

Medical Systems Business

Differentiation strategy using the AI technology “REiLI”
～ In the example of endoscopy business ～

FUJIFILM Holdings Corporation
September 17, 2020

Today's presenters

Director, FUJIFILM Holdings Corporation
Director, Executive Vice President,
General Manager of Medical Systems Business Division of FUJIFILM Corporation
Teiichi Goto



General Manager, Endoscopy System Division,
Medical Systems Business Division of FUJIFILM Corporation
Keiichi Nagata



General Manager, Medical Systems R&D Center and IT Solution Division. Medical
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Toshiyuki Nabeta



Today's contents

1. Overview of the Medical Systems Business
2. Description of the Endoscopy business
3. Differentiation strategy using the AI technology "REiLI"

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1. Overview of the Medical Systems Business

Director, FUJIFILM Holdings Corporation
Director, Executive Vice President,
General Manager of Medical Systems Business Division
of FUJIFILM Corporation

Teiichi Goto

Medical Systems Group's initiatives in response to COVID-19

X-ray diagnostic imaging device

○ Mobile digital X-ray unit (mobile radiography room)

"CALNEO AQRO"
Smooth transportation and maneuvering also in isolation wards and at bedside



Offering new image processing kits that support AI-based computer-aided diagnostic (AI-CAD) software* in some areas for efficient diagnosis of COVID-19 symptoms by doctors



Medical IT

○ 3D image analysis system "SYNAPSE VINCENT"
Contributing to the analysis of chest CT scans mainly for use in definitive diagnosis



Analyzing GGO (ground glass opacification) in COVID-19 pneumonia patterns* CT scans, specifying threshold CT values

○ AI-based diagnostic support for COVID-19 pneumonia (under development)
OSYNAPSETM (for remote working)

Providing doctors who have difficulty commuting to hospitals with a secure environment for accessing the SYNAPSE system at hospital

COVID-19肺炎患者CT画像のGGO(すりガラス陰影)の分析とCT値の閾値を指定する



*Software to be installed are limited to those that have been confirmed by Fujifilm to work together.

Ultrasound diagnostic system

○ Mobile ultrasound diagnostic system

"iViz air" (wireless ultrasound diagnostic imaging system)
Cable-free, compact and plain design for the operation area, making it easy to apply infection prevention measures and contributing to reducing the workload of testing duties
The touchpanel screen can be operated from outside a disposable bag.



IVD (In-vitro diagnostic system)

○ Genetic identification kit for PCR test
Saliva-based fast PCR testing for COVID-19



○ Fully automated PCR testing system
"uTAS Wako g1"
Fast and easy automatic PCR testing (75 minutes)

Others

○ Disinfecting and antibacterial products
Ecological cleaner "Hydro AgTM"
Technology sustains a long-lasting antibacterial effect, based on photographic film technology nurtured since corporate foundation (involving "silver," which is a main ingredient of photographic film, and "coating technology," which is essential for producing photographic film)

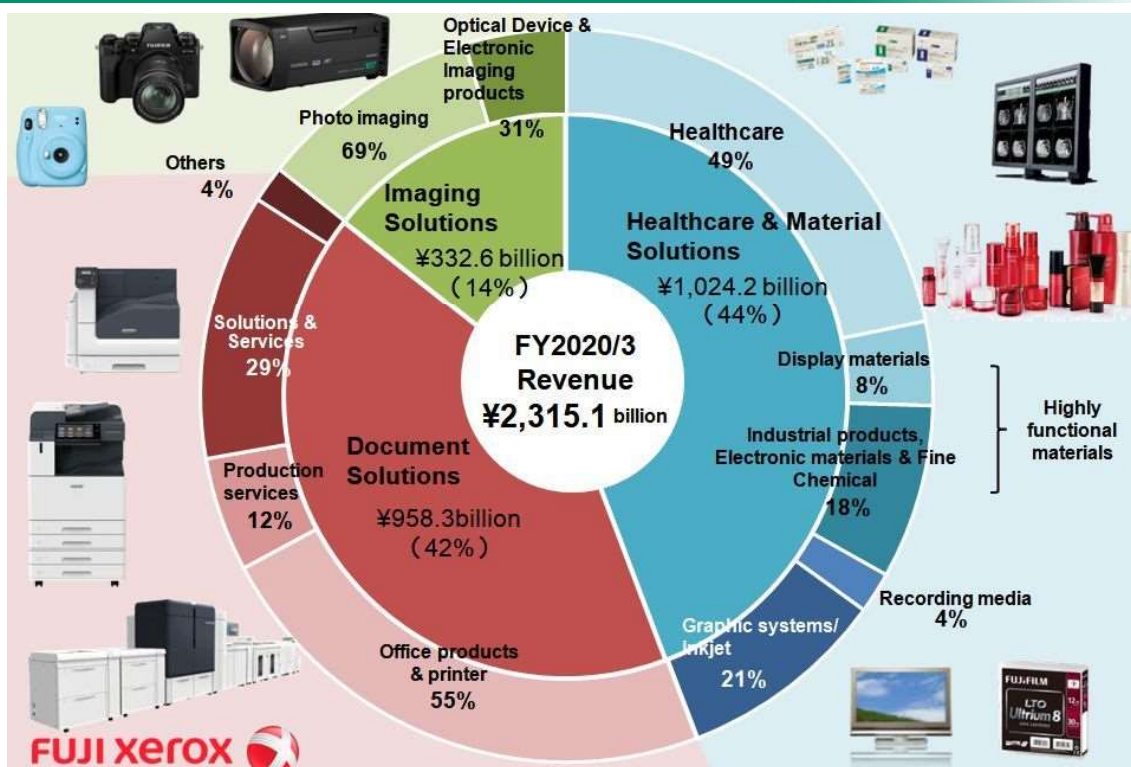


Available for medical frontline and general households



Using Fujifilm's unique technologies for a company-wide effort to counter COVID-19

Positioning of the healthcare field in Fujifilm



How we position the Medical System Business within Fujifilm

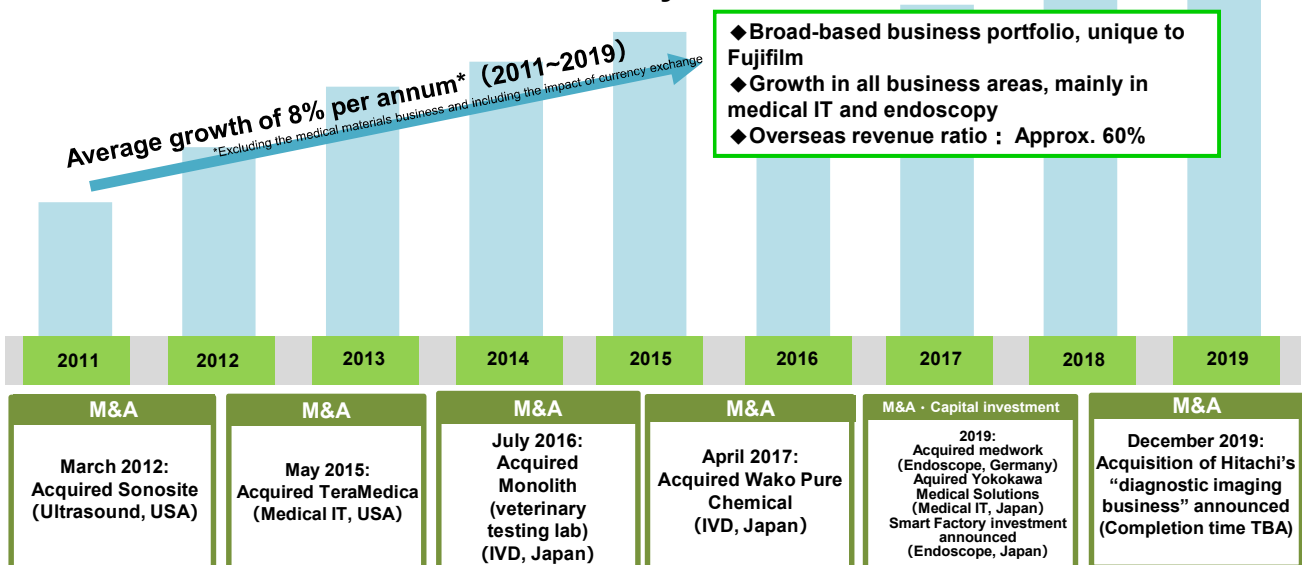
Aiming to grow the healthcare business as a main pillar



The Medical Systems business is a core business in the healthcare field, generating the largest revenues and income and drives growth.

Overview of the Medical Systems business

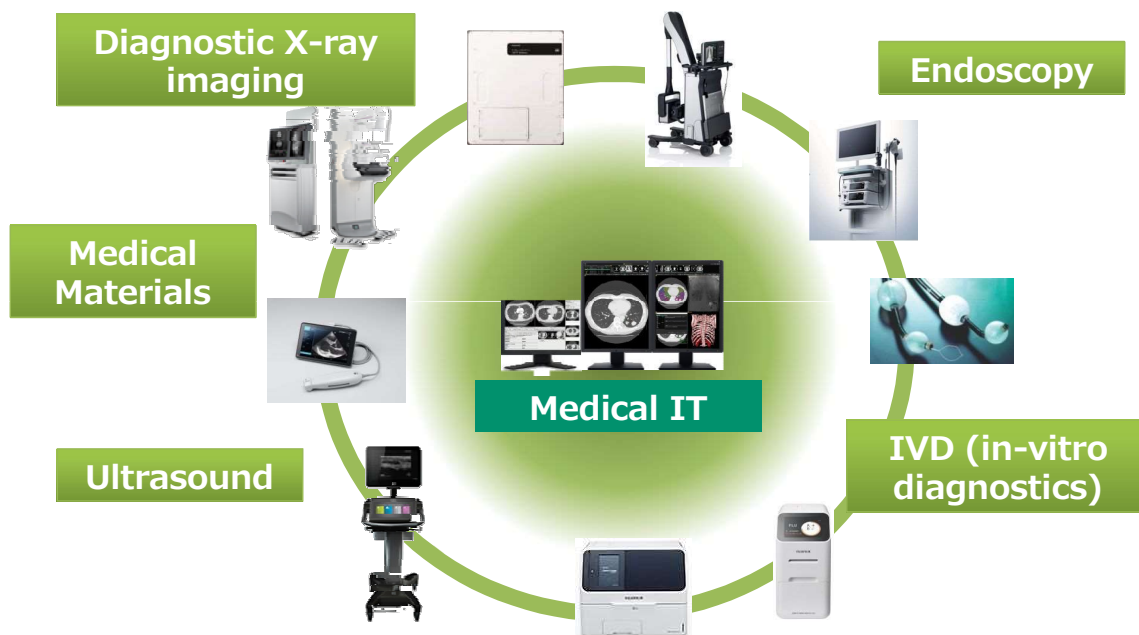
<Revenue transition of the Medical Systems business>



Building solid business foundation with M&A and the growth of existing business operations

Core business field that delivers a high rate of revenue growth and operating income rate in excess of 10%

Overview of the Medical Systems Business



Connecting “medical IT” to various products and services such as “X-ray diagnostic imaging,” “endoscopy,” “ultrasound” and “IVD” to enable sustainable growth

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2. Description of the Endoscopy business

General Manager, Endoscopy System Division,
Medical Systems Business Division
of FUJIFILM Corporation

Keiichi Nagata

Initiatives for the gastrointestinal endoscopy field in the Endoscopy business

<Main lineup of the gastrointestinal endoscopy systems>

<p>LASEREO</p>  <p>上段:プロセッサ(NP-7000),下段:レーザー光源装置(LL-7000) <内視鏡システムの構成図></p>	<p>ELUXEO</p> 	<p>6000 System</p>  <p>プロセッサと光源を一体化したコンパクトモデル</p>
<p>Flagship model equipped with a laser light source (Marketed mainly in Japan)</p>	<p>Flagship model equipped with an LED light source (Marketed mainly overseas)</p>	<p>Affordable model equipped with an LED light source, targeted at medical examination centers and clinics that perform screening tests</p>

<Special light observation technologies>

 <p>Linked Color Imaging</p>	 <p>Blue Light Imaging Blue LASER Imaging</p>	<p>Multi-Light Technology Combining irradiated light with image processing to create images suitable for observation</p>
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Offering endoscopic systems based on image processing technology from photographic business and light-source control technology from healthcare business to meet high global demand for early detection of diseases

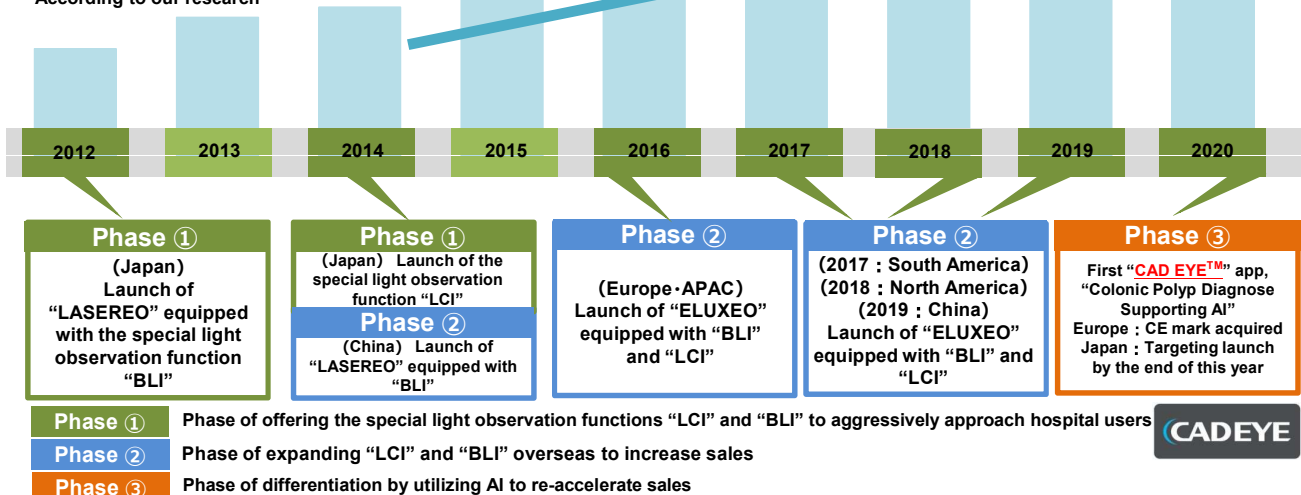
Growth performance of Endoscopy business

<Sales transition of Endoscopy business>

Greatly exceeds the market annual growth rate, 5-7%*

*According to our research

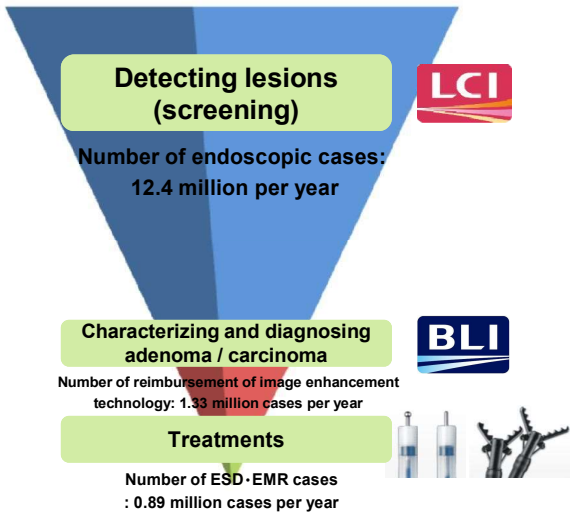
CAGR 10% (2012~2019)



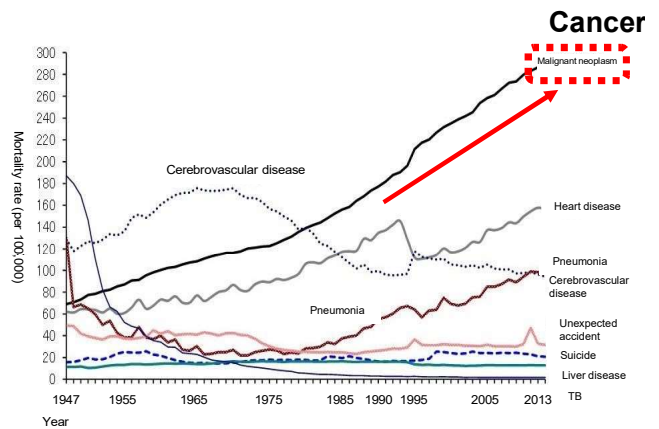
After the launch of LASEREO with special light observation functions, sales has been doubled , achieved CAGR +10% growth exceeding the market growth rate

Phase① Special light observation functions “LCI” and “BLI”

■ Endoscopy workflow



■ Mortality rate by cause of death in Japan



Note 1: The drop in heart disease figures in 1994 and 1995 is suspected to be the impact of information circulated prior to the enforcement of government guidelines (January 1995) to avoid listing heart failure, respiratory failure and other conditions that present at the final stage of a disease as a cause of death in a death certificate.
Note 2: The main factor of the increase in cerebrovascular disease figures in 1995 is the clarification of rules on selecting a cause of death under ICD-10 (enforced in January 1995).

Source: 2013 Vital Statistics (MHLW)

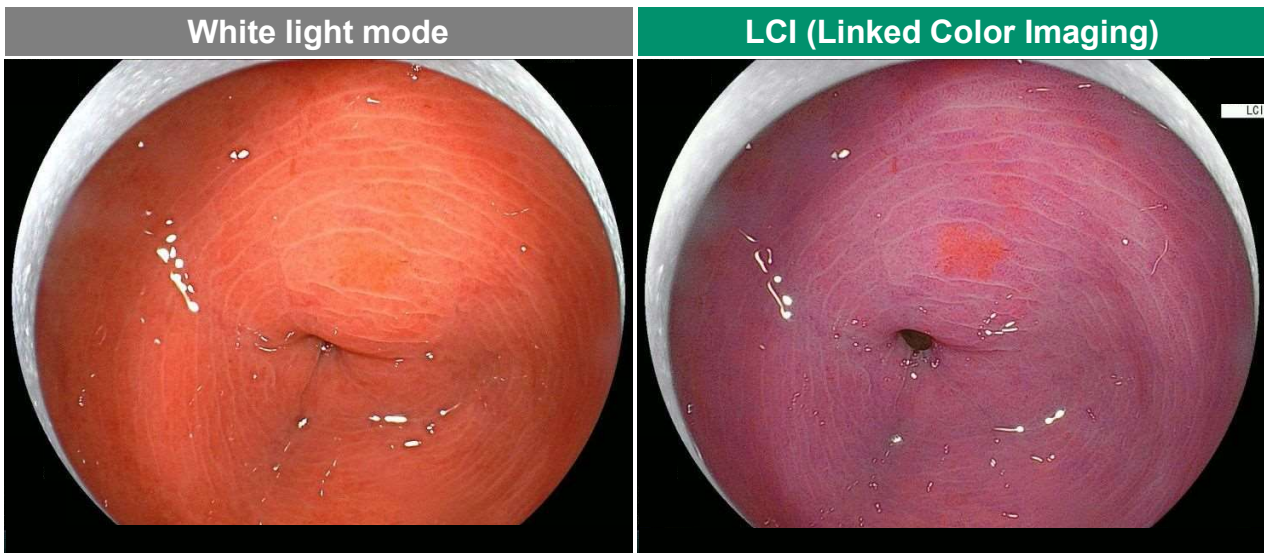
Introduction of “LCI” and “BLI” has enhanced the function of detection and characterization. In particular, “LCI” has been rated highly for its clinical benefit for early cancer diagnosis and inflammatory disease diagnosis.

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Phase① Special light observation functions “LCI” and “BLI”



Function to emphasize slight color differences of the red color spectrum
⇒ Assisting the detection of early lesions (**screening**)



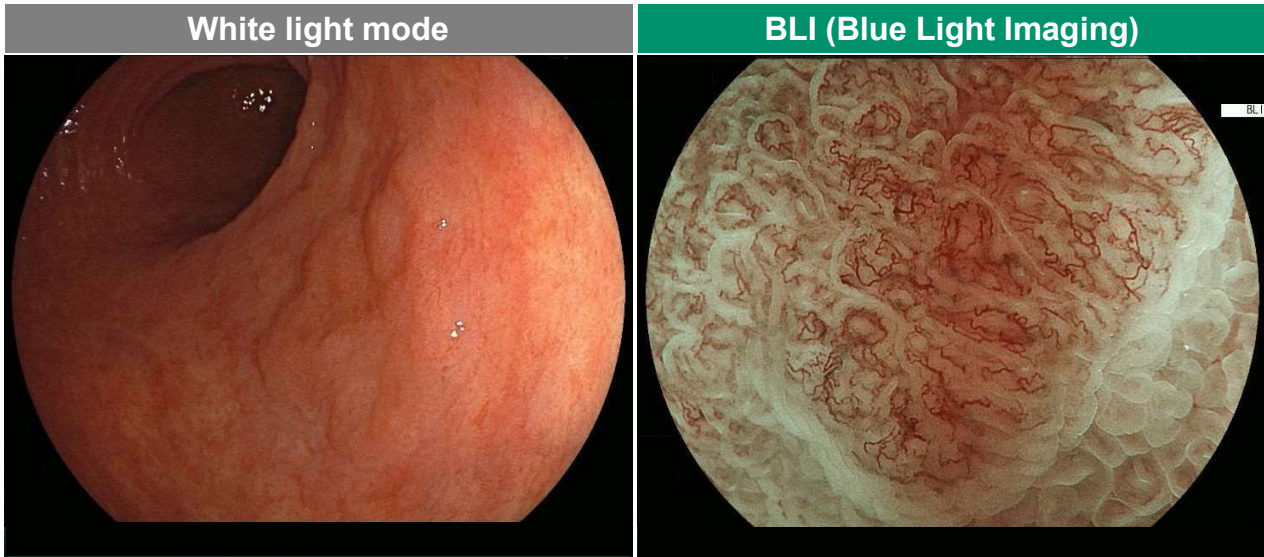
Images provided by Dr. Hiroya Ueyama, Juntendo University Hospital

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Phase ① Special light observation functions “LCI” and “BLI”



Function to produce high-contrast images of superficial mucosal structures and micro vascular patterns on mucosal surface layer of organs
 ⇒ Assisting the **characterization and diagnosis** of lesions



Images provided by Dr. Hiroya Ueyama, Juntendo University Hospital

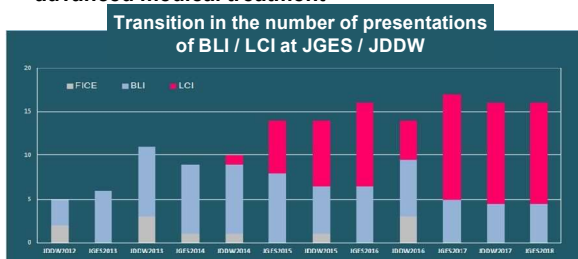
Phase ①
Special light observation functions “LCI” and “BLI”

Promoting evidence establishment* for “LCI” and “BLI” inside and outside Japan to appeal its clinical benefit

*Basis for indicating clinical benefit (≠ Compiling papers based on research results)

<Japan>

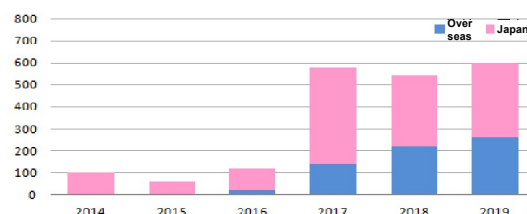
- ✓ Launch “BLI” in 2012 and “LCI” in 2014
- ✓ Number of research papers of “LCI” and “BLI” is increasing
- ✓ Presentations of “LCI” and “BLI” at endoscopy-related academic societies (JGES/JDDW) are also increasing
- ✓ Installed in more than 70% of Specific Functional Hospitals in Japan (86 facilities) which provide advanced medical treatment



<Overseas>

- ✓ Launched ELUXEO which is equipped with “LCI” and “BLI” in 2016
- ✓ Number of research papers of “LCI” and “BLI” is increasing year annually, gaining recognition

Transition in the number of research papers of BLI and LCI, inside and outside Japan

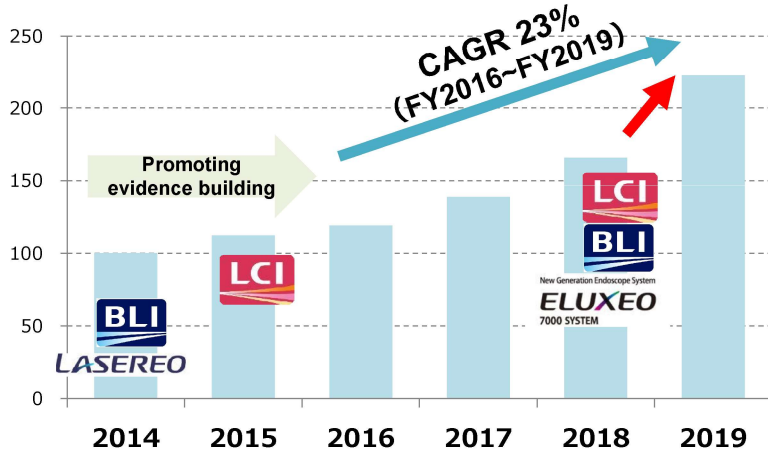


*Index when the number of research papers in Japan in 2014 is “100”.

Significantly contribute to sales increase by promoting evidence building in worldwide.

Phase ② Oversea deployment of “LCI” and “BLI”
~Expanding share in the Chinese market~

<Transition of sales in the Chinese market (Indexed when FY2014 result is “100”) >



Year-on-year sales growth in FY2019

+34%
(local currency basis)

Gastrointestinal endoscopy market share in China

over 30%*

*According to our research

With the introduction of “LCI” and “BLI”, the business scale has more than doubled in 5 years in China, where the endoscopy market is rapidly expanding.

Phase ② Oversea deployment of “LCI” and “BLI”
~Expanding share in the Chinese market~

<Background for increased endoscopy demand>

✓“Healthy China 2030”:

The government’s policy switch from treatment to prevention, early detection and early treatment

→Increase of endoscopy cases, which are effective for early cancer detection

✓“Hierarchical Medical Treatment”:

Shift from concentration to Level 3 hospitals (large hospitals) to hierarchical medical distribution

→Increased allocation of endoscopy budget to Level 2 hospitals

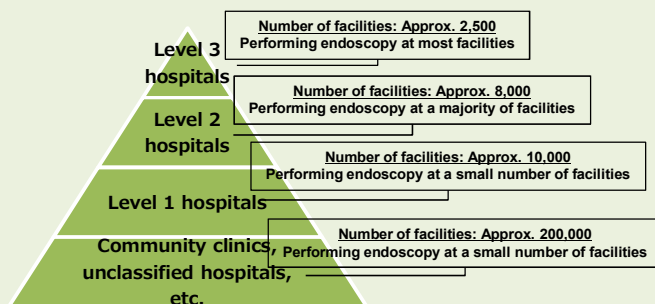
<Fujifilm’s initiatives>

✓Promoting evidence building through variable clinical research in China after the introduction of “LCI” and “BLI”

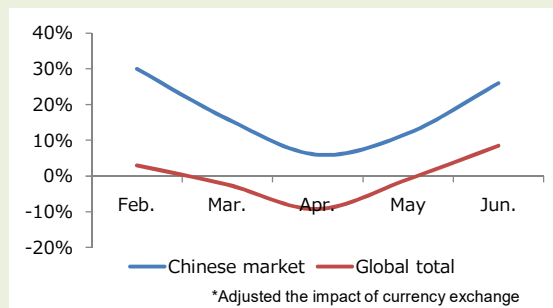
→Boosting Fujifilm’s presence in the Chinese market to deploy products to Level 2 and Level 3 hospitals

✓Introducing “ELUXEO” in 2018, achieve 34% year-on-year sales growth in FY2019

→Achieved significant sales increase despite the impact of COVID-19, by building evidence to boost credibility of Fujifilm technologies and establishing a solid structure for sales, service and training.

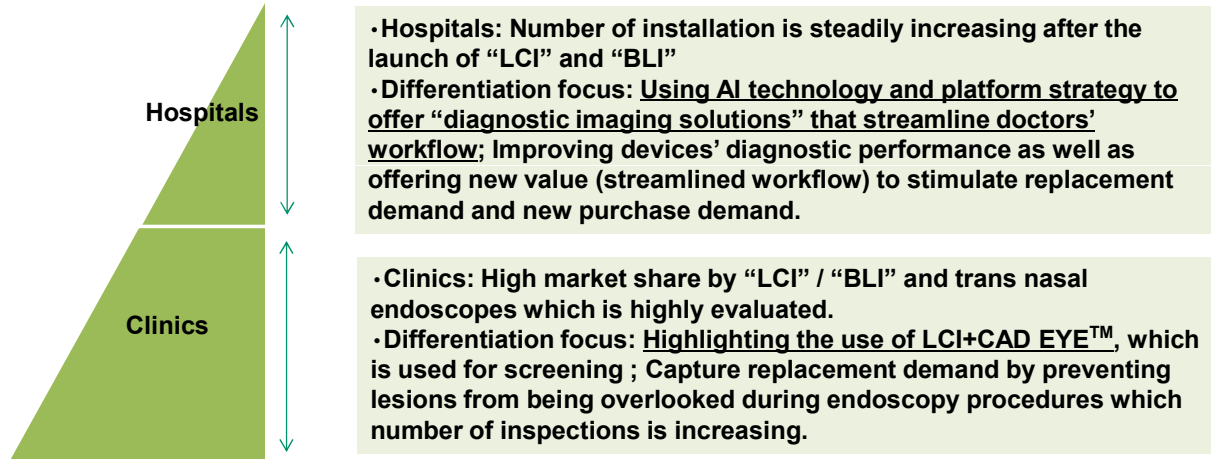


Year-on-year sales fluctuations for February – June 2020* (%)



Phase ③ Differentiation by utilizing AI

〈Market entry strategy (Example: Japan)〉



**Utilizing AI technology to accelerate business growth.
Targeting to achieve over 30% global market share by FY2023.**

*In the gastrointestinal endoscopy market. according to our research. 19

3. Differentiation strategy using the AI technology “REiLI”

General Manager, Medical Systems R&D Center and IT Solution Division,
Medical Systems Business Division of FUJIFILM Corporation
Director of the AI Laboratory of FUJIFILM Holdings Corporation

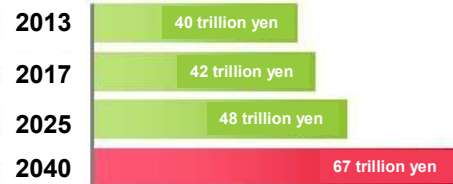
Toshiyuki Nabeta

Medical issues surrounding our society

Population growth / aging increasing medical expenditures

- The average life expectancy of WHO member states in 2016 was **72.4 years longer** than 2008. (84 for Japan, 81 for UK, 79 for USA, 76 for China and 69 for India)¹
- The average annual increase of medical expenditures (2014 – 2018): Western Europe **2.4%**, North America **4.9%**, Asia and Australia **8.1%**, Middle East and Africa **8.7%**²

[Outlook of national medical care expenditures] (Japan) ⁵



Regional disparity in medical services

- Industrialized nations account for **77%** of the world's medical expenditures. In contrast, the ratio of developing countries is expected to grow from **23%** in 2014 to **32%** in 2020.³

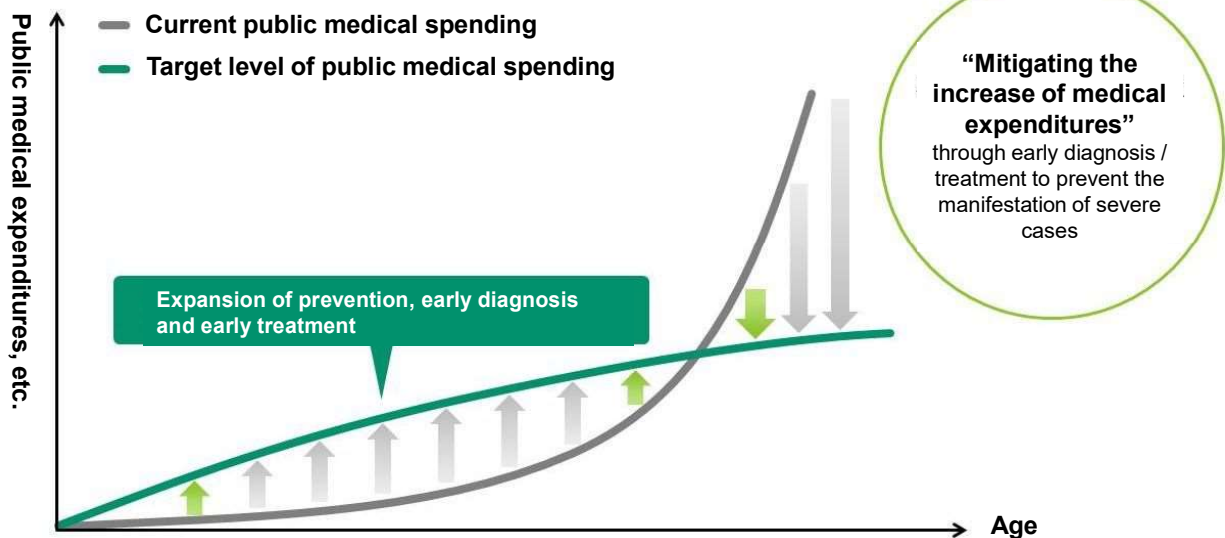
Healthcare worker shortages and tough working conditions (supply – demand gap)

- There is a global healthcare worker shortfall of **17 million** (including 11 million for Africa and Southeast Asia alone)⁴

Source: 1. Life expectancy data, World Health Organization, <http://apps.who.int/gho/data/node.main.688?lang=en>
 2. 2015 Global life sciences outlook: Adapting in an era of transformation. Deloitte DTTL, 2014. 3. Informa Plc Market Line Extracted October 2014.
 4. Health workers density and distribution, World Health Organization. 5. "FY2017 Medical Expenditure Trends" and "Future Outlook of Social Security for 2040" by the Research Section, Health Insurance Bureau, Ministry of Health, Labor and Welfare

Increase of social security expenditures (including medical expenditures) and labor shortages have become pressing global issues.

Medical issues surrounding our society: Increase of medical expenditures



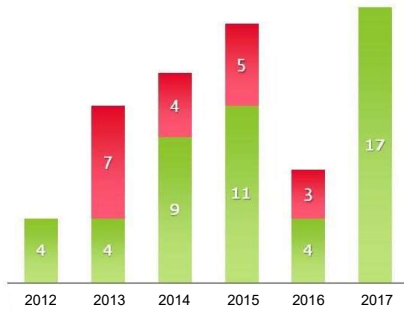
Mitigating public medical spending by shifting the focus from “treatment after manifestation of severe symptoms” to “prevention, early diagnosis and early treatment”

Medical issues surrounding our society: Tough working conditions

■ Medical accident information collected from medical institutions

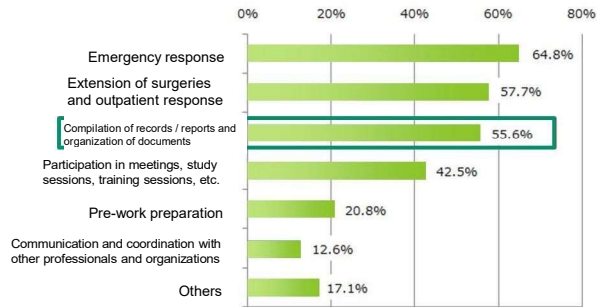
Failure to thoroughly check diagnostic imaging reports: 49 cases

Failure to check pathology reports: 19 cases



Supplementary Volume of the 50th Report for the Medical Accident Information Collection Project by the Japan Council for Quality Health Care

■ Main reasons for doctors' overtime work (June 2015) n=691 (multiple answers)



Source: "Reality of medical practitioners' working conditions" prepared for the first meeting of the Medical Work Style Forum

Tough working conditions have led to failure to check diagnostic reports at university hospitals, etc. "Compilation of records / reports and organization of documents" ranks third as a reason for overtime work, following "emergency response" and "extension of surgeries and outpatient response."

Expanding and spreading services that reduce doctors' workload

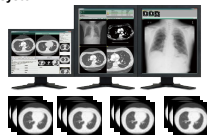
〈 Picture Archiving and Communication System (PACS) "SYNAPSE"〉

Medical image information system

SYNAPSE

Diagnostic information archiving system

SYNAPSE VNA



3D image analysis system

SYNAPSE VINCENT



- Medical image information system primarily used by the radiology department
- Core imaging system for efficiently managing and distributing scans for diagnosis

〈Endoscopy information management system "NEXUS"〉

Image input
Report preparation etc.



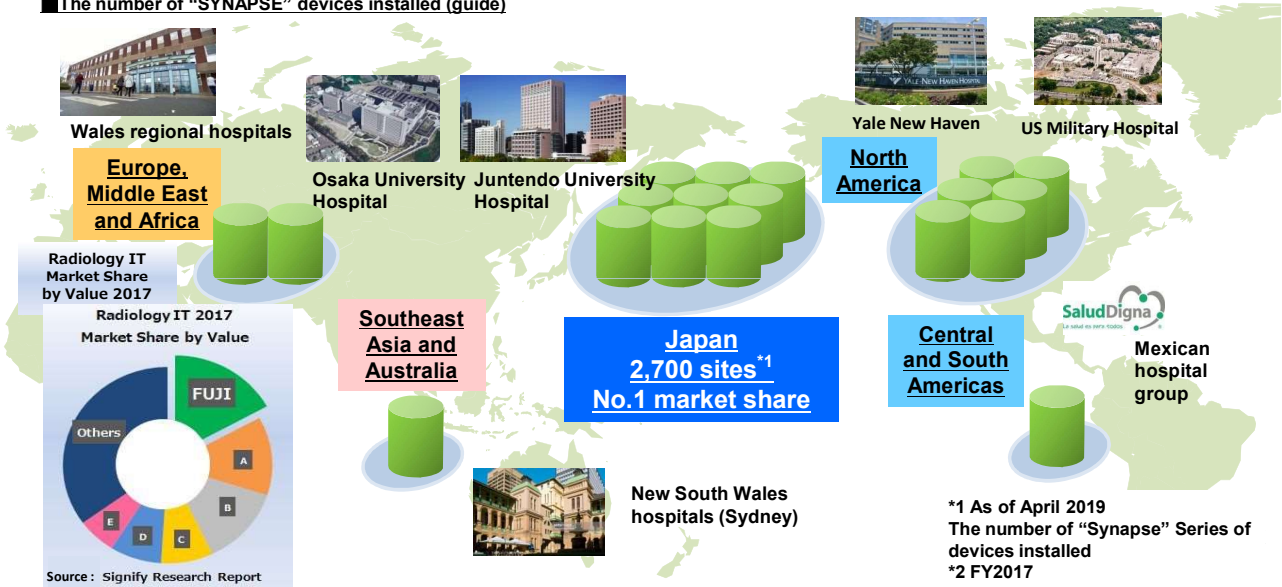
NEXUS

- Endoscopy information management system primarily used by the endoscopy department
- Integrating a wide range of functions from checking test requests, entering images and preparing reports
- Connectivity with other departments' network systems associated with endoscopies, such as radiology and pathology systems, as well as PACS and electronic medical records

Spreading the use of "SYNAPSE" and "NEXUS", which are the platforms for managing and storing images at hospitals, to reduce doctors' workload

Expanding / spreading services that reduce burden of healthcare workers

■ The number of “SYNAPSE” devices installed (guide)



“SYNAPSE” is used at 5,500 sites worldwide^{*1}, getting remarkable feedbacks from key hospitals in various areas and captured the world’s top market share^{*2}.
“NEXUS” has the largest market share among advanced treatment hospitals in Japan.

AI technology trends in healthcare

■ **Japan: Ministry of Health, Labor and Welfare (MHLW)**
The ministry’s advisory panel for promoting AI use in the health and medical field (6/27/2017)

Selecting six priority fields for AI development

- 1) Japan’s strengths in health and medical technology in these fields
- 2) Challenges that Japan must address in these fields

Six priority fields	Genomic medicine	Diagnostic imaging support
	Diagnosis and treatment support	Pharmaceutical development
	Nursing care and dementia	Surgery assistance

MHLW: Report by the advisory panel for promoting AI use in the health and medical field

■ **Overseas : RSNA2018 latest survey results**

- Increase in the number of companies exhibiting AI-related contents; AI dominating themes by academic societies

	2016	2017	2018
Number of presentations by academic societies	42	151	216
Number of companies exhibiting AI	5	49	105

- **Title of 2018 keynote**
“Medical practitioners and technologists who cannot use AI will be eradicated by those who can.”
- AI with various forms of deep learning is demonstrating performance that surpasses diagnosis by radiologists, but it has yet to be incorporated into actual workflows.

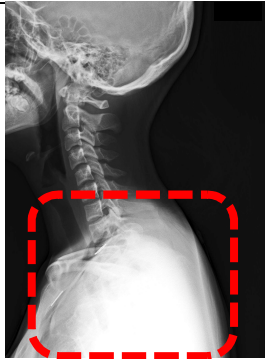
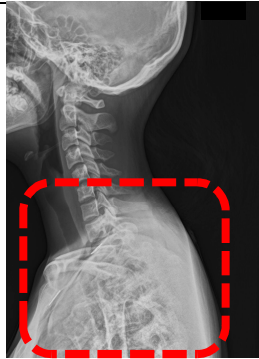


Growing expectations for AI development in the healthcare sector in and outside Japan

AI technology trends in healthcare

Results of in-house trials for AI on chest X-ray

- "Data quality and learning method" are important in improving AI accuracy.
Merely having a large volume of training data would not improve AI performance unless the data is of high quality.

Quality of training image data	Unclear image		Clear image	
	Volume of training data	210,000 cases		20,000 cases
Sensitivity	94.9%		94.9%	
Specificity	20%		87.5%	

Misidentifying abnormality in 80% of healthy subjects!?

※ Sensitivity = Ratio of determining a positive case as being positive. Specificity = Ratio of determining a negative case as being negative

High-quality images are needed for high AI accuracy

FUJIFILM's advanced image processing technology


Before




Brightness and contrast are affected by subject's body thickness, X-ray dose and positioning

FUJIFILM's advanced image processing technology

After



FUJIFILM's image processing is applied to automatically stabilize brightness and contrast

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REiLI, FUJIFILM's AI technology

FUJIFILM AI Platform



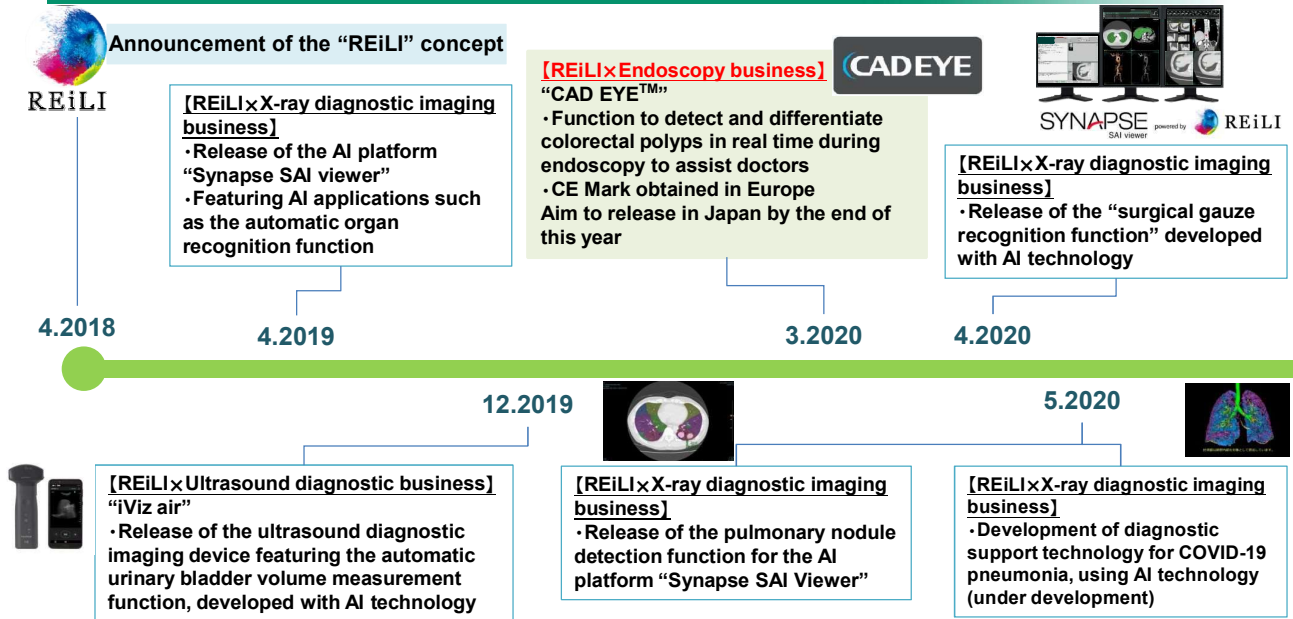
REiLI

Combining cutting-edge image processing technology FUJIFILM
nurtured for over 70 years
with latest AI technology to create new values in next-generation image
diagnostics

Unveiling the AI technology brand "REiLI" in April 2018

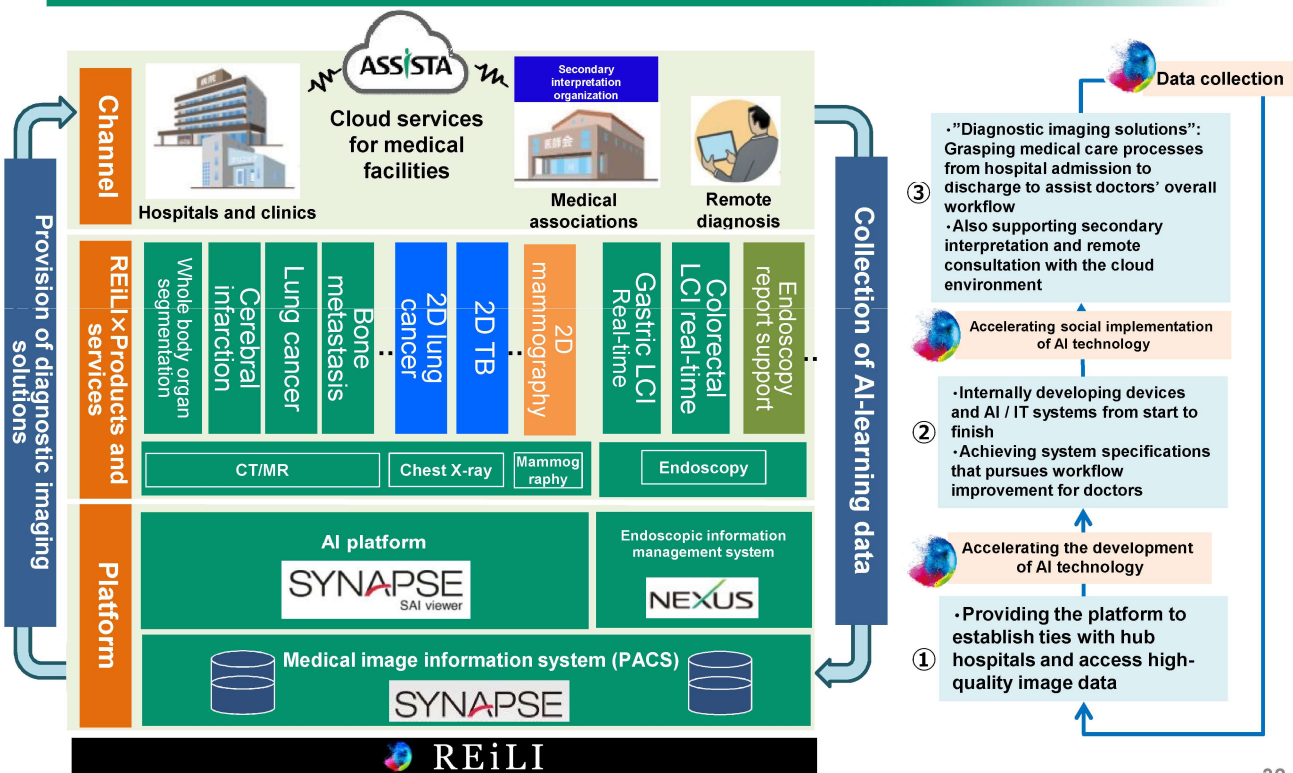
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Introduction of "REiLI" AI applications

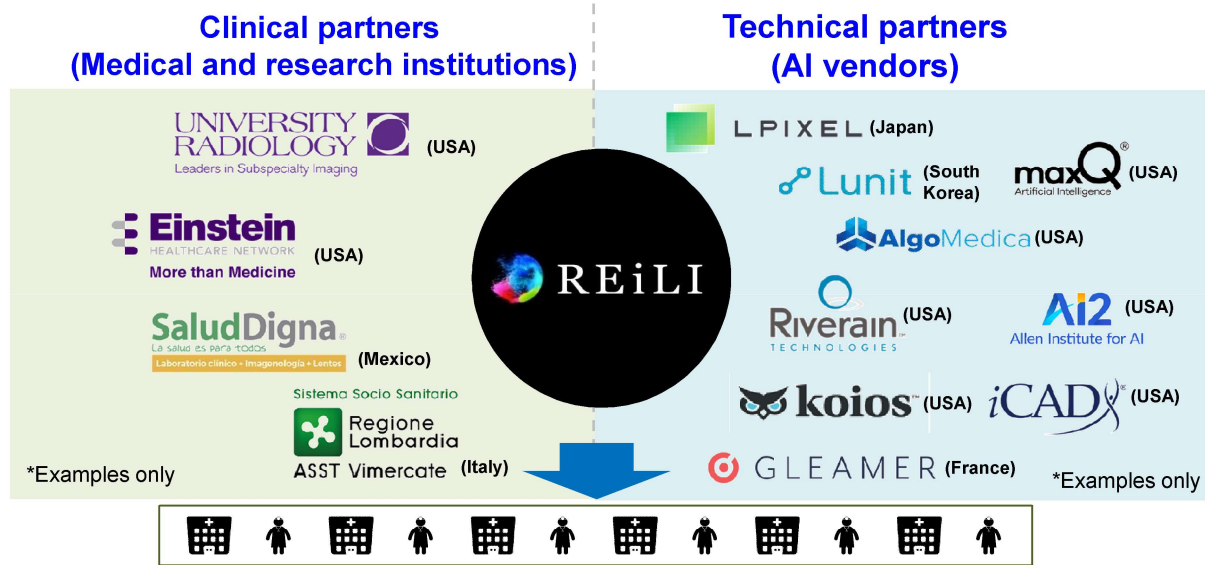


The announcement of the "REiLI" concept has accelerated the market introduction of AI applications. In March 2020, the endoscopy diagnostic support AI "CAD EYE™" was released in Europe.

Competitive edge "Diagnostic imaging solutions" that can only be provided by Fujifilm with its medical imaging platform and a wide range of product lineups



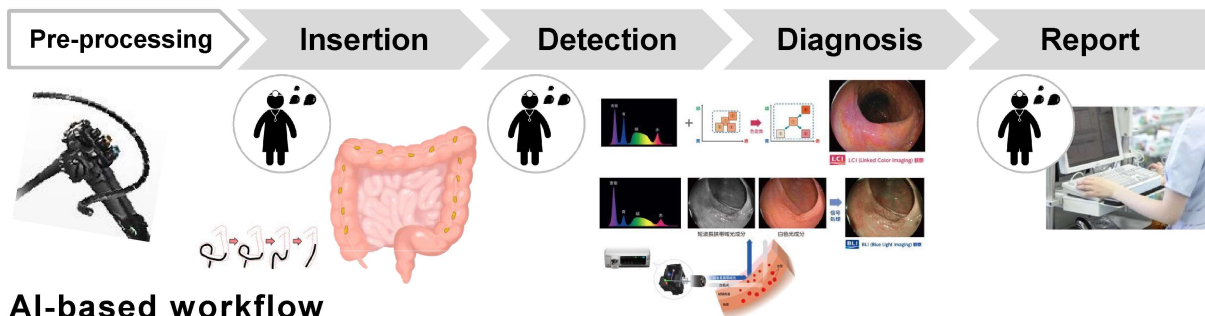
Competitive edge: Open partnership



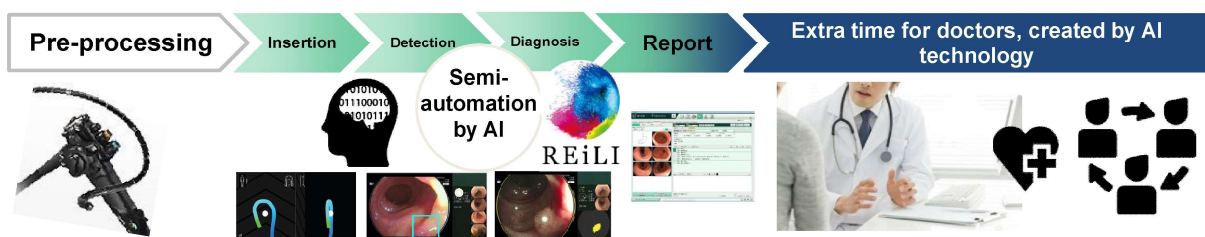
Partnering with medical and research institutions in and outside Japan as well as vendors with excellent AI technologies to accelerate product development and offer a greater range of AI-based values

What “REiLI” strives for: Deployment to endoscopy systems

Conventional endoscopy workflow



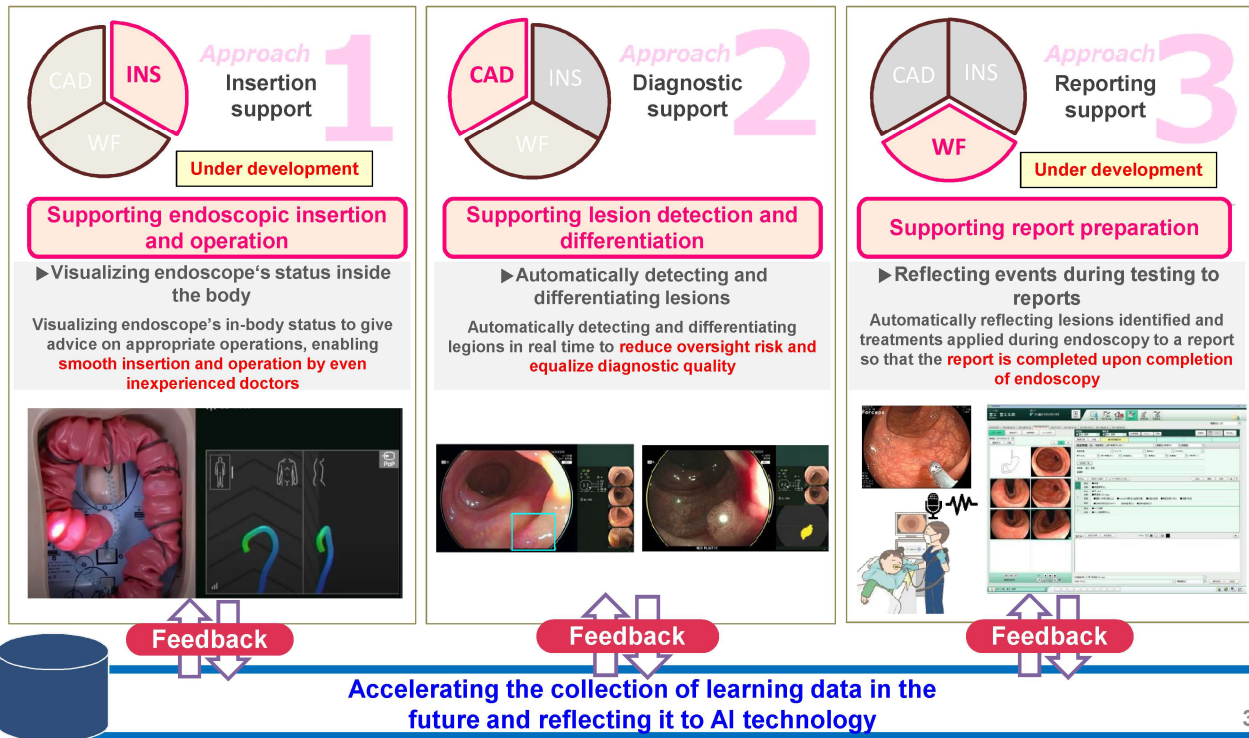
AI-based workflow



Semi-automation of workflow with AI technology, reducing doctors' workload

AI technology "REiLI": Deployment to endoscopy systems

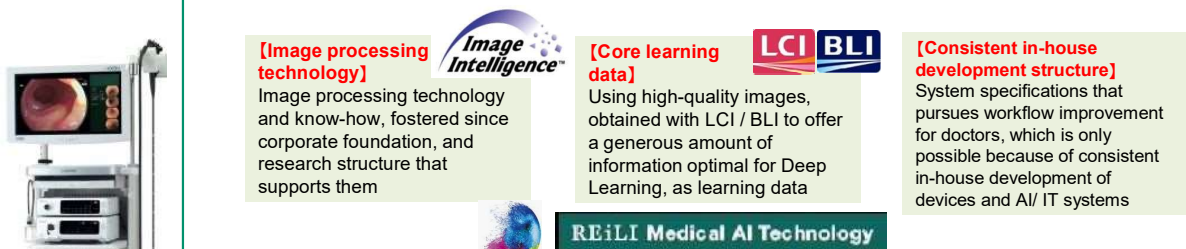
REiLI's three approaches to endoscopy workflow



"Diagnostic support" CAD EYE™

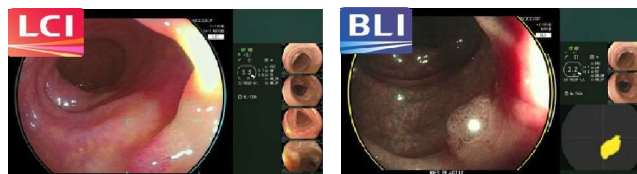


CADEYE Detecting and differentiating colorectal polyps in real time during endoscopy to assist doctors

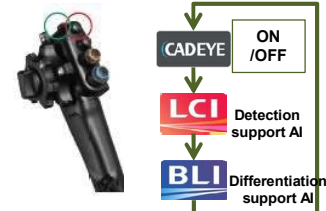


■ **Detection support AI**

■ **Differentiation support AI**



■ **One and only* AI-based system that can handle detection and differentiation with a routine endoscope**



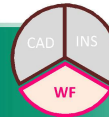
- Supported systems**
- LASEREO 7000 system
 - ELUXEO 7000 system
 - 6000 system

*As of September 17, 2020, according to Fujifilm data

Introducing the CAD EYE™ to establish Fujifilm as a leading company in AI use in the gastrointestinal endoscopy market

“Reporting support
(Under development)”

FF(images)×FX(languages)
Technological synergy



Approach
Reporting support

3

FUJIFILM
Value from Innovation

FUJI XEROX

Fujifilm’s image processing technology

Fuji Xerox’s natural language processing technology

Using AI technology to compile a massive amount of past medical images into a database (Structurization)

Using AI technology to compile a massive amount of past radiographic interpretation reports into a database (Structurization)

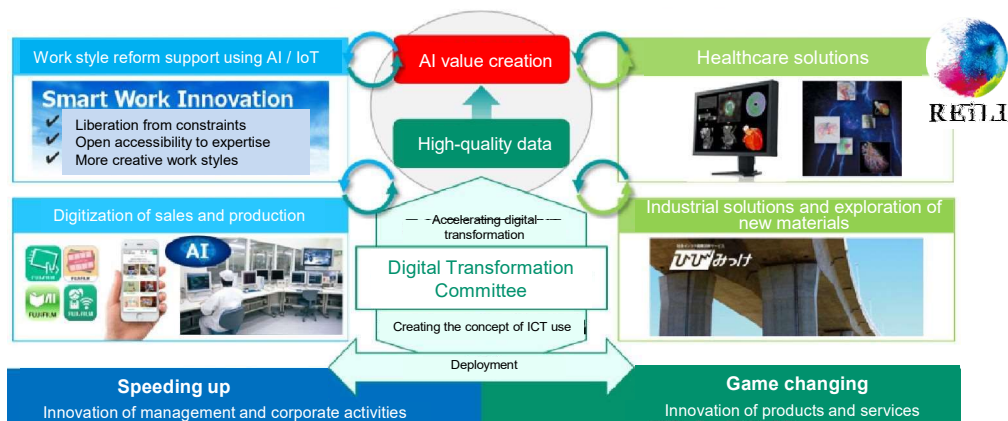
Technological synergy (under development)
〈Linking images with languages〉

Automatic generation of an radiographic interpretation report

Automatically generating radiographic interpretation reports to help reduce doctors’ workload Using technological synergy between Fujifilm and Fuji Xerox to create new value.

Expansion of “REILI” : DX initiatives under “All-Fujifilm”

Collecting high-quality data to enhance the ability to convert it into value



Fujifilm was chosen in the DX Stock Selection 2020 in recognition for its use of AI in the medical diagnostic imaging field as well as for its initiatives to reinforce the development of DX human resources and streamline work processes with ICT tools

“All-Fujifilm” DX promotion, transforming products, services and work processes, and strengthening organizations and human resources

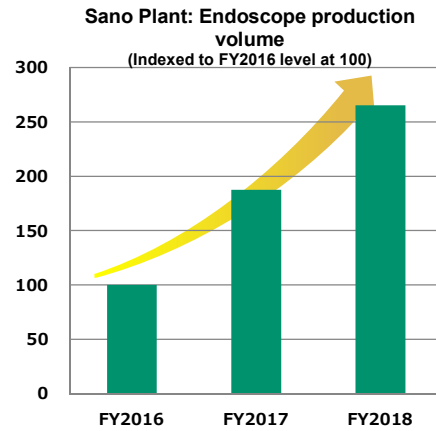
Expansion of “REiLI” : Deployment to production processes

〈New Smart Factory using AI and IoT technologies〉



Production capacity →
Double*

Productivity → **30%**
***improvement**

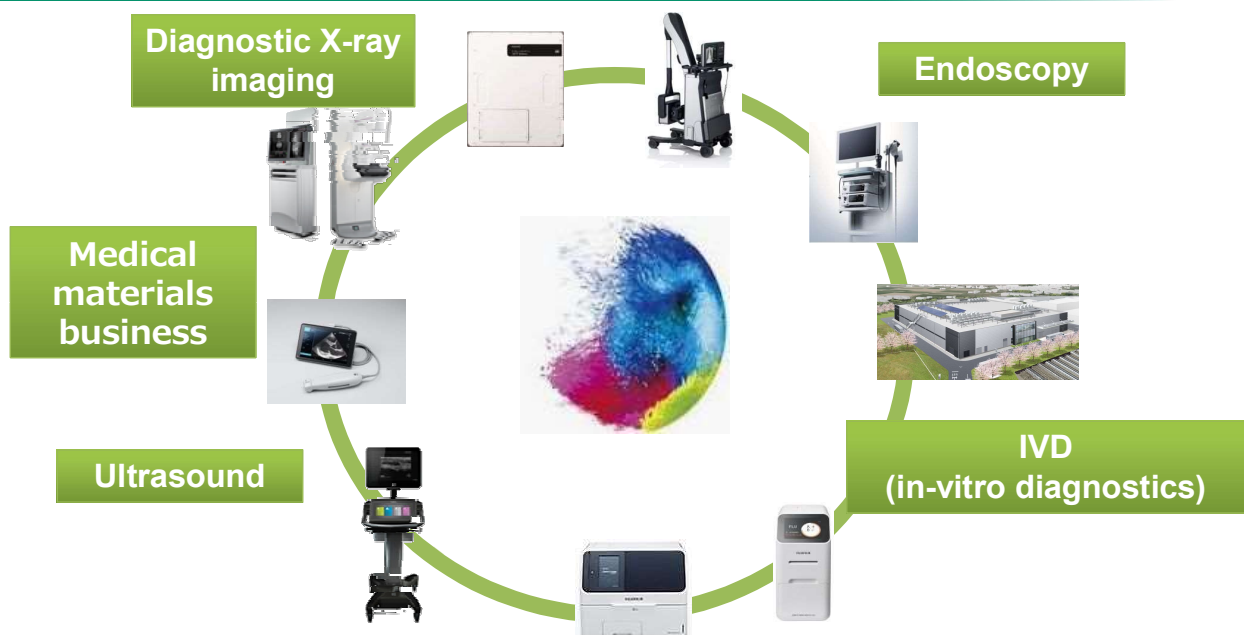


*Comparison between FY2021 level (in full operation) and FY2018 (before the start of Smart Factory operation)

Using AI and IoT to streamline endoscope production, which used to rely on the skills and craftsmanship of experienced workers
Expanding production capacity and improving productivity to cater to the growing demand for endoscopes

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Conclusion



REiLI works with individual products, services and production processes to help resolve medical issues.
Fujifilm will continue its challenge in the spirit of “NEVER STOP” for the health of people around the world.

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FUJIFILM

Value from Innovation

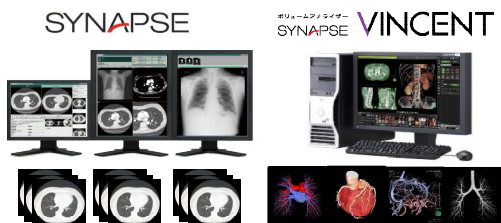


Appendix



Source of competitiveness ① AI technology “REiLI”

Existing assets (technology, know-how, structure)



- Experiences and insights from working with medical images for many years
- Massive image data and research performance

- Advanced image processing technology and know-how
- R&D structure that supports image processing technology

- market-leading PACS share
- Installed in 5,500* sites

*As of April 2019

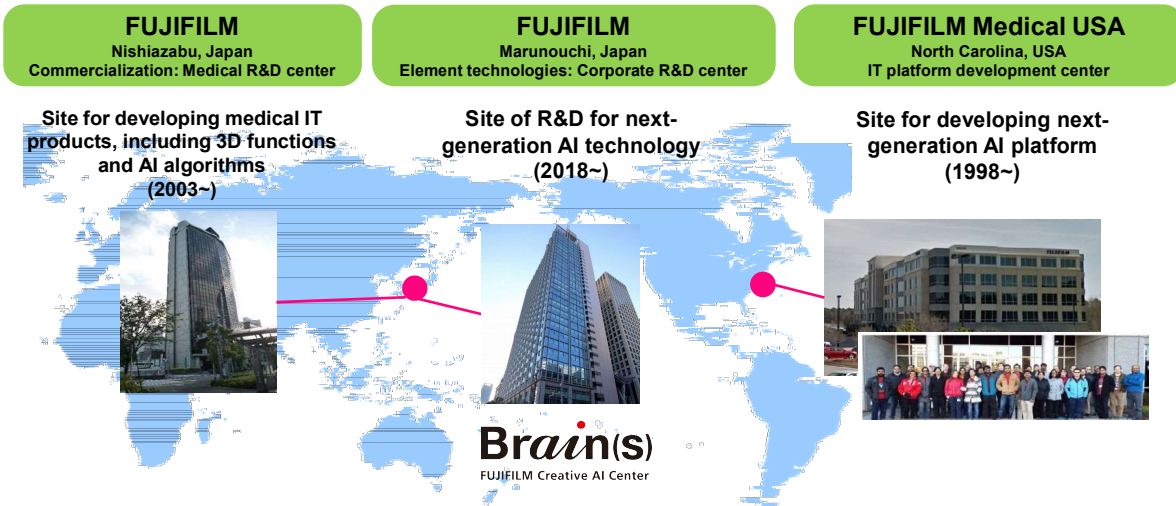
Offering new values with AI technology



Applying AI technology to image processing technology / know-how fostered over many years, a massive amount of high-quality image data to create new value broadly and swiftly

Source of competitiveness ② Development structure

<Global AI R&D structure: Hybrid approach with Japanese and US sites>



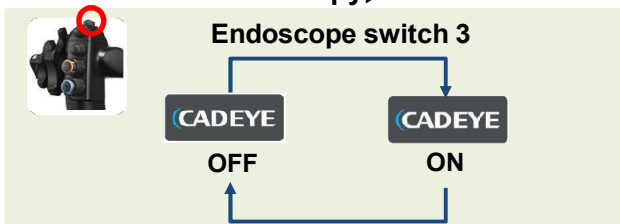
Building sites for developing next-generation AI technology elements and their commercialization
⇒ Generous investment in next-generation AI foundation technology

“Diagnostic support” CAD EYE™

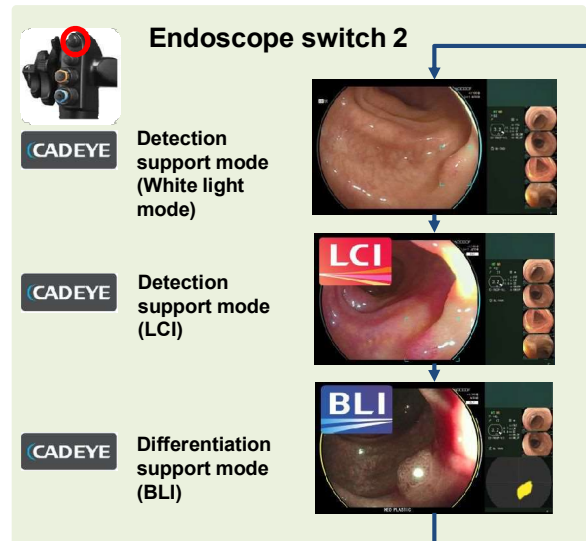


<One and only* AI-based system that can achieve detection and differentiation in routine endoscopy>

*As of September 17, 2020, according to Fujifilm data2020



- ✓ System that integrates both detection support function and differentiation support function
- ✓ Allowing continued use of existing endoscopes for regular testing
- Maintaining the conventional flow of endoscope operation while allowing the use of AI for detection / differentiation support



System specifications that pursues workflow improvement for doctors, which is only possible because of consistent in-house development of devices and AI/ IT systems

