

STATUS OF MEDICAL IMAGING EQUIPMENT AND DETECTORS 2020

Market & Technology Report - June 2020

Semiconductor technologies continue to revolutionize the medical imaging market by enabling point of care and disposable systems.

WHAT'S NEW

- The scope of the report was enlarged to consider a new modality: MRI
- COVID effect on Q1 2020
- Rapid rise of new companies in ultrasound and molecular imaging
- Analysis of the OCT market

KEY FEATURES

- Market data in units and value at the equipment level from 2015 to 2025 for ultrasound, molecular imaging, MRI, OCT, X-ray and endoscopy
- Players and market shares for each modality
- Insight at the detector level for the main type of sensors for every modality - Data in units and value for these sensors
- Players for the detector level with market shares for most modalities
- Supply chains for each modality and the equipment and detector level

MODALITY DYNAMICS AND ECOSYSTEM OF EQUIPMENT FOR MEDICAL IMAGING

The medical imaging industry has always been a place for high-end technology and innovative solutions. There are many players, and many dynamics, from big companies trying to innovate in mature markets, to disruptive start-ups innovating in specific fields. To better understand the ecosystem, one must first describe the segmentation of this industry.

In this report Yole Développement (Yole) is analysing the medical imaging market for the six major modalities: endoscopy, ultrasound (US), optical coherence tomography (OCT), X-ray, molecular imaging (MI) and magnetic resonance imaging (MRI).

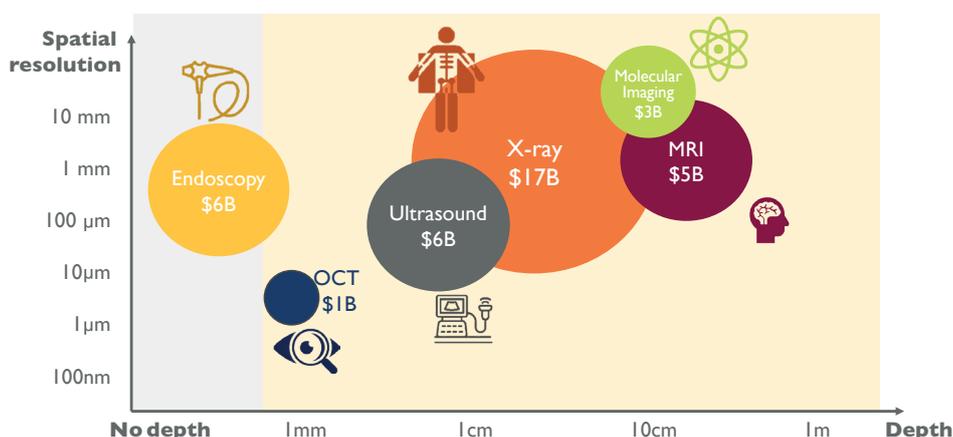
All six modalities have varying degrees of difference regarding their market dynamics. The general trend is twofold. On one hand, for modalities such as MRI, X-ray or molecular imaging, where large equipment is involved, there is a race towards higher performance machines. On the other hand, in modalities with smaller equipment, such as ultrasound, endoscopy, or OCT, we see a trend in the development of accessibility and affordable point of care solutions. Not to say that performance is a negligible factor, but in these markets, there

is a push for low-cost solutions, and a trend towards single use, and/or point of care.

These trends are due to different factors. First, development of semiconductor technology has led to widespread adoption in the medical industry. It has allowed for the miniaturisation of camera modules at such a low cost that for certain applications, such as endoscopy, it is now possible to consider single use, disposable equipment where the camera module is also single use. This miniaturisation has also allowed equipment manufacturers to design portable solutions allowing for point of care medicine. This is where the equipment comes to the patient instead of the conventional other way round. This trend may even go directly to the patient's home. Moreover, there is a trend towards tele-diagnosis and dematerialized medicine. The 2020 coronavirus pandemic has catalysed this change in paradigm, making these trends more acceptable, as it reduces stress on medical infrastructure.

It is thus important to understand the technologies hidden behind these modalities as they are the main reason these changes are possible.

Medical imaging equipment landscape – 2019 global spending*



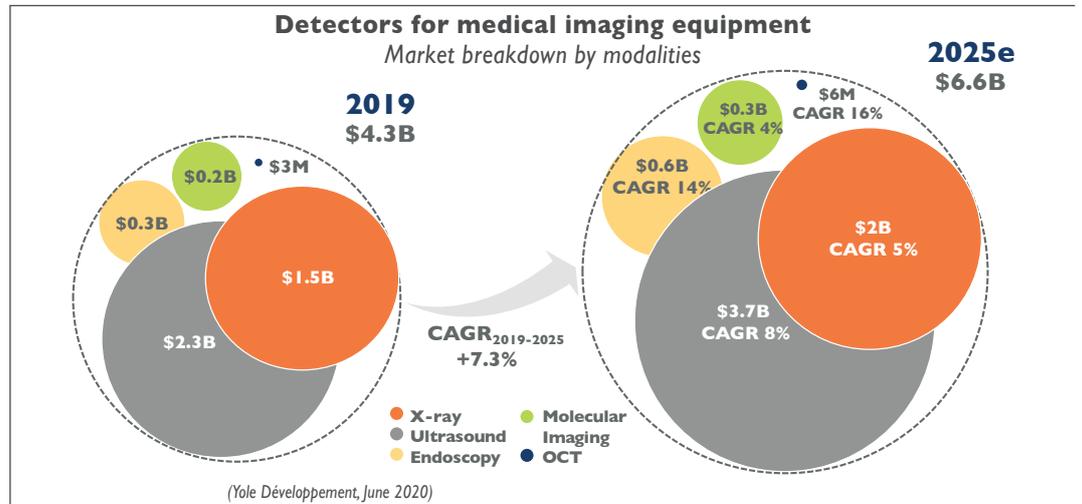
* Equipments only, service and consumables not included

AT FIRST THERE WAS THE TUBE, NOW THERE IS THE SEMICONDUCTOR

Globally speaking, the medical imaging equipment market is estimated to be worth \$38B in 2019. It is forecasted to increase toward \$52B in 2025, with a 5.3% Compound Annual Growth Rate (CAGR). This is a relatively high value considering the slow-moving nature of the medical industry. This figure is backed up by different trends observed at the equipment and detector levels, and evolution of the players in the industry.

The medical imaging industry is profiting from global trends in the development of semiconductor technology. The detector market for medical imaging equipment is estimated at \$4.3B for all modalities in 2019. It is forecasted to grow to \$6.6B in 2025 with a CAGR of 7.3%.

At first most modalities, such as X-ray and molecular imaging, relied on tube technologies. Others, such as ultrasound, used piezoelectric crystals. Today, thanks to microtechnology development, all modalities have moved towards semiconductor solutions for detection. Remarkably, in the US market development of capacitive micromachined ultrasonic transducers (CMUT) allowed Butterfly Network to offer a new kind of ultrasound probe with a disruptive approach rarely seen in the medical market. Although detector manufacturers cater for multiple modalities, the unique requirements each modality has detector-wise means that there is little technological crossover, leading to a very diverse ecosystem.



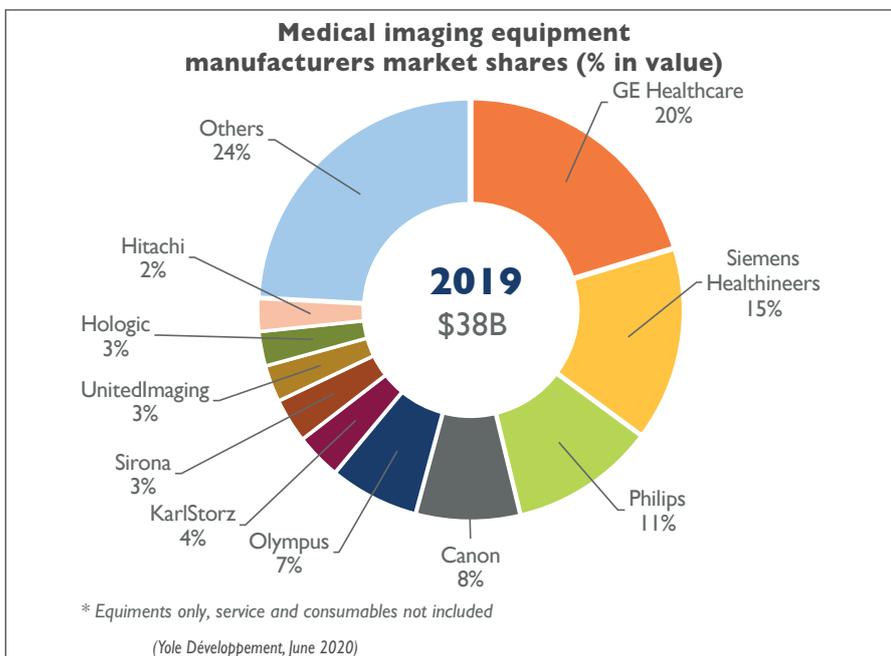
A WIDE VARIETY OF PLAYERS, FROM MULTINATIONALS TO DISRUPTIVE START-UPS

At the centre of these markets are many actors providing solutions in all the fields. The first five biggest are GE Healthcare, Siemens Healthineers, Philips, Canon and Olympus, which have about 60% of the market-shares. The first four are quite similar in terms of their business model. They cater to a wide variety of modalities, specifically where

performance is key, such as MRI, X-ray, or molecular imaging. This is because these modalities require a certain level of upfront investment and it is thus hard for small players to enter these markets. Having said that, newcomers do exist, such as Canon, which has acquired the medical imaging division of Toshiba, thus adding these modalities to their catalogue. Olympus specializes exclusively in endoscopy. This is quite a common trend for all smaller players such as Topcon or Zeiss, who specialize in OCT, or Sonosite, which specializes in ultrasound when accounting for their medical imaging activities.

At a detector level, we see well-known names such as Varex, ON Semiconductor, Teledyne Dalsa, and Omnivision, who offer solutions for different modalities. These actors can rapidly adapt to the market.

In this report you will find a detailed description of the six modalities. Each of them having their own dynamics and drivers. The global picture presented in this “Status of Medical Imaging Equipment and Detectors 2020” report is key to understanding the market to make pertinent business decisions. It is easy to overlook key events from this complex picture. Understanding the dynamics at the equipment level and the detector level is crucial, hence this report will provide many answers, shedding light on this ever-changing scenario.



REPORT OBJECTIVES

- Give an overview for the six major modalities in the medical imaging industry from the equipment to the detector level for: MRI, X-ray, OCT, ultrasound, endoscopy and molecular imaging, with data on market size, and units sold, from 2015 to 2025.
- Provide insight about the drivers underlying these market trends and ecosystems at the detectors level and particularly the general change towards semiconductor-based detectors for most of the modalities.
- Understand every factor about the dynamics for each modality of the medical imaging market at the equipment and detector level. As an example, seeing the development of single use, or point of care system is allowed thanks to the development of cheaper semiconductor components.

COMPANIES CITED IN THE REPORT (non exhaustive list)

Abbott, AGFA, AJAT, Ambu, ams, Aohua, AS Anke, Asahi, Avinger, Basler, BOE, Boston Scientific, Broadcom, Butterfly Network, Caeleste, Canon, CapsoVision, Careray, Carestream, Clarius, Compact Imaging, Detection Technology, DPIX, Dongbu HiTek, Ecoray, Esaote, Exo, Fujifilm, GE Healthcare, Genoray, Gpixel, Hamamatsu, Heidelberg, Hitachi, Hologic, Hyperfine, Innolux, IntroMedic, iRay, ISDI, JAI, Jinshan, Johnson & Johnson, Karl Storz, Kavo Kerr, Ketek, Kolo, Konica Minolta, Kromek, Leica, LG, Medigus, Mediso, Medonica, Medtronic, Mindray, MinFound, Morita, Neusoft, Olympus, Omnivision, ON Semiconductor, Optovue, Pentax, Philips, Photonicare, Planmeca, Pusen Medical, Rayence, Richard Wolf, Rohm, Samsung, Sharp, Shimadzu, Siemens Healthineers, Silterra, SinoVision, Sirona, Silex, SonoScape, SonoStar, Sony, Spectrum, ST Microelectronics, Stephanix, Stryker, TE connectivity, Teledyne Dalsa, Terumo, Thorlabs, Topcon, Toshiba, TowerJazz, Trixell, TSMC, United Imaging, Varex, Vatech, Verasonics, Vermon, Vieworks, Vinno, Xfab, X-scan imaging, Zeiss, Ziehm, Zimmer and more..

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RELATED REPORTS, MONITORS & TRACKS



- Artificial Intelligence for Medical Imaging 2020
- X-Ray Detectors for Medical, Industrial and Security Applications 2019
- BioMEMS Market and Technology 2020
- OmniVision's OVM6948 CameraCubeChip
- Butterfly Network iQ CMUT Sensor

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ABOUT YOLE DEVELOPPEMENT

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The “More than Moore” market research, technology and strategy consulting company Yole Développement, along with its partners System Plus Consulting, PISEO and Blumorpho, supports industrial companies, investors and R&D organizations worldwide to help them understand markets and follow technology trends to grow their business.

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- Market data & research, marketing analysis
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- 2.1 Products are sent by email to the Buyer after Seller’s confirmation:
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 - Within a reasonable time for Products ordered prior to their effective release. In this case, the Seller shall use its best endeavours to inform the Buyer of an indicative release date and the evolution of the work in progress.
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Bank code: 30056
Branch code: 00170
Account n°: 0170 200 1565 87
BIC or SWIFT code: CCFRFRPP
IBAN: FR76 3005 6001 7001 7020 0156 587

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- 9.1 Any dispute arising out or linked to these General Terms and Conditions of Sale or to any Licenses or Products purchased in application thereof shall be submitted to the French Commercial Court of Lyon, which shall have exclusive jurisdiction upon such issues.
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