

A person in a white lab coat is seated at a desk, viewed from the side. They are looking at two large computer monitors. The left monitor displays a cross-sectional medical scan of a human torso, showing internal organs and structures. The right monitor displays a vertical medical scan, possibly a spine or a long bone, with several horizontal lines indicating specific points of interest. The person's hands are resting on a mouse on the desk. The background is dark, and the overall lighting is focused on the monitors and the person.

PICTURE ARCHIVING AND COMMUNICATIONS SYSTEMS

(SAMPLE COPY, NOT FOR RESALE)

Trends, Industry Participants, Product Overviews and Market Drivers

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1. Overview

1.1 Statement of Report

Globally, healthcare organizations are experiencing constant pressure to manage, transport, store and process an increasing amount patient data. A larger part of this data originates from two applications that are bringing healthcare to a digital environment: Picture Archiving and Communication Systems (PACS) and Electronic Medical Records (EMR). PACS is primarily used as an application to manage digital images, while EMR is the principal application interface for gathering patient data from multiple ancillary applications. These digital technologies enhance patient care with more timely, more secure and easier access to patient data. U.S., Europe and Japan are the largest markets for PACS. In terms of PACS utilization in medical imaging procedures, the U.S. leads the global market. In Asia-Pacific, growth in demand for PACS is catching up in the emerging markets such as China and India, where cost efficient initiatives are being implemented by the hospitals in the region. Leaders in the PACS market comprise GE Healthcare, Philips Healthcare, Siemens Healthcare, Agfa-Gevaert, Fujifilm, Carestream Health, McKesson and others.

1.2 About This Report

PACS was enabled by the development of standards by the American College of Radiology/National Electrical Manufacturers Association (ACR/NEMA) called the Digital Imaging and Communications in Medicine (DICOM) protocol. Other key regulations and standards that impact this space and are also examined are the U.S. Health Insurance Portability and Accountability Act (HIPAA) and the health level seven (HL7) guidelines. In this report, the trends, key vendors and market drivers are examined and abundant graphs and tables detailing important aspects of the space are provided.

By purchasing this study, the reader will have:

- An understanding of the most exciting PACS market segments.
- The latest information on leading products and R&D initiatives.
- Familiarity with recent developments and their effects on selected markets.
- Knowledge of the PACS market as an area of growth, research and investment.
- An extensive review of the PACS hardware, software and radiopharmaceuticals markets leading companies.

Key questions answered in this review are:

- How can PACS tools and technologies facilitate improved patient care?
- What are the main types of PACS technologies that are currently available?
- Who are the current key players in this marketplace?
- What is the current state of the PACS market?
- What are the major trends in PACS solutions?
- What is the impact of regulatory changes on the PACS markets?

Additionally, this examination contains:

- In-depth profiles of the leading companies with PACS tools and technologies.
- Detailed analysis of the trends in the PACS marketplace.
- Views on the PACS industry from leading industry experts.
- Analysis of new PACS applications.
- The latest news and M&A developments in the PACS marketplace.

Analysis includes charts and graphs measuring product growth and trends within the marketplace. Company-specific information, including sales figures, product pipeline status and R&D trends, is provided. The study will help the reader to:

- Evaluate the effect of strategic factors such as technology driven change and industry consolidation.
- Investigate how cost-constraints and technological advances are driving change in the PACS markets.
- Review the main participants in each sector and plan an entry strategy in line with the strengths and weaknesses of the competition.

1.3 Scope of the Report

This analysis primarily focuses on PACS and RIS (radiology information systems). It discusses products, trends, new developments and compensation issues that are currently affecting or are likely to affect the market soon. Detailed analyses are provided for each of the key companies in the major and minor market segments. More comprehensive information is provided for those companies that are in the major market segments. The reader should consult other TriMark reports at <http://www.trimarkpublications.com> for a detailed discussion of the important individual market segments that are related to the medical imaging sector.

1.4 Objectives

Discussions of the key products for PACS market are presented here. The analysis goes on to discuss the trends that have developed and are stimulating this market. A survey of all of the significant, active companies known to be marketing, manufacturing or developing instruments and agents in the areas selected as leading PACS markets in the U.S. is included in this study.

1.5 Methodology

The author of this report has an M.D. with a specialty in clinical radiology. The editor is a retired college professor with three decades of experience in teaching biochemistry, biotechnology and pharmacology. Company-specific information is obtained mainly from industry trade publications, academic journals, news and research articles, press releases and corporate websites, as well as annual reports for publicly-held firms. Additional sources of information include HIMSS Analytics, *DiagnosticImaging*, OECD Health Policy Studies, *Journal of Health Informatics in Developing Countries*, *Journal of Digital Imaging*, *Next Generation Healthcare* (NGH), *Health Informatics Research Series*, American Radiological Nurses Association, Agency for Healthcare Research and Quality (AHRQ), American Hospital Association (AHA), *The New England Journal of Medicine*, The Dorenfest Institute for Health Information, Columbia University of Science and Technology Ventures, Milken Institute, *Journal of Digital Imaging*, *Journal of Health Informatics in Developed Countries*, *Biomedical Imaging and Intervention Journal*, China Hospital Information Management Association (CHIMA) and OECD Health Policy Studies.

Some of the statistical information was taken from Biotechnology Associates' databases and from TriMark's private data stores. The information in this study was obtained from sources that TriMark believes to be reliable, but do not guarantee the accuracy, adequacy or completeness of any information or omission or for the results obtained by the use of such information. Key information from the business literature was used as a basis to conduct dialogue with and obtain expert opinion from market professionals regarding commercial potential and market sizes. Senior managers from major company players were interviewed for part of the information in this report.

Primary Sources

TriMark collects information from hundreds of Database Tables and many comprehensive multi-client research projects, as well as Sector Snapshots that are published annually. TriMark extracts relevant data and analytics from TriMark's research as part of this data collection.

Secondary Sources

TriMark uses research publications, journals, magazines, newspapers, newsletters, industry reports, investment research reports, trade and industry association reports, government-affiliated trade releases and other published information as part of its secondary research materials. The information is then analyzed and translated by the Industry Research Group into a TriMark study. The Editorial Group reviews the complete package with product and market forecasts, critical industry trends, threats and opportunities, competitive strategies and market share determinations.

TriMark Publications Report Research and Data Acquisition Structure

The general sequence of research and analysis activity prior to the publication of every report includes the following items:

- Completing an extensive secondary research effort on an important market sector, including gathering all relevant information from corporate reporting, publicly available databases, proprietary databases, direct meetings and personal interviews with key personnel.
- Formulating a study outline with the assigned writer, including important items:
 - Market and product segment grouping and evaluating their relative significance.
 - Key competitors' evaluations, including their relative positions in the business and other relevant facts to prioritize diligence levels and assist in designing a primary research strategy.
 - End-user research to evaluate analytical significance in market estimation.
 - Supply-chain research and analysis to identify any factors affecting the market.
 - New technology platforms and cutting-edge applications.
- Identifying the key technology and market trends that drive or affect these markets. Assessing the regional significance for each product and market segment for proper emphasis of further regional/national primary and secondary research.
- Launching a combination of primary research activities, including two levels of questionnaires, executive-direct focused, company-specific and region-specific communications to qualified and experienced senior executives worldwide.
- Completing a confirmatory primary research assessment of the report's findings with the assistance of Expert Panel Partners from the industry being analyzed.

1.6 Executive Summary

In medical imaging PACS is a synthesis of hardware and software meant for the short and long term storage, retrieval, management, distribution and presentation of images. Electronic images and reports are transported digitally via PACS and this eliminates the need to manually file, retrieve, or transport film jackets. PACS find their applications in imaging modalities such as CT, MRI, X-ray and ultrasound. There are increasing indications of work-flow efficiencies, improved quality of care and cost savings being realized in a number of hospitals, which in turn, has generated interest in the adoption of PACS among general physicians and private practitioners. Today, PACS has almost become indispensable in a digital radiology environment.

Innovation in technology for clinical utilizations such as oncology PACS and surgical PACS is going to propel greater adoption of PACS outside the radiology department over the next several years. A lot of technological improvements, in both clinical applications and work-flow management tools have been introduced that have changed the functionality of PACS from a viewing and storage solution for images, to a crucial decision support system. The compelling need for integrated and improved diagnostic and visualization tools for non-radiology departments such as orthopedics, cardiology, oncology and mammography will catalyze technological innovation in the PACS market.

Globally, PACS has expanded from offering independent imaging solutions to an integrated platform catering all modalities across all departments. Historically, PACS is being employed by big hospitals and large university institutions and now new segments such as smaller community hospitals, outpatient imaging centers and physicians' offices are digitizing their operations with the help of PACS. The global growth in PACS market will be fueled by the increasing adoption of PACS systems, in community hospitals and non-affiliated imaging centers. Additionally, sales of replacement units and system upgrades will propel market growth. TriMark's research indicates that the global market for PACS was worth about \$ [REDACTED] in [REDACTED] and this is anticipated to grow and reach \$ [REDACTED] in [REDACTED].

According to CapSite, in the U.S. nearly [REDACTED]% of the Radiology PACS systems in use within hospitals are more than five years old. In contrast, [REDACTED]% of the Cardiology PACS systems are less than five years old. In addition, there is a steady increase in Cardiology PACS adoption curve over the past seven years, with [REDACTED] showing nearly twice the adoption as in [REDACTED]. According to IMV Medical Information Division, replacement has become the primary motivation for purchasing new systems in [REDACTED], with [REDACTED]% of the planned purchases of complete systems being replacement systems, compared to [REDACTED]% for first buyers. In hospitals with over 100 beds, the adoption of PACS has clearly reached the mature stage, with very few 'first buyers' of PACS systems. Moreover, the purchase of first buyer and replacement systems is a small portion of future PACS investments, comprising only [REDACTED]% of the planned expenditures from now through [REDACTED], while [REDACTED]% of the expenditures are for expanding and upgrading their present PACS systems. TriMark estimates that the PACS market in the U.S. was worth about \$ [REDACTED] in [REDACTED] and anticipates this figure to reach \$ [REDACTED] in [REDACTED].

In the U.S. acute-care facilities give priority to technology than the cost and most of them consider DR Systems, McKesson and Fujifilm as excellent systems with great support. Community hospitals are burdened with limited IT and financial resources and their decisions are based more on simple care. The community hospital providers generally choose a web-based PACS, such as NovaRad, Infinitt, GE PACSIW, Fuji, and Philips. The other vendors in the U.S. market are Agfa, Aspyra, Avreo, BRIT, Carestream, Cerner, Sectra and Siemens.

The adoption of PACS in European hospitals is [REDACTED]%, but the modern RIS that drives PACS has only reached an adoption level of about [REDACTED]%. Traditional RIS modules still dominates the market and many hospitals are disinclined to install a new RIS due to complications associated with training a large group of staff as well as concerns over data migration and security. But, with the third generation of PACS installations, hospitals have recognized the importance of investing in a modern RIS. More than that, they are also realizing the need to purchase RIS and PACS from the same vendor to minimize operational costs. The regulatory initiatives of DICOM and HL7 are likely to make the traditional RIS solution outmoded, thereby expanding RIS installations from leading vendors. Installation of modern PACS will force hospitals to have a modern RIS system that will drive more installations of these PACS. TriMark's research indicate that the European PACS market in [REDACTED] was worth about \$ [REDACTED] and we estimate that this will reach about \$ [REDACTED] in [REDACTED].

Agfa-Gaevert N.V, Siemens Healthcare and Philips Healthcare are the leaders in Europe's PACS market. These three companies have a share of about [REDACTED]% of the market share. Other leaders are Carestream Health, Detonator and GE Healthcare. Many local players are also in the race, with Ferrania and Esaote in Italy, Vepro and GWI in Germany, Sectra in Sweden and the U.K. The market leaders are offering competitively priced, feature-rich products to attract more customers in a saturated market.