



**EU-Japan Centre**  
for Industrial Cooperation

日欧産業協力センター

**MINERVA**



## HUMAN ASSISTANT ROBOTICS IN JAPAN

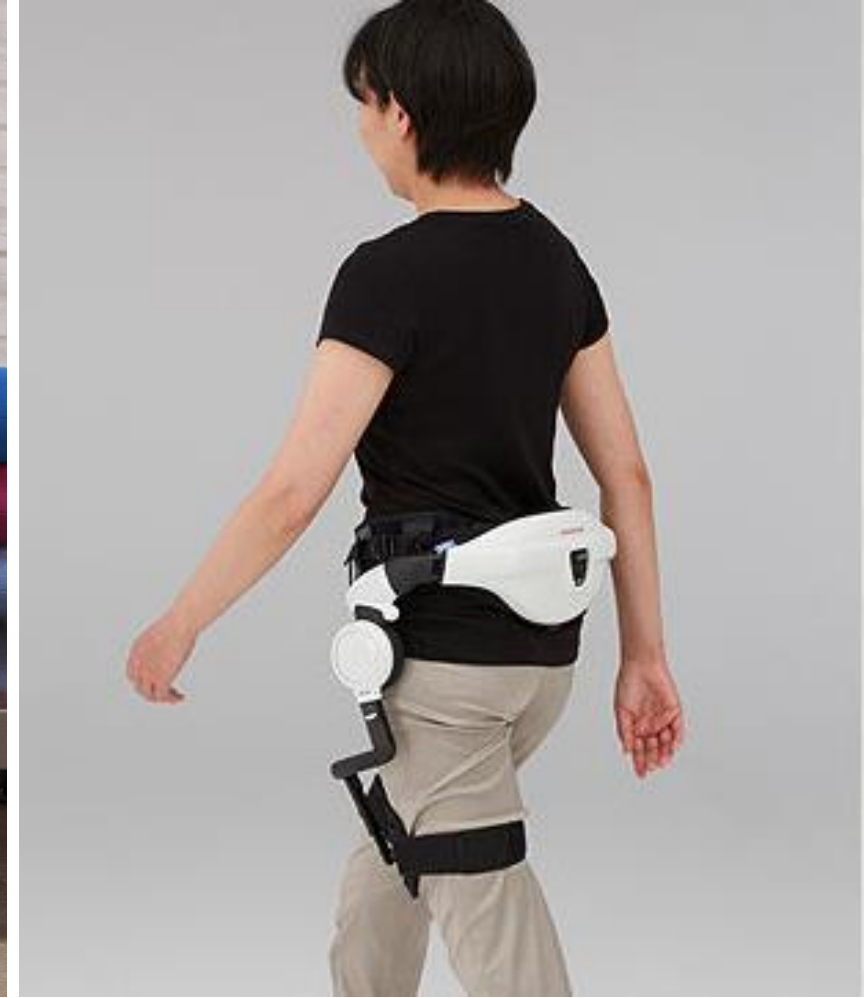
**Challenges and Opportunities for  
European Companies**

Dana Neumann, MINERVA Visiting Fellow

Tokyo, 22 March 2016

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WHAT IS A HUMAN ASSISTANT ROBOT?

# WHAT IS A HUMAN ASSISTANT ROBOT?

## -PROBLEMS-

- Not a technical term
- No standard definition
- Variety of robotics products

# WHAT IS A HUMAN ASSISTANT ROBOT?

-DEFINING THE AREA OF RESEARCH-

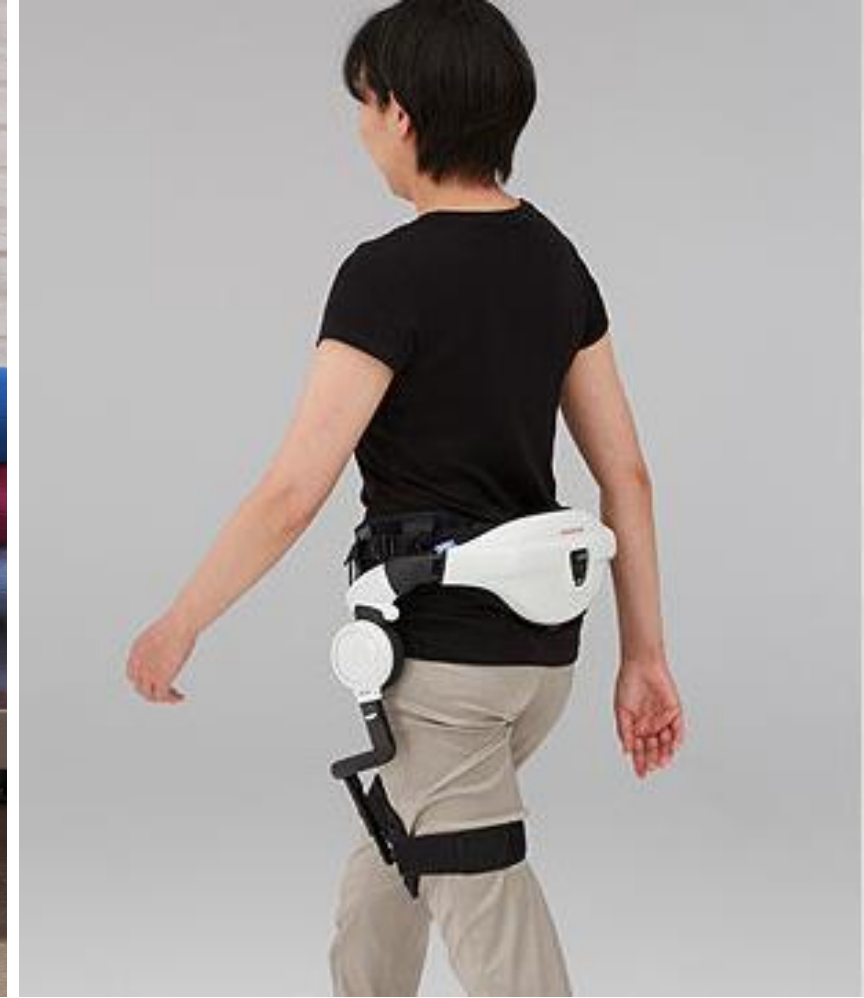
**Service robot:** *performs useful tasks for human or equipment excluding industrial automation application (ISO)*

**Against the background of Japan's demographic challenges**

- Welfare purposes and livelihood support
  - Physical and/ or mental support
  - Patients, the elderly, caregivers

**Typical types of human assistant robots**

- Mobile servant robot
- Physical assistant robot
- Person carrier robot
- Monitoring robot
- Companion robot



MARKET PROSPECTS

# MARKET PROSPECTS

-GLOBAL GROWTH (IFR WORLD ROBOTICS REPORT 2015)-

*“Historic market growth patterns in other areas of robotics manufacturing suggest that, when fully commercialized, the personal assistive [...] robotics industry will be a source of strong future industrial economic development” (OECD 2012)*

## **Number of sold service robot units went up by 11.5% from 2013 to 2014**

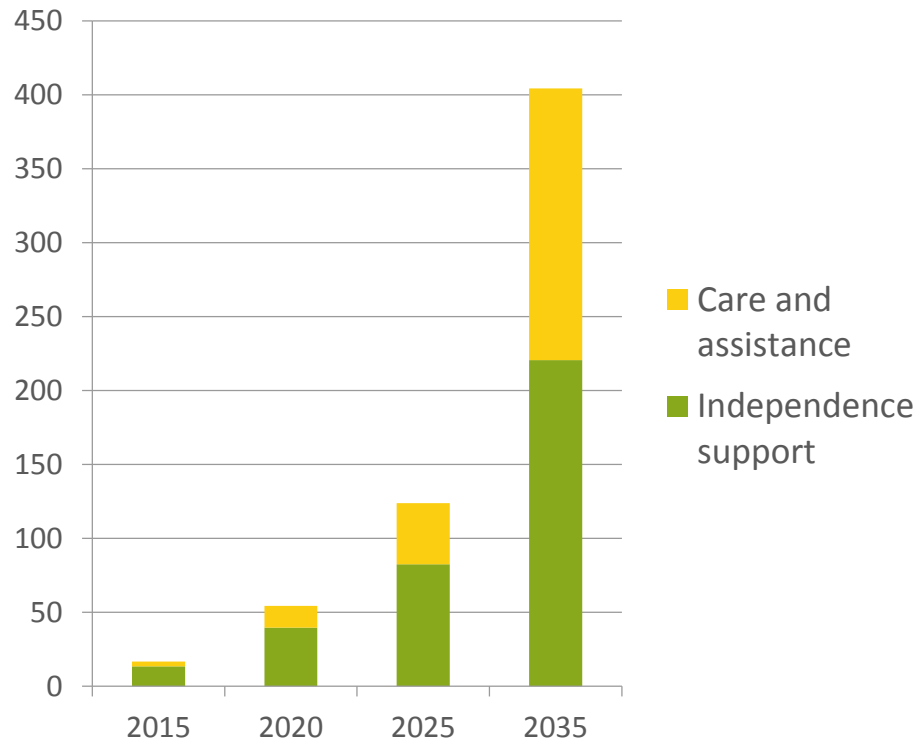
- Impairment assistant robots
- Robots for personal transportation
- Robots for elderly and handicap assistance
  - Robotic exoskeleton segment
  - Lower body exoskeleton currently leading
  - Strongest potential: low power restraint-type physical assistant robots

# MARKET PROSPECTS

## -THE JAPANESE MARKET-

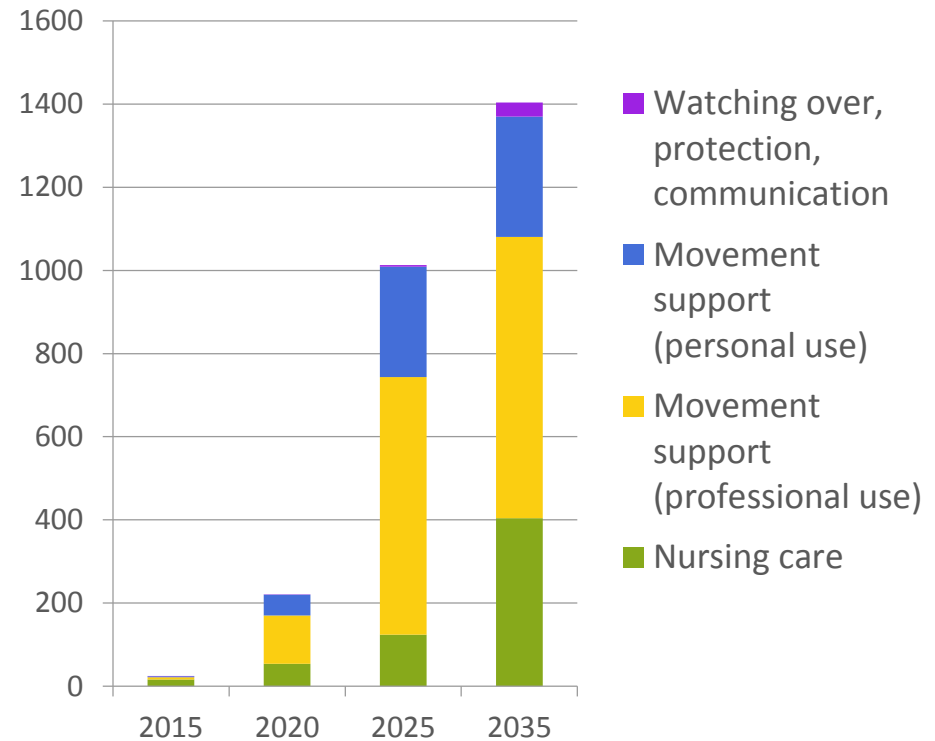
Share of service robots meant for nursing care (billion JPY)

[source: METI/ NEDO 2010]



Share of service robots meant for human assistance (billion JPY)

[source: METI/ NEDO 2010]



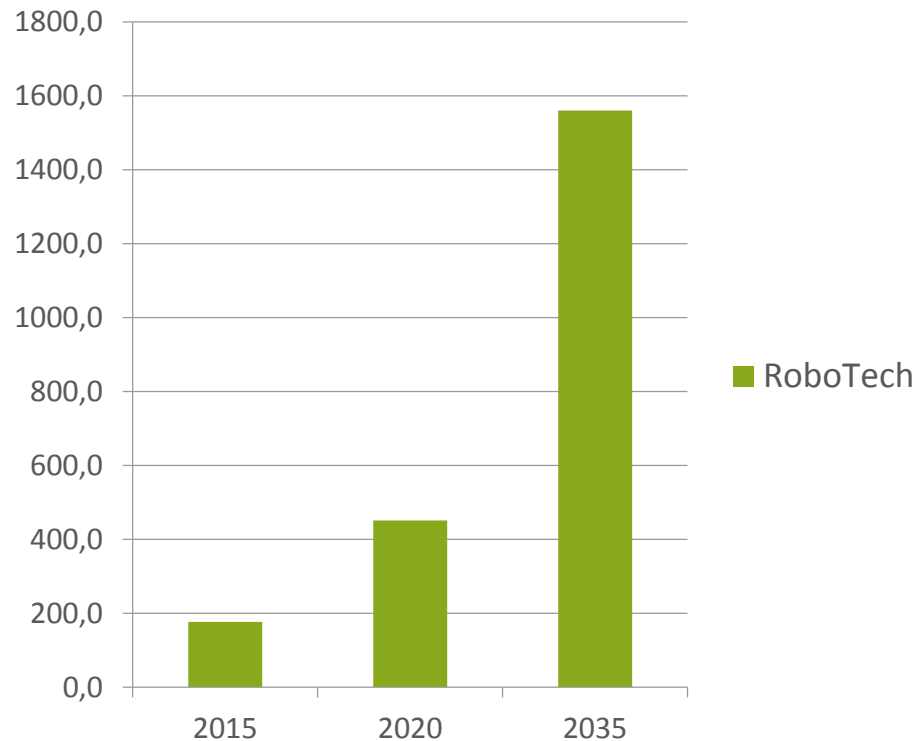


# MARKET PROSPECTS

## -THE JAPANESE MARKET-

Growth of the RoboTech segment (billion JPY)

[source: METI/ NEDO 2010]



### RoboTech

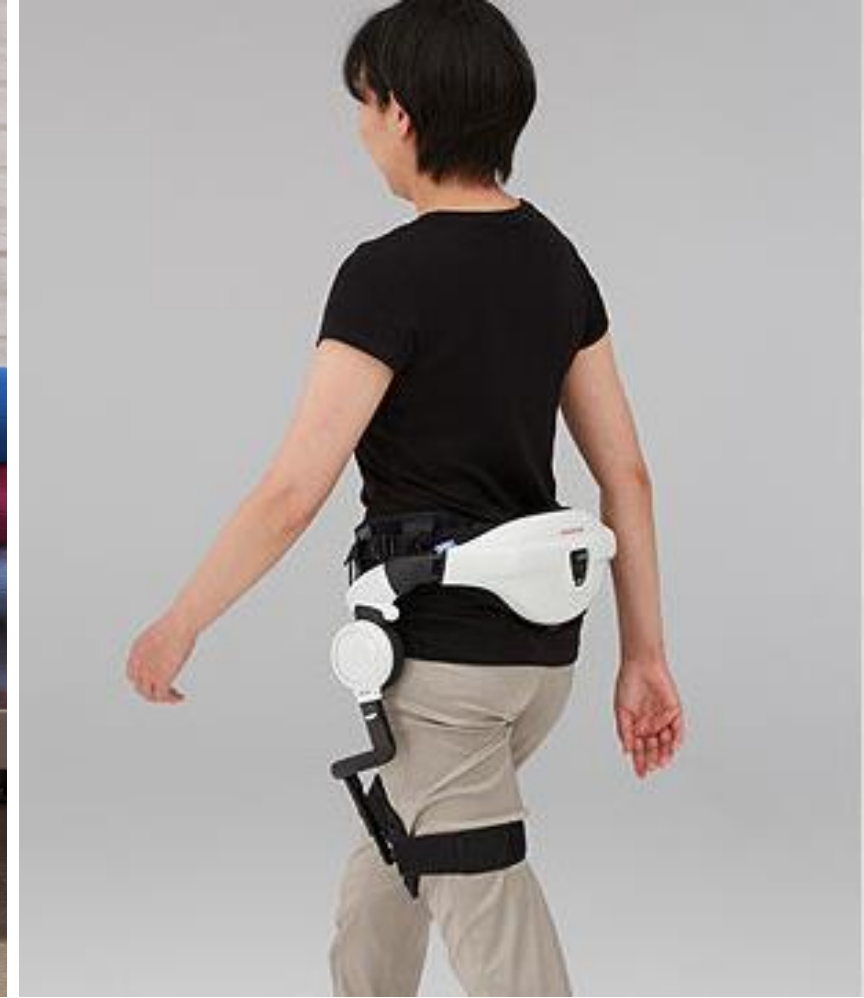
- Highly established

### Software

- Considered market weakness

### Focus on future technologies

- Artificial intelligence (AI)
- Technologies for automated behaviour
- Sensors and cognitive systems
- Mechanisms, actuators and their control systems
- Platform technologies



# THE JAPANESE MARKET ENVIRONMENT

# THE JAPANESE MARKET ENVIRONMENT

## -BACKGROUND FACTS-

### **Population crisis**

- 2025: 30% share of elderly people aged 65 and older
- 2060: 40% share of elderly people aged 65 and older
- Increasing shortage of nursing staff

### **Solution: utilizing robots to fit arising needs**

- Nursing care (and medical) robotics is expected to grow fastest within the sector of service robots

# THE JAPANESE MARKET ENVIRONMENT

## -IMPORTS & EXPORTS-

### **Exact value not accurately determinable**

- No HS (Harmonized System) code for „human assistant robots“ as in the case of industrial robots (HS 84.79.50)
  - Person carrier robot may be categorized as “lifting machinery”
  - Companion robot may fall under the code for “sound apparatus”
- Immaturity of the market
  - Opening up of the export market not expected before early 2015
  - With product development proceeding slowly manufacturer will not move aggressively towards exporting
  - Manufacturers might not be aware of their products' market potential (dampened interest in pursuing commercialization)

# THE JAPANESE MARKET ENVIRONMENT

## -DISTRIBUTION-

### Japan's distinctive characteristic: multi-layered distribution channel

- Depending on target customer group
  - Hospitals
    - Common to sell through first-tier, second-tier, and other intermediary wholesalers to medical institutions
    - High-priced medical equipment (e.g. MRI's) generally distributed directly (manufacturer - hospital)
    - Might also apply to human assistant robots, as they are still highly priced
  - Nursing facilities
    - Possible to sell directly or involve a rental company
    - May be requested by the facility
    - May be of benefit to smaller manufacturers as they can outsource sales/ rental processes if they have no capacities
  - Individuals
    - Direct distribution due to the devices ease of use and less technological advancement possible
    - Selling to stores or through mail order services

# THE JAPANESE MARKET ENVIRONMENT

## -MARKET DIFFICULTIES-

### **No empirically measurable market lead over manufacturers in the European Union**

- Costs
  - Little knowledge about how much is cheap or expensive
  - Price difference between prototype and marketed version
  - Over-engineering
- Demand limited by development
  - Japanese companies tend to develop assistant robots independently of existing needs
  - Lack of user involvement
  - Rather focus on manufacturing than on putting assistant robotics to use
- Demand limited by insurance spending
  - Reimbursement of expenses: encourage demand and a wider use; incentive for manufacturers to gain market access
  - Japanese government plans to review the current nursing care insurance (revisions: 2015 to 2020)

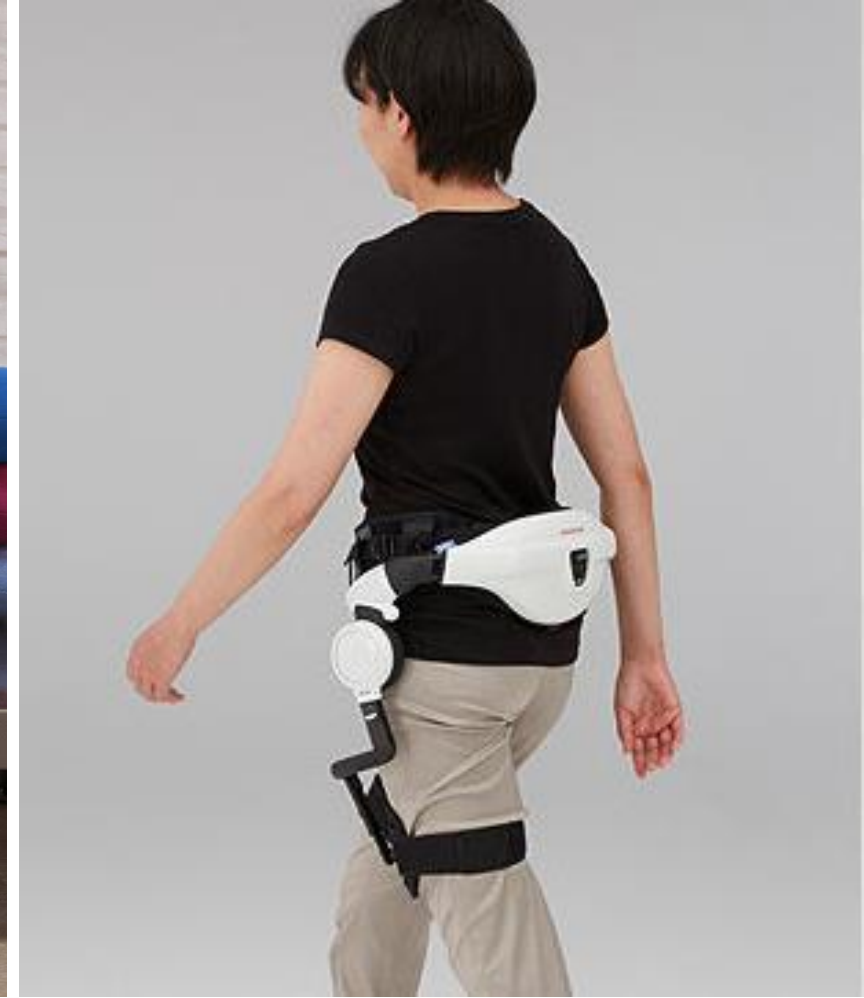
# THE JAPANESE MARKET ENVIRONMENT

## -MARKET DIFFICULTIES-

- Standardization
  - High barriers to standardization : high costs of manufacturing, mass production is challenging  
→ small quantities
  - Absence of standards prevents increase in demand and wider use

### “New Market Establishment Standardization System” (established in July 2014)

- Allows for accelerated development of national industrial standards
- No need for industry consensus, in case that
  - A company that has strikingly advanced technology has difficulty making adjustments within the industry;
  - Drafting by small or medium companies is difficult;
  - The technology spans several industries
- Regulatory barriers are still high in regard to robotics
- High safety regulations similar to those of the medical industry



# SCOPES OF APPLICATION



# SCOPES OF APPLICATION

## -ELDERLY SINGLE HOUSEHOLDS-

### Elderly being cared for in three-generation households

- Less than 20% of all Japanese households

### One-person households of elderly individuals

- 9.6% (4.98 million) in 2010 to 15.4% (7.62 million) in 2035

### Resulting trend

- Robots in the role of companions that ease the feeling of loneliness



# SCOPES OF APPLICATION

-CARE DUE TO DISEASE OR DISABILITY-

## Heart diseases

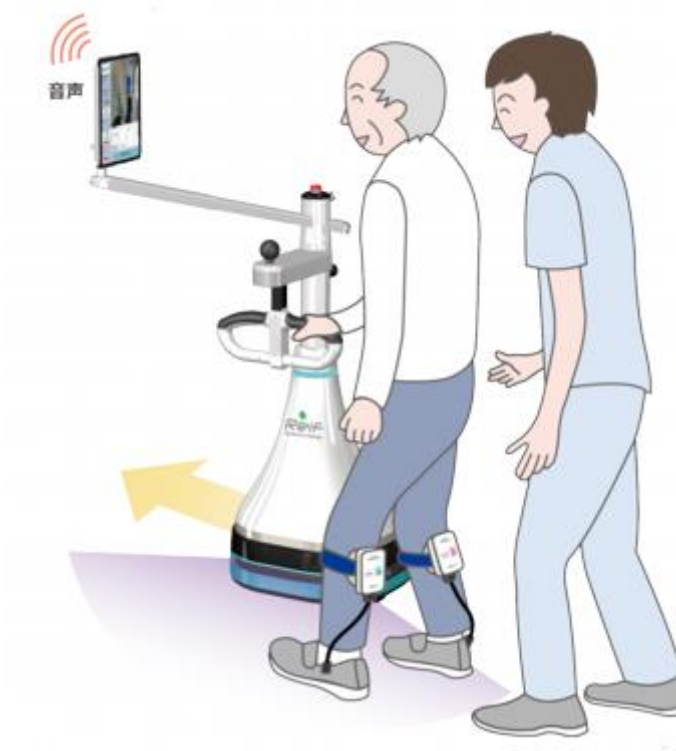
- Second most common cause for death in Japan

## Chronic conditions (high blood pressure, diabetes)

- Some of the biggest risk factors for stroke apart from age

## Chronic diseases and accidents

- Can further lead to disabilities, which increase the risk of becoming a nursing case



# SCOPES OF APPLICATION

## -LONG-TERM CARE-

### **2.7% of Japan's population received long-term care in 2013**

- 6.3% of people aged 70 to 74, 26.9% of people aged 80 to 84 and about 70% of people over 90 years
- Main causes are cerebrovascular disease, dementia and age-related weakness
- Cases of dementia and age-related weakness will rise from 9 million in 2010 to 12 million in 2025



# SCOPES OF APPLICATION

-CARE GIVING SECTOR-

## Importance of assistance robots to caregivers

- Heavy physical and psychological burdens
- 70% complain about backaches (survey by METI)
- Over 50% are aged at least 60 years

## Benefits

- Lessen the physical burden, prevent work-related injuries and enable nursing care staff to work longer hours
- Possible influence on how long caretakers can continue working later in life



# SCOPES OF APPLICATION

## -BENEFICIAL USER CHARACTERISTICS-

### Acceptance

- R&D has led to assistant robots with greater functionality, their proliferation, and a broader consumer acceptance
  - Paro (electronic harp seal that was developed to keep dementia patients occupied) successfully in use in Japan and throughout Europe since 2003
- Survey by ORIX Living Corp.: 80 % of participants were positive to the introduction of robots
- Acceptance is based on basic requirements
  - Motivation for the use of a robot
  - Ease of use
  - Being physically and emotionally comfortable with it

# SCOPES OF APPLICATION

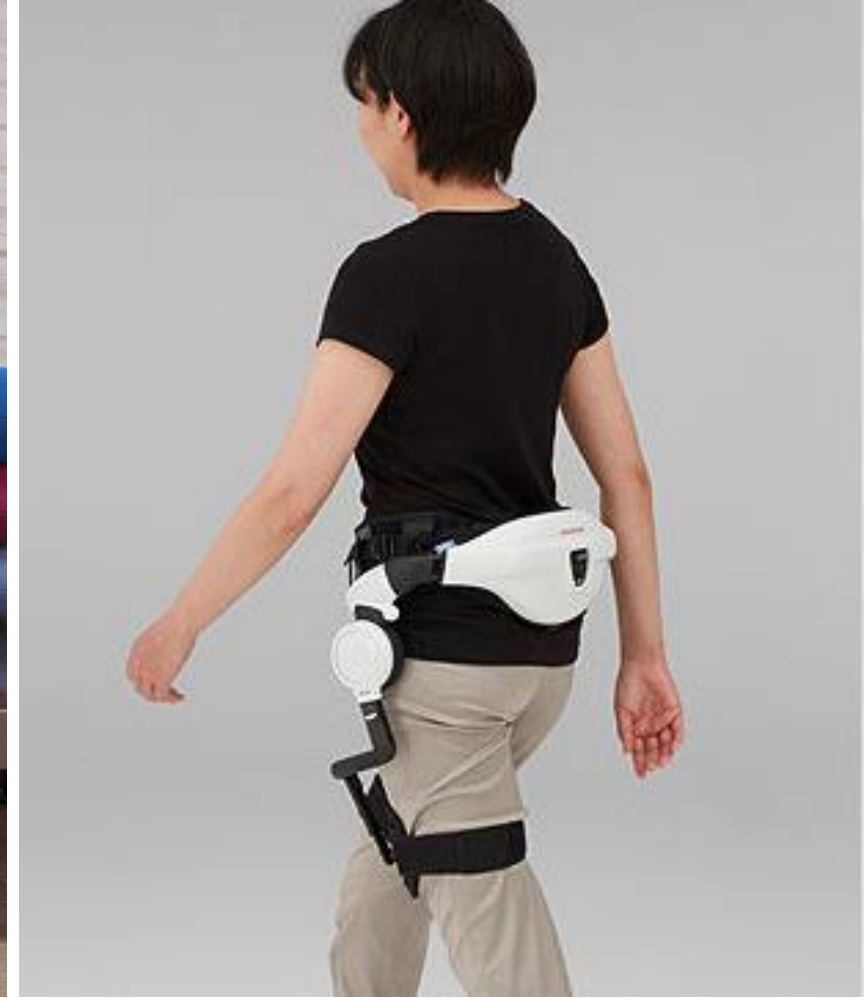
## -BENEFICIAL USER CHARACTERISTICS-

### **Age and sex of users**

- Japanese women have the longest average life expectancy at birth worldwide
- Majority among the elderly
- More likely to live alone at an older age
- 85% of caregivers are women

### **Economic factors**

- Old-age-dependency ratio of 2014: one elderly person depending on 2.3 people at working-age
  - Robots for rent could be a bargain compared to expensive human help
  - Successful therapy involving assistant robots could result in lower social costs after the treatment
  - Could save money prior to elderly care by delaying elderly people's entrance into nursing home or hospitals



STRATEGIC POLICIES

# STRATEGIC POLICIES

## -FUNDING SCHEMES-

### **The Japanese government has been supporting R&D in the field of service robotics for years**

- Project for the Implementation of Livelihood Support Robots (2009 to 2013; METI and NEDO)
- Project for Helping Putting Welfare Equipment and Nursing Robots into Practice (started in 2011, MHLW and The Association for Technical Aids (ATA))

### **Five priority areas (officially determined in 2012 and 2014)**

- Transfer aids (assistance in lifting and moving)
- Mobility aids (walking support)
- Toileting aids (ease the use outside the bathroom)
- Monitoring systems (tracking movements and whereabouts)
- Bathing aids (performing bed baths to keep bedridden patients clean)

### **Project to Promote the Development and Introduction of Robotic Devices for Nursing Care in 2013**

- Several calls for SMEs and large companies to apply for subsidies of either two-thirds or 50% of their development costs

### **Project for Demonstrating the Introduction of Nursing Care Robots starting in 2015**

- Focus: support of actual demonstration trials in care facilities



# STRATEGIC POLICIES

## -ROBOT REVOLUTION-

### **New Industrial Revolution Driven by Robots proclaimed in late 2014**

- Strategic action plan for specific sectors that suffer from severe labour shortage

### **Nursing care sector**

- Five-year plan (2015 to 2020): a change of awareness of robotics as new method of caring for people
- Essential objectives: developer support, encouraging potential users

### **Organizational platform “Robot Revolution Initiative” launched**

- Robot Utilization Promotion Work Group
  - Introduction and proliferation of actual usable robots into the medical and care giving sector
- Robot Innovation Work Group
  - Increasing interoperability and standardisation

# STRATEGIC POLICIES

## -LAWS & REGULATION-

### **International safety standards**

- Collaboration between METI and NEDO on the “Project for Practical Application of Service Robots” (2009)
- Proposal drafted was submitted to the International Organisation for Standardisation (ISO)
  - ISO 13482 “Robots and robotic devices - Safety requirements for personal care robots” was issued and published in early 2014
    - “specifies requirements and guidelines for the inherently safe design, protective measures, and information for use of personal care robots, in particular the following three types of personal care robots:
      - mobile servant robot;
      - physical assistant robot;
      - person carrier robot.”

# STRATEGIC POLICIES

## -LAWS & REGULATION-

### **National standards and labelling**

- Final regulations still in progress
  - Efforts planned to simplify the regulatory framework and new standards are actively developed
- Japan Industrial Standards (industrial and mineral products)
  - Enhance sales potential and consumer trust/ acceptance
  - Three-part standard (JIS B 8446) has been newly drafted and approved for enactment (December 2015)
    - April 2014: “Robots and robotic devices - Safety requirements for personal care robots - Static stable mobile servant robot with no manipulator” (Part 1)
    - April 2014: “Robots and robotic devices - Safety requirements for personal care robots - Low power restraint-type physical assistant robot” (Part 2)
    - April 2014: “Robots and robotic devices - Safety requirements for personal care robots - Self-balancing person carrier robot” (Part 3)

# STRATEGIC POLICIES

## -LAWS & REGULATION-

### **Ongoing regulatory discussions for the purpose of enhancing utilization of robots**

- Coverage under official nursing care insurance (Long-Term Care Insurance Act)
  - Making the system for accepting and reviewing requests for items falling under the nursing care insurance system more flexible
- Framework for consumer protection (Consumer Product Safety Act and Electrical Appliance and Material Safety Act)
  - Certification in compliance with the mandatory Consumer Product Safety Mark PSC and/or the mandatory Product Safety Electrical Appliance & Materials Mark PSE
- Manufacturers of robots might be held liable under the Product Liability Act
  - Definition of “product”: “a movable product which is manufactured or processed”



# OPPORTUNITIES & CHALLENGES

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## Opportunities

- Europe faces the same population ageing as Japan
- Growth of demand
- Types of human assistant robots
- Software
- User/ consumer characteristics
- Insurance coverage

# OPPORTUNITIES & CHALLENGES

## Challenges

- Infancy of the market
- Standards and regulation
- Long-term investment
- Personnel
- Trust

THANK YOU!





# IMAGE SOURCES

## Title page, last page

- FUJISOFT Inc. (FSI): *Palro*

## Separating pages (from the right to the left)

- PIP Co. Ltd.: *Unazuki Kabochan*
- Aldebaran Robotics (SoftBank Group): *NAO and Pepper*
- Honda: *Walking Assist*

## Other pages

- NEC Corporation: *PaPeRo R500* (slide 17) "Courtesy of NEC Corporation. Unauthorized use not permitted."
- Reif Co. Ltd.: *Soutenir* (left); VGo Communications, Inc.: *VGo* (right) (slide 18)
- Panasonic: *Resyone* (slide 19)
- Honda: *Walking Assist* (slide 20)