and data, providing internal technical support, managing

security systems, and planning and budgeting for application and infrastructure needs. The corporation negotiates and acquires corporate licenses for software development tools, office software, Enterprise Resource Planning software (ERP) and Customer Resource Management software (CRM).

3.4.1.2   Human Resources Management

In terms of human resources management, personnel development and staff training are partially provided by the corporation. Corporate trainers are scheduled to come on site periodically to provide training that promotes skill and non-PACS specific learning. McKesson Corporation also provides e-learning over the Web. The HR Department at MIG coordinates the resources available and makes MIG personnel accessible, whether via an intranet or during consultation with employees directly or through the managers.

Recruitment is an in-house activity to make sure candidates fit the organization and culture. McKesson Corporation provides guidelines and structure for staff compensation and benefits, while MIG adjusts the compensation and benefits according to the local market. Every quarter, MIG reviews with MPT on the rolling forecast of sales and the required staff headcount to support the predicated sales. MPT will approve or disapprove the request for additional headcount based on MIG's sales figures and overall corporate profit targets and financial objectives. When the new hiring is approved, MIG's HR Department proceeds to put out advertisements externally and internally. Meanwhile, HR will also open files of prospects that have been screened previously and determine matches to the requirements of the current openings. Interviews of the prospects are set up by MIG's HR and are conducted locally. If a candidate is identified for a position,

his/her personal file and application will be sent to the corporate head office for final approval before the offer is extended. The position is matched to a job level defined by the corporation in accordance with the candidate's qualifications and experience. Each job level has a corresponding compensation package. HR and the concerning VP and/or director to whom the candidate will report will then work out a starting compensation package and prepare to negotiate with the candidate. Once the candidate accepts the offer, HR will complete the hiring process with the corporation by following up on the employee file creation.

MIG's HR Department also provides resources like employee assistance programs such as confidential counseling and referrals to local professional services.

3.4.1.3   Technology Development

Being a high-tech firm, MIG's R&D is a major activity in the company. R&D staff is constantly engaged in finding a fit for new and proven technologies and solutions to meet the rapid changing requirements for PACS. Nevertheless, the philosophy behind technological development is to let PACS users and customers drive technology, not the other way around. Therefore, technological developments at MIG are primarily brought forth by customer requests that turn into PACS requirements, and by meeting challenges presented during product envisioning, design, and development. Feasibility studies are conducted by pulling relevant personnel from different functional teams to break the ground in providing new technological solutions. For example, for feasibility studies on different instant messaging technologies and servers to be provided in PACS, a joint

effort between software and system engineers, under the supervision of the director of system architectures, was formed.

The R&D Department cultivates an atmosphere that values innovative but proven technology by providing a budget for each software engineer to attend training and conferences. Furthermore, R&D has the freedom to access and conduct technology research over the Internet during work hours. Aside from attending training sessions and conducting research, systems engineers remain in touch with their vendors to be apprised of the launch and introduction of any new technology.

3.4.1.4   Procurement

The Department of Procurement is responsible for all of MIG's purchases. It is up to the Procurement Department to negotiate pricing with vendors and ensure that the right product is in the right place at the right time and at the right price.

Working with Logistics, the Procurement Department negotiates the best prices for all parts and subsequently orders the materials for building PACS in each quarter. Due to the substantial size of orders and the availability of very price competitive substitutes, MIG has been very successful at getting reasonable prices for PACS materials. MIG has standard payment terms and has not failed to keep its payment schedule; therefore its relationship with suppliers is on favorable terms.

Procurement of special items, like third party software and optional components in PACS offerings, is performed in coordination with product management. When product management has negotiated reselling contracts with software vendors, procurement will

proceed with placing orders according to the terms set out in contracts. Last, but not least, the department also procures all incoming materials that are used for research and development, and for activities of other operations.

3.4.2 Inbound and Outbound Logistics

The Logistics Department offers services in handling the receiving and shipping of goods to and from MIG. The department also provides assistance in the management of inventory, which includes receiving, storage, distribution, and security of inventory parts. Outbound logistics also handles return materials authorization (RMA) for service repairs and obsolete stock disposal handling. Goods being handled by the department are office supplies, development resources, and PACS building materials. ERP is used to track the bill of materials (BOM) to be ordered, shipment status, and inventory status.

After the Production and Installation Department (P&I) has finished building the PACS order for a facility, P&I will handle all aspects related to the packaging of the PACS order. Being informed ahead of time by P&I that an order is ready for shipment, the Logistics department arranges for a national freight carrier to deliver the system to the facility for installation. The Logistics Department continues tracking of shipment status until client representatives at the site confirm delivery arrival.

All inbound logistics for MIG are performed in-house. System engineering documents source and qualify all suitable original equipment manufacturers (OEM) before producing a BOM to production management and P&I for approval. With PACS components being mostly off-the-shelf hardware components, the Logistics Department works closely with the Procurement and System Engineering departments so that

information about any parts being obsolete is learned ahead of time, giving systems engineers sufficient time to qualify replacements, and preventing Logistics from over stocking parts that will soon be obsolete.

3.4.3 Operations

3.4.3.1 Product Management

Product management works closely and directly with marketing, sales, service, customers, users, and suppliers to acquire information and get feedback on the requirements for PACS. The Product Management Department, therefore, provides the vision and roadmap of the product. Customer and user feedback are gathered from direct channels via conference calls, road shows, prototyping, conferences, and indirectly via service records and sales feedback.

After gathering data on PACS, product management will then translate stakeholder requests into features in the vision. Working with the product committee, which consists of executives and high-level management, product management is ultimately responsible for deciding the direction the company's products will take. Product managers will decide which features are in the final system and which will be deferred to a later release. Because product managers have the information first hand and have it at the earliest possible timeframe by working closely with all stakeholders, product managers are able to prioritize requests and address product issues appropriately, according to their timeline.

Product managers are responsible for providing the business case of a PACS product and for its new releases. During the envisioning of the product release, product managers

evaluate the cost and benefit of components outsourced or vertically integrated. Therefore, product managers are also the initiators for any third-party software vendor selection and contract/license negotiations.

3.4.3.2 Software Design and Development

After the requirements and scope of a new project release are defined, the project team is formed for software design and development. A project team consists of at least a project manager, systems analysts, UI designers, software engineers, and testers. The project development model has recently changed from a waterfall process to an iterative Rational Unified Process (RUP). Projects under the RUP model allow for checkpoints during the development, facilitating prototyping and allowing work-in-progress to receive early user feedback.

The project manager is the person charged with an overall responsibility for the project. The project manager needs to ensure tasks are scheduled, allocated, and completed in accordance with project schedules, budgets, and quality requirements. The systems analyst details the specification of a part of the system's functionality by describing the requirements aspect of one or several use cases and other supporting software requirements. The UI designer details the user interaction with a part of the system or the system as a whole. Moreover, the UI designer is responsible for designing and documenting the various user interfaces that will be developed as part of the system. It will be the UI designer's responsibility to convey these designs to the users and to perform the appropriate usability testing.

After the systems analysts and UI designers have detailed the requirements and UI design, software engineers take on the artifacts to design and implement functionality in accordance with project-adopted standards, operation procedures, and practice guidelines. An in-house testing team performs black box testing on functionality and performance once software is developed. The key objective of the testing team is to assess product quality against the requirements, which includes verifying the correct integration of McKesson products and third-party products. Moreover, testing assesses the scalability and performance of the software's architecture. If the project is a maintenance release, it is not be necessary to conduct clinical trials. If it is a major release, however, the product will require beta testing at a hospital site.

MIG's roots began in the research and development area, and this has been its core competence ever since. By using its own intellectual property in its products, MIG can supply state of the art technology. However, R&D is only as good as from the leadership it receives from product management. For example, competition in the PACS market has gradually expanded from core PACS functionality to the ease of integration with rapidly changing software tools in specialized areas. MIG has developed a proprietary integration platform that permits its core PACS component and third-party software to interface seamlessly, without violating intellectual properties of either party. This gives MIG a competitive edge over other companies in meeting the requirements for rapid product integration because MIG's PACS can be integrated with other software on the fly. Such a solution means that no off-line development is required to support product integration. Were it not a product requirement, such innovative technology would not have needed to be developed.

3.4.3.3   Systems Engineering

Systems Engineering is responsible for identifying and qualifying the hardware platforms, operating systems, and third-party software necessary for a product to function as intended. This function is performed whether or not the hardware platforms, operating systems or third-party software are delivered as part of the product or the product is software-only and, thus, the hardware platforms, operating systems, and third-party software are to be supplied by the customer. Systems Engineering also ensures that appropriate considerations are made regarding the time and resources needed for the hardware platforms, operating systems, and third-party software identification and qualification effort that would be required or otherwise affected by the issues under consideration. In releasing a PACS version, Systems Engineering is responsible for providing the manufacturing procedures, BOM, and a build CD that contains the qualified OS and its patches, as well as third-party software for a generic or specific hardware platform.

3.4.3.4   Quality and Regulatory Affairs

The McKesson Quality and Regulatory Affairs Department is responsible for ensuring that:

- The company's business processes for design, production, installation, and servicing are in compliance with relevant medical device quality regulations in the countries in which McKesson does business. ("Quality");
- Relevant clearances and approvals to market products are obtained from government health authorities in the countries in which McKesson does business. ("Regulatory Affairs - Premarket") and;

- Required reports pertaining to the company's products are filed with the government health authorities in the countries in which McKesson does business. ("Regulatory Affairs – Postmarket").

MIG is an ISO-9000 certified company. Moreover, McKesson Corporation has adopted the Capability Maturity Model (CMM) as the corporate model for Software Process Improvement. MIG is aiming to reach CMM level 2 by September, 2005. The CMM areas that MIG is focused on are requirements management, project management, configuration management, and software quality assurance. All employees at MIG are required to perform their duty consistently with the relevant procedures and guidelines in their functional area. All MIG operations are subject to audit by the ISO every six months. To ensure compliance to the ISO and MIG quality system, internal audits are conducted periodically and at milestones for every in-house project.

By following the standards, operation procedures, and guidelines, the quality of a PACS at different stages of development is, to an extent, guaranteed. At the very least, the risk of stumbling in loopholes in terms of requirements, design, development, and in testing are mitigated.

3.4.3.5   Production and Installation (P&I)

Upon receipt of a purchase order, Logistics picks up the parts and delivers them to Production. An install team is then formed, with its first task being to prepare a customized site preparation document that details network, power, facility, personnel and training requirements and timelines. The install team includes personnel from manufacturing, installation, and training, and is coordinated by an assigned Project

Manager in P&I. The goal of the install team is to ensure a smooth implementation, to train users well, and to consistently rank first in KLAS reports[27] for PACS implementation and training. Weekly conference calls are made with the customer to track progress. The install team will then send personnel to conduct a site walkthrough, workflow analysis, and install a test server at site. Moreover, the install personnel will conduct DICOM, RIS, and inter-vendor modality conformance tests while they are onsite and before installation.

While site preparations are underway, the customized PACS system is being manufactured, according to the specifications detailed in the purchase order, by a dedicated team. The system is configured, loaded with site specific options and software, and then extensively tested and 'burnt in' at the factory before it is shipped. Customer specific exam codes, user names, and IP addresses are all configured before delivery. When the pre-configured system passes final quality checks, it is shipped and is ready for installation.

Site installation is usually implemented in phases. During the initial phase, the data center with servers and archive, and perhaps one or two workstations, are installed first. Next, super user pre-training is conducted. Rolling out the remaining workstations is typically done two weeks after the data center has been set up and more pre-training is

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[27] KLAS, founded in 1996, is the only research and consulting firm that specializes in monitoring and reporting the performance of Healthcare Information Technology (HIT) vendors and, beginning in 2004, the performance of healthcare Professional Services Firms (PSFs). KLAS, in conjunction with thousands of healthcare executives, CIOs, directors, managers, and clinicians, has created a dynamic database of information on the performance of both HIT vendors and PSFs. The KLAS database represents the opinions of healthcare executives, managers, and clinicians from over 4,500 healthcare facilities on 300+ vendors and 500+ different products. The information is continually refreshed with new performance evaluations and interviews daily. Source: About KLAS. Retrieved March 31, 2005 from: http://www.healthcomputing.com/site/v2/aboutklas/whoweare.asp.

provided. On Thursday, before the system goes live, the install team will conduct final site inspections and preparations for technicians going live. On the next day, Friday, technicians will use the system and go live. On the following Monday, the whole site will go live and radiologists will be reading soft copies. The site will stop printing and using film on Monday. Finally, training will be provided throughout the week. The install team will schedule follow-up training and technical visits later on. P&I then hands off the site to service.

The implementation model that MIG employs of pre-installs and staging the system in-house before shipping to site is very unique in the industry. In doing so, it has shortened the installation at the site from six weeks down to two weeks. However, it is a very expensive model to maintain. Rather than shipping off-the-shelve hardware components directly from vendors to the customer site, they are making two extra trips to and from MIG. Moreover, the pre-installation requires a bigger facility to build the system in-house, and adds a load on logistics to store and handle the shipments. While this model saves the customer hassle and shortens the implementation time at the site, it may be possible to achieve the same effect with lower cost by better planning and management, and by arrangement with computer vendors, like DELL, to install software for bulk orders and shipments.

Moreover, the existing implementation model does not gain any competitive edge with smaller facilities that have limited financial resources and usually use Web deployment. For Web deployment, only backend and Web servers and archive systems are required to be installed onsite. Client software can be downloaded by hospital staff from a server on

the Web. Web deployment, aside from reducing the cost of PACS implementation to the customer, also reduces work and costs involved in production and installation. Nevertheless, customers are found to be very satisfied with the implementation model that MIG deploys because it is less disruptive to their worksites.

3.4.4   Marketing and Sales

The Marketing Communications Department at MIG is responsible for a variety of programs and communiqués designed to elevate brand awareness, increase customer satisfaction, and fuel sales. For example, product marketing programs are responsible for product positioning, promoting new product launches, conducting market research, managing customer satisfaction in publications such as KLAS, MD Buyline, ECRI, etc., performing win/loss bid assessment studies, and hosting user groups.

MIG's sales distribution is organized into three regions: West, North, and East for the North American market. MIG predominantly employs a direct sales force. It consists of salespersons allocated to each of these three regions. Commissions are based on the discount off the list price of the product as a percentage of the maximum discount allowable for that product. The maximum discount, set by the product manager, depends on the margins for the product. Salespersons are responsible for selling PACS for their regions by submitting RFP, providing sales "spin" for RFP responses, giving sales presentations, demo-ing the product, and drafting quotations.

Upon receipt of an RFP, the Sales Executive will forward it to the RFP Team to develop an RFP response. The RFP Team is trained to have enough knowledge about the products, project management, and company procedures to answer questions in the RFP.

In order to provide informative, timely responses to customer requests for information about MIG's products and services, RFP teams maintain a knowledge database that fills, over time, with all of the essential and up-to-date information about the product from R&D. The first draft of the RFP response is reviewed by the sales executive of the region before a final draft is completed. Eighty-five percent of RFPs submitted by MIG are winning bids. This win ratio is considered to be very high in the industry. Regardless of which segment of the market, whether for high-end hospitals or imaging centers, the use of RFPs and the format of RFPs do not change significantly. The difference is mainly in the content of an RFP, such as the scope of the system proposed and the dollar value of the bid.

The direct model poses advantages in that MIG can "own" the relationship with the end user. Gathering buyer information is important to further fuel new ideas for product development. For MIG's differentiation strategy, this type of feedback is essential.

3.4.5   Service

After the install team has installed the PACS and finished training at the site, it hands the site off to the Service Department with the site report submission. The Service Department at MIG is responsible for providing remote telephone software support and onsite hardware support for over 200 customer facilities. MIG is an industry pioneer amongst PACS providers for the delivery of remote online service support. Roughly, 95% of customer service calls are managed quickly over the telephone, which helps in maintaining MIG's 99% uptime performance at customer facilities. Besides running the help desk and online service support, the Service Department is also responsible for

applying software patches and upgrades, dealing with customer service issues, and resolving service contract issues.

There are five service zones, A to E, each dedicated to one of the five customer regions. A support zone consists of an eight to ten member support team. A system automatically routes calls, based on area code, for direct call pick up. This process eliminates the need for a dispatch layer. Service guarantees to respond to calls within 6 seconds between 6:00 am and 6:00 pm, and within 6 minutes between 6:00 pm and 6:00 am. Because a dedicated service team is assigned to support each customer zone, customers often communicate with the same group of people, enabling support to provide customer service that is more personalized.

When a customer contacts the 24x7x365 MIG support desk, Service troubleshoots the reported problem remotely and attempts to determine the root cause of the issue. If the issue is with MIG applications or third-party software, the issue can be resolved remotely. If it is a hardware problem, the support team will contact the respective third-party hardware vendor's support unit. If the problem cannot be resolved remotely, a local service representative will be dispatched to the site. When an issue requires engineering action, an engineering action request (EAR) will be submitted. If, after two days, there is no response to an EAR that has been raised, the support group will escalate the issue to their team leader. If the issued report continues to remain unresolved after two more days, the support team will escalate the issue to the zone manager.

Moreover, MIG's Service Department regularly performs system maintenance on all workstations, servers, archives, and networks in order to remedy potential problems

before they impact the user. An automated software processes monitoring service is used to remedy and notify support teams of system problems. Regular manual system health checks are conducted to identify and remedy software problems before they occur. System health checks include confirmation of successful database backups, monitoring the memory usage of PACS processes, keeping track of the usage of disk space, and monitoring network performance.

CRM is used for tracking customer installed software and hardware, and all relevant third-party device configurations. MIG provides customers with an online, Web based forum to resolve issues. The features of the CRM portal include: 24/7 online access to all support issues, account status summary, advanced issue search, access to shipping information, and MS patch and virus update information.

MIG's Service Department currently offers customers several service programs. Maintenance service agreements range from full coverage maintenance service agreements to software only maintenance service agreements. Customers without a service contract are eligible for service on a time and materials basis.

Although outsourcing its service support functions will be a cost effective solution, MIG has selected an in-house servicing strategy with its PACS for several reasons. First, in-house service is used to ensure that maximum feedback is able to be collected. Due to the complexity and critical mission nature of the system, it is very important that MIG has information of customer issues first hand, and available at the earliest possible time. If third-party support is used, information could be lost during the resolution process, with an increase in difficulty of controlling information flow. Second, in-house service

helps build personal relationships with the customer. MIG's approach of employing a dedicated support team to a service zone at the help desk is unique in this industry. The effort does not go unnoticed, as customer feedback indicates they appreciate the personalized service. Third, product knowledge and up-to-date product information can be shared more effectively and retained with in-house service. This helps to promote a good experience for the customer in that "the person who answers the call, solves your problems." MIG's ranking at the top of almost every independent PACS report survey is a testament to the value of its customer support model.[28] MIG's commitment to customer service is definitely a key differentiator in PACS purchase decisions.

3.4.6   Value Chain Assessment

MIG is a highly vertically integrated firm that has tightly knit operations from product management, to product development, to logistics, to production and installation, to service. The forward and backward moving information feedback loops within the organization are essential in its efforts to produce and market products and services that customers want and are satisfied with. Operating all of its primary activities in-house gives MIG an advantage over its competitors. MIG is able to collect market information and user feedback and respond to them in an effective and timely fashion.

Value adding is not just in the individual activities or operations in the value chain. Value is multiplied to the products and services sold to customers when product development, R&D, and customer service are working in concert and being user-centric in their operations. Good customer service is backed by R&D and technical marketing in being

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[28] McKesson MIG Support is ranked number one in KLAS PACS surveys in 2002 and 2003. In KLAS June 2004 PACS survey, McKesson MIG Support is ranked number 2. In MD Buyline Oct 2002, 2003, 2004 PACS surveys, McKesson MIG Support is ranked at the top of the list.

able to respond to customer inquires and issues quickly. Without a system architecture designed for remote monitoring and support, product management would be unable to make relevant product improvements, and MIG's customer service would fail to satisfy customer needs.

With most primary activities carried in-house, MIG has control over innovative processes and is able to modify the organization in order to meet changing needs. However, as the company grows larger in size, it becomes a challenge to maintain the same responsiveness and nimbleness with respect to information flow and issue follow-ups. MIG, recognizing the impending challenges, has made changes in its ERP and CRM to manage data quickly and extensively. Moreover, by reinforcing operations to follow operational procedures and guidelines, MIG operations are self-maintained, predictable and, autonomous, freeing up management resources to focus on bringing value to the customers they ultimately serve.

3.5   Financial Analysis

MIG has experienced five consecutive years of annual growth in both revenues and profits. The financial summaries of the last four years, Q4 of FY2005 and the whole year of FY2005, are given below:

	FY02 (in millions)	FY03 (in millions)	FY04 (in millions)	FY05 (in millions)
Revenues	$ 44.9	$ 59.4	$ 85.9	$ 115.0
EBIT (Profit)	$ 5.6	$ 14	$ 26.7	$ 41.1

Table 3: Financial Summary FY02 - 05[29]

	Q4 FY05 (in millions)	Q4 FY04 (in millions)	% growth over FY04
SW Bookings	$ 26.5	$ 16.2	64%
Revenues	$ 36.3	$ 29.0	25%
EBIT (Profit)	$ 13.3	$ 12.2	9%

Note 1: Q4 FY05 total bookings are USD $60.3 or CAD $73.5M.

Table 4: Financial Summary Q4 FY05[30]

	FY05 (in millions)	FY04 (in millions)	% growth over FY04
SW Bookings	$ 64.6	$ 41.3	56%
Revenues	$ 115.0	$ 85.9	34%
EBIT (Profit)	$ 41.0	$ 26.7	54%

Note 1: FY05 total bookings are US $157.4M or CAD$192.0M.
Note 2: MIG is responsible for significant portion of MPT total profit.

Table 5: Financial Summary FY05[31]

The statistics show that growth has increased from FY2004 in both dollar value and percentage. However, comparing just the numbers from the fourth quarter in 2005 and the fourth quarter in 2004, it shows that the growth rate in profitability is lagging behind the growth rate in revenues. This may be due to the fact that MIG is suffering from the fierce pricing competition in the market, so much so that its profits have begun to erode.

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[29] Data obtained from presentation for All (MIG) Employee Meeting on April 26, 2005.
[30] Ibid.
[31] Ibid.

However, it is difficult to draw a conclusion based on the financial data from just one quarter. It is also worth noting that this trend is not seen in the year over year results.
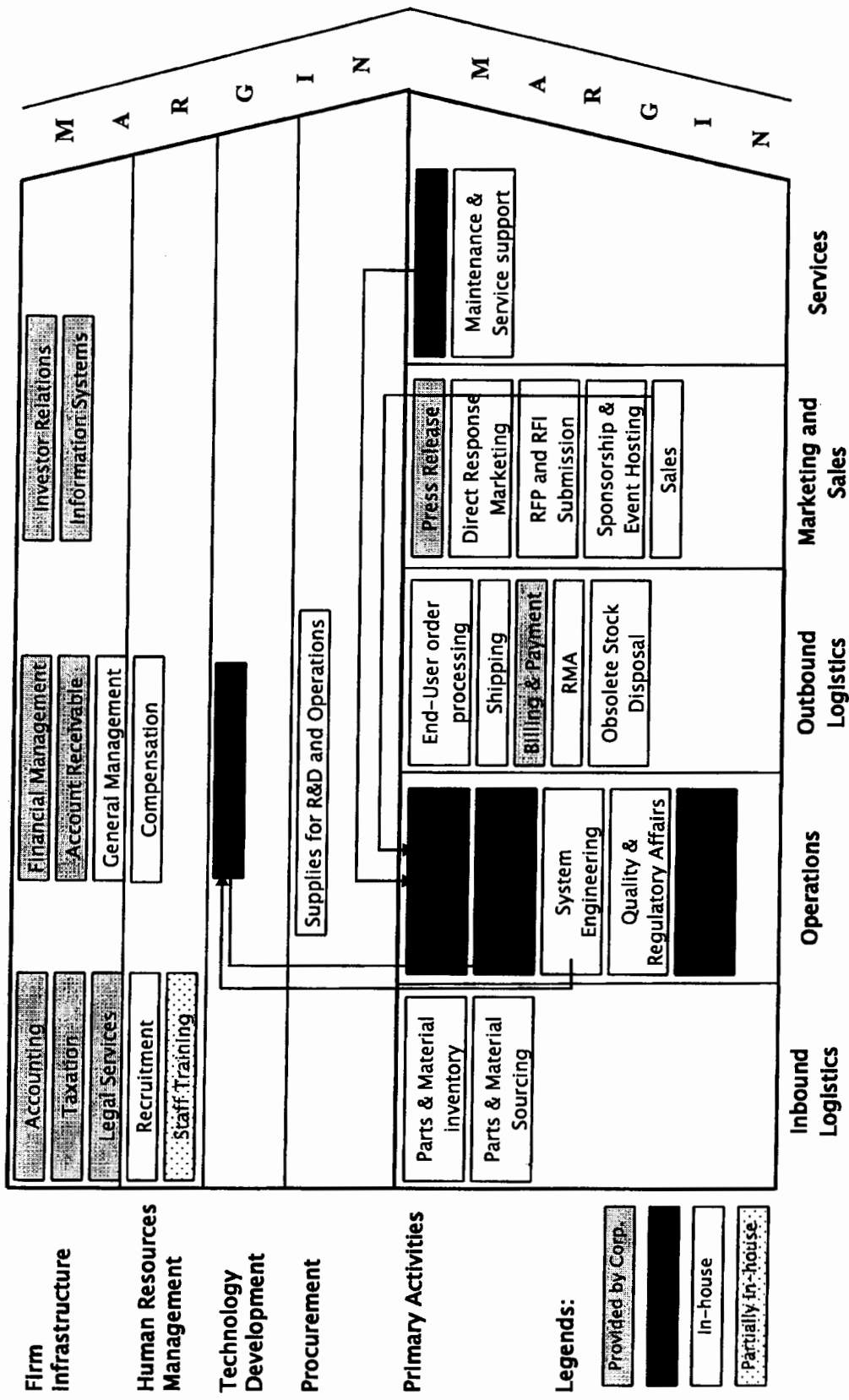
Figure 7: Value Chain of McKesson Medical Imaging Group[32]

Firm Infrastructure
Accounting | Taxation | Legal Services | Financial Management | Account Receivable | General Management | Investor Relations | Information Systems

Human Resources Management
Recruitment | Staff Training | Compensation

Technology Development

Procurement
Supplies for R&D and Operations

Primary Activities
Parts & Material inventory | Parts & Material Sourcing | System Engineering | Quality & Regulatory Affairs | End-User order processing | Shipping | Billing & Payment | RMA | Obsolete Stock Disposal | Press Release | Direct Response Marketing | RFP and RFI Submission | Sponsorship & Event Hosting | Sales | Maintenance & Service support

Inbound Logistics | Operations | Outbound Logistics | Marketing and Sales | Services

M A R G I N   M A R G I N

Legends:
Provided by Corp.
In-house
Partially in-house

4 ISSUES FACED BY MIG

The success that MIG enjoys today is due mainly to the strategic fit achieved between MIG's strategy, organizational capabilities, core competence, and the PACS markets. MIG has adopted a differentiation strategy that focuses on innovative product development and personal customer care. Its core competence lies in product development, R&D, and customer service and support. Over the years, MIG has been building on its brand and, together with its excellent track record with existing customers, has gained a competitive advantage over many of its rivals. However, as the PAC market changes and as the company faces rapid growth, MIG itself faces a number of issues it must overcome.

4.1 Lack of Strategic Vision

As indicated in Section 3.5 on Financial Analysis, figures show that MIG's profits in PACS may be coming under pressure. One possible explanation for this decline is MIG's commitment to maintaining a high degree of quality in its products and services, but selling them at less than premium prices. Competition in the PACS industry is fierce, and major rivals of MIG's are competing with price, though they avoid making direct price comparisons. MIG, responding to price competition, has unconsciously adopted a cost based strategy, one that is hoped to be backed by significant scale and learning effects.

Changes in the industry and growth of the market beyond the early adopter stage have affected MIG. The company suffers from a lack of a clear and articulate vision and strategic objectives. Consequently, MIG is stuck in limbo, between being a differentiator, carried over from its past, and offering cost effective solutions to customers, in an effort to react to price competition. With a muddling strategy such as this, the company is losing focus on innovations for differentiation and on costs for cost-based firms. For example, MIG's sales of systems under other brand names harm its differentiation efforts and yet do not enhance scale effects or enable lower costs. Moreover, with unclear strategic objectives, MIG does not have an evident target market segment, causing it to lose out to competitors who cherry-pick customers with better differentiation or lower costs. The result is erosion in cost positioning, making MIG very vulnerable on costs.

In recent product vision documents, product management has stated the importance of offering cost effective solutions, using innovative technology and system designs, in reacting to the increasingly price-sensitive market. However, this vision and its strategic objectives have not been effectively and extensively communicated to the staff. Employees of different departments need to catch on with the vision by understanding the changes in the industry and the reasons behind the strategic objectives. Without this understanding, different departments and teams continue to focus on making progress with projects and development activities that no longer align with the new strategy for success.

4.2   Lack of Product Portfolio Offering

MIG's major PACS competitors are leveraging their product portfolio and market advantages. Until July of 2002, MIG was known as ALI, and had just one product offering: PACS. Although MIG is now part of a $50 billion company—McKesson—a company that offers an extensive range of medical products and services, MIG has not been fully integrated with other McKesson products, ones that it can benefit from.

4.3   Behind in Web Product Development

Apart from the fierce competition MIG faces from GE Healthcare, Siemens Medical, Fujifilm Medical, Agfa Healthcare, and Philips Medical—all who extend bundle offerings—MIG also competes upstream against smaller PACS vendors. These vendors offer cost effective solutions in their Web products, deploying pay-per-usage modeling to smaller hospitals and clinical centers.

According to an article posted on AuntMinnie.com, a popular website frequented by radiologists and professionals related to the medical imaging industry, with the provisioning and enabling of web technology, radiologist shortages have been eased by permitting image diagnoses and interpretation to be performed remotely.[33] In a study done by Reuters Health, there will be a shortage of 200,000 doctors, accounting for 20% of the required workforce, by 2020.[34] The shortage is a combination of retirement among practicing physicians and physicians seeking non-clinical jobs or changing work patterns,

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[33]Daniel R. Corbett, "Where are all the radiologists?" Sept 26, 2003. Retrieved June 25, 2005 from: http://www.auntminnie.com/index.asp?Sec=sup&Sub=imc&Pag=dis&ItemId=59266
[34]Reuters Health, "Shortage of 200,000 doctors predicted in U.S. by 2020", Nov 3, 2004. Retrieved June 25, 2005 from: http://www.auntminnie.com/index.asp?Sec=sup&sub=res&pag=dis&ItemId=63458; and AuntMinnie.com, "U.S. radiologist shortage abating", Feb 9, 2004. Retrieved June 25, 2005 from: http://www.auntminnie.com/index.asp?Sec=sup&Sub=bai&Pag=dis&ItemId=60788

such as reducing their intake of patients.[35] In addition, Web-accessible PACS enable

radiologists to be reached for emergency cases and shorten response times when they are

on-call. Web-accessible PACS also meet the growing demand of referring physicians' to

receive PACS data faster and in a more direct way (e.g. interacting with radiologists over

the Web.)[36]

When compared to its competitors, MIG is behind with its Web product offerings. The

current Web product that MIG provides requires users to download and install the

software before it can be linked with data servers residing in the hospitals over the

Internet. This Web offering, a "thick client" model, limits radiologists and other PACS

users in that they can only access the system from authorized computers and

workstations. Computers that are locked against permitting user-installed software (e.g.

public computer terminals), cannot access the system in a "thick client" model. MIG

lacks a "thin-client" PACS software model, one that allows its users to use any Internet

browser to emulate a PACS workstation. Without a "thin-client" model, MIG forfeits a

valuable convenience for users using Web-enabled products.

In addition to the fact that Web-enabled computers have become a primary

communication tool among physicians, they help to reduce costs to both PACS vendors

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[35]Phil Miller, "Survey predicts big loss of practitioners to retirement, changing work patterns", Dec 23, 2003. Retrieved June 25, 2005 from:
http://www.auntminnie.com/default.asp?Sec=sup&Sub=imc&Pag=dis&ItemId=60466; Merrit, Hawkins, and Associates, "Summary Report—2004 Survey of Physicians 50 to 65 years old Based on 2003 Data," Retrieved June 25, 2005 from: http://www.healthshare-tha.com/img/mha2004olderphysiciansurvey.doc.
[36] Jonathan S. Batchelor, "Healthcare IT delivers market advantage," June 9, 20005. Retrieved June 25, 2005 from:http://www.auntminnie.com/index.asp?Sec=sup&Sub=imc&Pag=dis&ItemId=66707:"RSP holds that the most important customer for its multicenter imaging practice is the referring physician. Reicher said his group has demonstrated that these physicians require faster, more accurate diagnoses, and delivery of information tailored to their individual needs."

and clients. Web-enabled PACS offerings change and reduce cost structures, network distribution, and licensing models. Different from the dedicated workstation model, the Web-enabled software architecture requires self-performed downloading of software upgrades for "thick clients", and does not require any software upgrades for 'thin clients". Hence, the upgrade process requires only for the PACS vendor to upload the latest software onto the Web server.

4.4   Lack of Business Development Acumen

Although MIG has product development managers and directors, there is currently a lack of a dedicated business development manager. Business development is different from product development in that business development deals with issues at the business and corporate level, whereas product development is concerned with strategies for ensuring market share and profit maximization for a product. Therefore, business development looks beyond product development at the product level. It involves employing practical techniques and strategies that ensure a business realizes its full potential. MIG has been very sales orientated in that it uses sales information to dictate and replace business development activities. Moreover, because sales information is historical, this approach is reactive rather proactive. But MIG has been successful with such an approach and, as such, it has become a victim of its own success. The company has been shielded from the need for business development.

A number of weaknesses arise from the lack of business development and marketing acumen. MIG conducts very little market research that can be used to predict future revenues to a reasonably high degree of accuracy. What little market research is done

tends to be conducted by sales managers who understand the products that their customers would like to acquire in the near future. With MIG being a customer focused company, customer wish lists have been dictating the direction of the company. However, these customer requests reinforce MIG's tendency to drill down to product level enhancement, and further reduce the needed for the company to conduct market research.

Until recently, MIG has been targeting the early adopter market. At the very beginning, customers were few. These early PACS adopters were risk takers, and were very tolerant of system irregularities. MIG, in its early days known as ALI, was targeting all of these potential customers. Therefore, ALI was very attentive to the requests of its customers; valuing each and every customer. ALI's overhead was minimal. However, this mentality is being carried over as the market grows much bigger and becomes more competitive. Conditions are such that MIG can no longer afford to value every customer regardless of the costs. Now that it is a bigger company, MIG's overhead is larger. It cannot lose focus and it cannot divert resources for lower profit products and services (e.g. privately labeling PACS to other PACS suppliers) or continuing supporting obsolete and discontinued products. Another unwise activity is the continuation of R&D on multiple versions of products that will ultimately be replaced by a newer version. Management has to justify resources spent by knowing the potential revenue each investment can bring.

Because of its glorious history, MIG is very concerned with its rating in the KLAS reports. Recently, MIG has dropped down to the forth position. Top achievers are now

the smaller companies. GE Healthcare is ranked in eighth position. Before MIG begins putting resources to bring up its rating in KLAS, MIG has to understand if the KLAS rating is a true indicator of its performance in the market segment it wants to target. How does KLAS define customer satisfaction? What does KLAS's customer satisfaction translate to in terms of MIG's customer support and P&I model? There is a balance between maintaining a high level of customer satisfaction, and diverting appropriate funds to that end.

MIG's management team suffers from a fundamental lack of any systematic approach to strategic analysis – something that has also been identified as a key success factor in the industry. The recent appointment of a new product management director may address this weakness. Otherwise, the strategies employed may fail in giving the business every chance of achieving above normal long term profits. Business development strives to understand the core competences MIG has, gain insight into sustaining the trends of industry, and devise a strategy and plan to give MIG a competitive edge through fitting or congruence. Good business sense is not reactive instead it is proactive. To be proactive, one must anticipate, prepare and plan for the market changes in industry.

4.5 Inappropriate Organizational Structure and Culture for Growth

Organizational structure and culture affect efficiency of a company's operations. MIG has doubled the number of employees in the last three years. As the number of employees increases, the scope, volume, and complexity of operating activities expand. The expansion drives a multiplicity of tasks that need to be defined, organized, and

completed. The challenge of internal growth to an enterprise is simply that there is more work to do. Thus, it fully warrants new ways of accomplishing that growth.

As a result of the rapid growth it has experienced, MIG has a flat organization. In essence, there are fewer managers to make real-time involvements including planning, reviewing, and decision making, to every aspect of operations. Managers are expanding their scope of responsibilities and are managing many more people. As the company grows, so too, do the demands on a manager's time.

The culture at MIG reflects these phrases: "Everyone walks an extra mile," and "Every customer is important." This culture encourages everyone to be flexible and to be helpful in making sure every PACS sale is thorough, right through to supporting after sales service and onsite issues. However, with a much higher overhead cost, MIG can no longer afford to have directors writing code and troubleshooting PACS at sites. It is not an effective or appropriate use of resources. Managerial resources are now too scarce to perform administrative tasks like filing and data entries. When MIG was a relatively small company, the organization and culture worked very well because information was easily shared with everyone. As the number and variety of people increases, flexibility means that no one has clear responsibilities.

Managers have to fundamentally change the mindset about management in a growing enterprise—it is not about having control over but about influencing outcomes in a positive manner.[37] Growth makes pressing demands for change on the managers

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[37] Michael J. Roberts, "The Challenge of Growth," The Entrepreneurial Venture. 2nd edition. Ed. William A. Sahlman et al. Boston, Massachusetts: Harvard Business School Press, 1999, p.375.

themselves,[38] who cultivate the culture of the company. Moreover, growth calls for reconfiguration and redefining of an organization such that staff is empowered to act independently, information is shared efficiently and correctly, and managers are freed up from serving as coordinating mechanisms.[39]

The competitive imaging landscape in the U.S. today requires MIG practices to position themselves where the future is moving, as opposed to reacting to where the market is currently at. This means streamlining the workforce, operations, and processes, both incrementally and in broad strokes.

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[38] Ibid., p.363.
[39] Michael J. Roberts, "The Challenge of Growth," The Entrepreneurial Venture. 2nd edition. Ed. William A. Sahlman et al. Boston, Massachusetts: Harvard Business School Press, 1999, pp.372-3.

5 RECOMMENDATIONS AND CONCLUSION

The preceding analysis has presented the issues that MIG faces today. This chapter will discuss the recommendations and options that are viable for MIG to pursue, given its current industry position. It will also briefly address a number of the implementation issues associated with the presented options.

5.1 Adopt and Revise Strategic Vision

Because the company has grown rapidly, and the landscape of the industry has changed significantly over the past few years, MIG needs to revise its strategy. MIG has been executing its opportunistic differentiation strategy, which has led it to sell PACS in its early adopter stage. It is well summarized by Dr. Ed Bukszar that when strategy is ingrained in the routines and is rooted in the firm's culture, it takes on an "Aura of Invincibility". Hence, it is difficult for the firm to change because of inertia.[40] MIG cannot make the assumption that current strategies and operations will continue to give itself a competitive edge in the market. It cannot afford to fail in making the most of new opportunities because it is still doing its best to make the most of old ones. As the PACS market matures, the market size as a whole is getting too large for MIG to target. For MIG's business to continue growing, it needs to revise its strategic vision to focus its resources on operating activities where congruence is achieved. Selecting a strategy implies that a firm selects a few market segments and tailors its strategy to serve these market segments. The implication of selecting a strategy is that a firm would have to

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[40] Ed Bukszar, MBA 607: Business Strategy course materials, Spring 2005, SFU.

tailor its value chain to provide systems and products to this market segment, and would not, therefore, be in a strong position to compete in other segments in this market.

MIG has to decide whether it will adopt a low cost provider strategy or continue in its differentiation strategy. If a firm selects a costs leadership strategy, it sets out to become the single low cost leader in its industry. This strategy can be appropriate for a firm addressing a market that can be segmented into groups, some of which are price-conscious, and others which have a need for product features that necessitate a higher price. On the other hand, if a firm selects a differentiation strategy, it attempts to be unique in the industry by providing value in some aspect of its products or services that competitors do not provide. In this case, there must be a market segment that must demand the extra value being provided by the differentiated supplier, and be prepared to pay a premium price for this value.

The majority of the new market segment lies with smaller hospitals and imaging clinics where price is a major issue in any procurement. Therefore, the lowest cost compliant provider is likely to win the vast majority of sales in this new market segment. These sales will generate small profit margins given the current state of MIG's operating costs. It is difficult for a business as big as MIG to achieve any growth in a low profit margin market. The only way for a large company to grow in a low profit market is with radical organizational and cultural changes. For MIG, reducing its costs to a point where it can compete as the industry's low cost provider in all segments of the market is simply impossible. For example, smaller emerging PACS vendors, such as Amicas and Stentor,

achieve growth in the very competitive PACS market by providing alternative purchasing schemes and financing plans through their Web-based solutions.

It is unwise for any business unit to select a strategy unless there is a fit between this strategy and the rest of organization. MIG's business has been founded on the strategy of being a differentiated supplier by means of its exceptional product development and customer oriented service and support in the PACS industry. Culturally, the company is well positioned to execute this strategy. Strategic fit is when strategy, organizational capabilities, core competences, and markets are in synch. When this is so, competitive advantage is achieved.

Rather than focusing its limited business development resources on capturing the new markets, MIG would be wise to deploy a highly targeted strategy, aimed at capturing high dollar-value contracts that contain multiple facilities. There are several characteristics in this target segment—they are likely be replacement markets, and these customers are large facilities that have multiple departments and information systems to be integrated (i.e. they are interested in enterprise solutions.) MIG has acquired expertise in custom integration, production and installation services, and, with the backing of McKesson Corporation, is well positioned to take on this strategy. MIG should eliminate its OEM activities; they detract focus, occupy scarce resources and muddle branding efforts.

Gaining employee support and commitment upfront is vital. When setting a strategy direction, the first thing that MIG must do is clarify its vision and communicate that vision to all employees. It is insufficient to simply present the vision at a session that all employees are unlikely to be able to attend, or to write the vision in a plan that few

people read. Instead, it must be communicated consistently and frequently, using a wide variety of media so that it becomes ingrained into the culture of the organization.

5.2   Leverage McKesson's Offerings

With McKesson's highly competitive healthcare IT product portfolio, MIG should leverage the corporation's offerings. Under the "One McKesson" initiative, McKesson is providing extensive IT solutions towards defining a new standard of healthcare and transforming clinical and administrative workflows. The IT product portfolio is geared towards hospitals with high patient flows. This fact is evident by the demand for high performance information systems to manage data efficiently and extensively, allowing hospitals to make informed decisions about patient care in a timely manner. Therefore, to leverage McKesson's offerings, MIG needs to target that same group of the market. This is consistent with making the high-end hospital market a priority, with smaller hospitals and imaging centers secondary.

Under the "One McKesson" initiative, McKesson is consolidating all sales departments from various business units to be a united corporate sales group. This demonstrates the commitment of the corporation in making available the full McKesson portfolio of integrated solutions that encompass products and services from several business units. This commitment starts with the consolidation of sales teams, emphasizing the fact that sales personnel are no longer selling discrete products from various business units, but are, in fact, a supply chain, offering efficiencies and cost savings to hospitals and health systems. The drive behind this initiative is that McKesson Corporation wants to catch on with the electronic health records' (EHR) vision within the healthcare industry. This

vision includes: enterprise access to all forms of patient data ranging from structured clinical findings to diagnostic images, waveforms, document images, voice, and video, all using industry-standard storage methods. This 'information-rich' approach enables healthcare facilities to provide clinicians with orders, results, vital signs, and other patient data based on their natural workflow, setting the stage for the broad scale use of clinical solutions and ultimately, safer healthcare. In order to achieve this vision of creating value for customers, McKesson's business units, including MIG, should catch on with the vision and make mandates towards integrating with other products and services provided by McKesson's other business units.

In order to effectively integrate with McKesson's other products, the intermediate to long term strategy is to take on the IHE initiative actively. As the IHE initiative is being promoted in the healthcare industry to establish IT healthcare interface standards, MIG will receive less rivalry resistance from other McKesson business units to be more cooperative in the integration effort. Furthermore, the initiative provides a framework for easy integration with other IT healthcare vendors for enterprise solutions. As the market shifts towards one that emphasizes more IT solutions, interoperability and integration with the myriad of other healthcare IT systems becomes critical. While DICOM serves as an excellent industry standard, there is still a lot to be done in order to make HL7 a well defined and sophisticated standard. The objective of the IHE initiative is to makes systems from all healthcare IT vendors interoperable, and it is the mandate of each and individual vendor to be compliant with the industry standard.

5.3   Focus on Cost Effective Offerings

Targeting higher dollar value contracts does not necessarily mean there are higher profit margins if costs are not controlled. Under fierce competition with other contenders, there is pressure to push down the overall price value of a PACS. The current PACS market is one in which system prices are rapidly decreasing, at a rate of about 25% annually. As a result, to remain competitive and maintain profitability, it is critical that operational costs incurred by MIG be reduced. MIG, with increasing overhead costs and trading capital for continuous growth, needs to make wise decisions to reduce the cost of sales. At the same time, hospitals and clinical centers are also facing pressures to reduce costs and increase efficiencies while delivering safer and higher-quality care. Therefore, healthcare providers are making buying decisions based on how cost effective the PACS solutions offered by different PACS vendors are. There are several areas that MIG needs to address to achieve this.

5.3.1   Lower Cost of Sales

As mentioned in the previous chapter, PACS are no longer competing on standard features. MIG's new generation PACS offers more features than radiologists will be able to use. It is speculated that an average PACS user will only use about 20% of the available features. However, there is increasing demand from users to be able to run PACS everywhere and on lower-cost technology platforms. This requires that the footprint of the software must be small so that it does not need to be run on systems with powerful CPUs and large amounts of RAM. R&D efforts should be justified by revenues and expected returns of benefits. Innovation is no longer required at the feature level but, instead, required in making the product offering a more cost effective one. Incremental

innovative effects should be spent on providing solutions that run on cheaper computer platforms and home based environments, while maintaining performance integrity.

5.3.2   Reduce Operational Costs

One of the areas that operational costs should be reduced is in the model of providing support for installed systems. It involves time and effort, and therefore costs, to upgrade software and install patches for customers. The model should also be revised to improve the ease of general system support in order to lower operational costs at MIG. Another reason to reduce the time and effort spent upgrading installed sites is the fact that replacement markets are intolerant of PACS problems, including system downtime. The replacement market makes up the majority of high dollar value businesses. Customers in the replacement market already have systems up and running. They are sophisticated users who have been using PACS to increase their output volume and quality. When their normal workflow is interrupted because of PACS downtime, revenue impact is significant.

Planned downtime for software and/or hardware upgrades can be minimized by utilizing Web-based technologies wherein applications self-install or perform automatic upgrades with minimal user intervention. Therefore, MIG should invest its resources so as to speed up the development of Web technologies. To avoid unscheduled downtime due to system irregularities, R&D effort should be placed on improving predictability and reliability by continually working towards world-class standards in quality, performance, and productivity. Moreover, making product release quality requirements more stringent

and increasing in-process inspection may reduce service costs and increase customer satisfaction.

Similarly, costs incurred in building and installing new systems and in providing new user training by P&I are another area that can be streamlined. The self-install solutions mentioned above are a key step to cut down on operational costs incurred by P&I. In this way, P&I will need only to install the "seed" software in the server, thus saving time and effort by not having to install the latest PACS software components on every workstation.

Alternatively, MIG should negotiate a volume discount with its computer suppliers to outsource the installation of required PACS software components as each machine is being built. Either of these approaches will free up P&I resources to build their core competence in installing and configuring PACS integrations with other healthcare IT systems, as customer demand in this area is strong. However, it requires R&D to provide more predictable and reliable software development schedules and products, so that P&I can plan for PC vendors to pre-install the correct versions of PACS software components, thus reducing installation and shipping costs. This demands proficiency in project management so that P&I can coordinate activities with R&D, Logistics, and Service. However, this model will save the computers from a trip to MIG for installation, only to be shipped out again to the final customer site. The machines will then be shipped directly from the PC vendor to the destination for the final stage of installation at the site. Thus, it does not just provide savings on shipping costs, but also reduces the need for inventory.

5.3.3 Provide Exceptional Customer Support

A key aspect in the PACS market, a market that is maturing and moving towards replacement sales, is customer satisfaction. Satisfied customers provide critical sales and marketing benefits for the company to maintain and increase market share. In a maturing PACS market, customers now pay significant attention to the total cost of operating a PACS system when making a buying decision and not just its initial "sticker price". They are much more focused on their ROI and are well aware that the cost of a system, after it is installed, plays a crucial role in the success or failure of their buying decision. Additionally, customer satisfaction can be adversely affected if customers find out, only after they have installed a system, that their costs to support it are higher than they expected, or are higher than competitive alternatives. Customer satisfaction is, therefore, a gauge to customer perception of cost effective offering.

Besides helping customers cut operational costs, another key determinant that affects customer satisfaction is the level of service and support they get from the PACS vendor. This has also been identified as one of the keys to success in the industry. To both the customer and the PACS provider, purchasing a PACS is just the start of a relationship. According to the KLAS rating, MIG no longer holds the first position. It is very important for MIG to understand the factors affecting the drop of customer satisfaction, and to address any related issues accordingly and effectively.

5.4 Acquire Business Development Skills

Rapid growth, like what MIG is experiencing, can bring its own problems. Small companies can buckle under the weight of sudden immense success, being unaware of the

need to change in order to keep up with the pace of growth. In addition to the need for project management skills to define, plan, organize, and complete a multitude of tasks due to the expansion of the company, there is a critical need for business development skills in management. In today's market, there is a greater emphasis on a special set of skills that perceive trends in the PACS industry, understands the consequences of industry changes to the company, and proactively responds and transforms the company to aggressively pursue high-opportunity markets. Currently, there is a lack of such skill among the present management of MIG. Moreover, acquiring business sense should not be a requirement just at the management level, but be required across the whole value chain of business. Employees willing to expand their business skill set will be mutually beneficial to both the company and themselves in advancing their careers.

The need for more capable managers to help MIG stay ahead of the curve can be resolved by putting an emphasis on training and careful recruiting. From a human resources perspective, training people internally to acquire the right set of business skills and to increase business awareness is an effective way to achieve results. Nevertheless, the success of training depends on the employee's willingness and ability to learn from the training materials and the trainer's effectiveness in transferring his or her knowledge and skills. On the other hand, there are also challenges in recruiting highly talented people. A skilled individual might not necessarily be of the right fit to the company in terms of work culture and ethics. It is essential to bring in people who share the same enthusiasm, vision, and fit with the existing culture at MIG, because understanding the company culture, increasing communication, and motivating employees are critical success elements for the company.

5.5   Reconfiguring the Value Chain and Organization

With costs soaring and profit margins showing a downward trend, MIG needs to overhaul its organization. While the current model of an autonomous departmental organization can be effective, departments must take care to find ways of working across these organizational silos in order to ensure agility, collaboration, and quick decision-making. Nevertheless, there is no such thing as an ideal organizational design. Each design has strategic advantages and disadvantages. Matching structure to strategy involves picking a basic design, modifying it as needed, and supplementing it with coordinating mechanisms and communication arrangements. While practical realities often dictate the nature of things, existing reporting relationships, personalities, internal politics, and other situational idiosyncrasies and strategy-structure factors must prevail.

To reengineer and restructure the organization, MIG should, firstly, develop a flow chart of total business processes, including interfaces with other value-chain activities. According to Michael Porter, optimizing the linkage along the value chain and reflecting on its strategy, and with better coordination within the value chain, a company can achieve a competitive advantage.[41] Secondly, MIG should assess and streamline, if needed, the current processes for a cost effective operation. Thirdly, to reduce costs and save time, it should determine parts of processes that can be automated to achieve volume deployment in a reliable and predictable manner. Fourthly, the company should evaluate each activity in every process to determine if it is strategy-critical or not. It should be focused on the core competence of the company and where high-opportunity markets, and hence profits, lie. Next, as a result of the assessment of in-house activities to

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[41] Michael Porter, Competitive Advantage, New York: The Free Press, 1985, p.48.

strategic fit, MIG needs to weigh the pros and cons of outsourcing processes that do not make the best use of its own resources and expertise, and should then design a structure for performing the remaining activities.[42] Last but not least, it is vital that MIG communicates the organizational change to gain employee support and commitment upfront. As with implementing any new technology, realigning an organization takes time.

Due to the nature of PACS installation activities carried out in P&I, it is recommended that MIG configure its P&I operations to achieve scale efficiencies in the use of its resources. P&I operations should be fully employed at the level of output selected and thus have a lower unit cost than that of equivalent resources in competing firms. It leads to the need for the department to be more automated and less autonomous. To achieve that, P&I should centralize its PACS installation operations and develop standard procedures for its activities so as to control variation and to ensure quality. Similarly, call center services should be organized so that there are standard procedures for handling calls and following up with reported issues, so that a certain level of service quality is guaranteed. Hierarchical structures make good strategic sense in these operations because activities can be divided into simple, repeatable tasks and efficiently performed in mass quantity. Moreover, the structure helps to retain and deepen functional expertise where it exists.

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[42] Richard D. Irwin, Inc. "Module 9: Implementing Strategy: Core Competencies, Reengineering, and Structure." 1995. Retrieved July 20, 2005 from:
http://www.csuchico.edu/mgmt/strategy/module9/sld059.htm.

To standardize and ensure the quality of services provided by install teams and the call center, it is crucial that there is a comprehensive knowledge database available. The database should be easy to access by most people in the company and have a powerful search tool for information that is well organized and up-to-date. The database serves to provide information across the value chain in a timely manner. Moreover, a fully automated, closed loop and centralized issue tracking system is essential for supporting more automated operations in the organization. These systems guide the flow of processes across different departments and units for reporting, tracking, assigning, verifying, and closing of issues.

On the other hand, to foster an environment that addresses the need for quick response to shifting customer requirements and shorten design-to-market cycles, R&D should work towards a more decentralized and autonomous organization, giving full accountability and control of its resources to its respective divisions. As the department grows bigger and stronger, certainly the responsibilities and roles must be shared by other people. It is impossible for one person to do everything. Decentralization and autonomy will allow R&D to participate closer to the market. In order to ensure information flow and tighter coordination among various project teams, it is suggested for MIG to implement a matrix organization in the R&D department. Matrix organizations are, by definition, much flatter than traditional hieratical structures. However, with the absence of extra layers of management to keep an organization in balance, it is necessary to establish clear operating guidelines to define operating principles and management roles and accountabilities to balance out a matrix organization. In a command and control structure, lines of authority and responsibility are clear and unambiguous. Individuals

used to this type of environment can have difficulties adapting to a matrix. Another possible pitfall within the organization is that it might cause business friction due to inconsistent views of management roles under the new matrix structure.

Reengineering strategy-critical processes can reduce fermentation and cut bureaucratic overheads. Potential outcomes are dramatic gains in productivity and organizational creativity where responsibilities and decision-making authority are clearly defined. In addition, strategy-critical processes would be unified, permitting tasks to be performed quicker and at lower cost, resulting in a company that is more responsive to customer expectations.

5.6   Conclusion

MIG is in an attractive, high-opportunity, and rapidly growing market. At the same time, it faces fierce competition with existing PACS vendors, wherein some use bundling strategies to gain market share, while others offer alternative financing models of "pay-per-use" fees to smaller healthcare facilities and imaging centers. In the past decade, ALI, later renamed MIG, has been successfully gaining its share of the market and building on its reputation in the PACS industry. MIG is at a cross roads of change where it's the right decisions will help the company sustain its competitive advantage and continue to be successful in the industry.

In view of the forces operating within and upon the PACS industry that MIG is in, this paper identifies the issues the company should address. It is imperative for MIG to select a strategy that enables it to meet both the growth and profitability targets imposed on it by its parent organization. Given its core competence, culture, and leveraging of the

excellent assets provided by its parent company, it is recommended for MIG to target high dollar value markets, primarily among high volume hospitals. Moreover, MIG is advised to assess the state of its human resources, organization, and processes for sustainable growth.

APPENDICES

Appendix A: Overall Vendor Rankings from KLAS 2004 November Report

Ranking	Vendor, Product	Total Score (out of 100)
1	Stentor, iSite	92.1
2	Amicas, Vision Series PACS	90.1
3	DR Systems, Dominator	88.4
4	McKesson, Horizon Medical Imaging	85.3
5	Fuji, Synapse	80.3
6	Agfa, IMPAX	80.0
7	Philips, Easy Access (Inturis) PACS	77.4
8	Siemens, SIENET	73.1
9	Kodak, DirectView	72.9
10	GE, Centricity	71.6

Source: McKesson Imaging Group, presentation at the All (MIG) Employee Meeting on April 26, 2005.

Appendix B: McKesson CIO Survey on Customer Satisfaction

Category	MPT Average Score	MIG Average Score
Product Quality by group	5.79	6.67
Meet business needs	5.75	6.60
Likelihood to buy again	5.61	6.48
Support Quality	5.81	6.36
Release Upgrade Quality	5.67	6.30
Satisfaction with new implementation	5.58	6.45

Source: McKesson Imaging Group, presentation at the All (MIG) Employee Meeting on April 26, 2005.

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