

# Service robots using AI technology will become a good solution for the aging population



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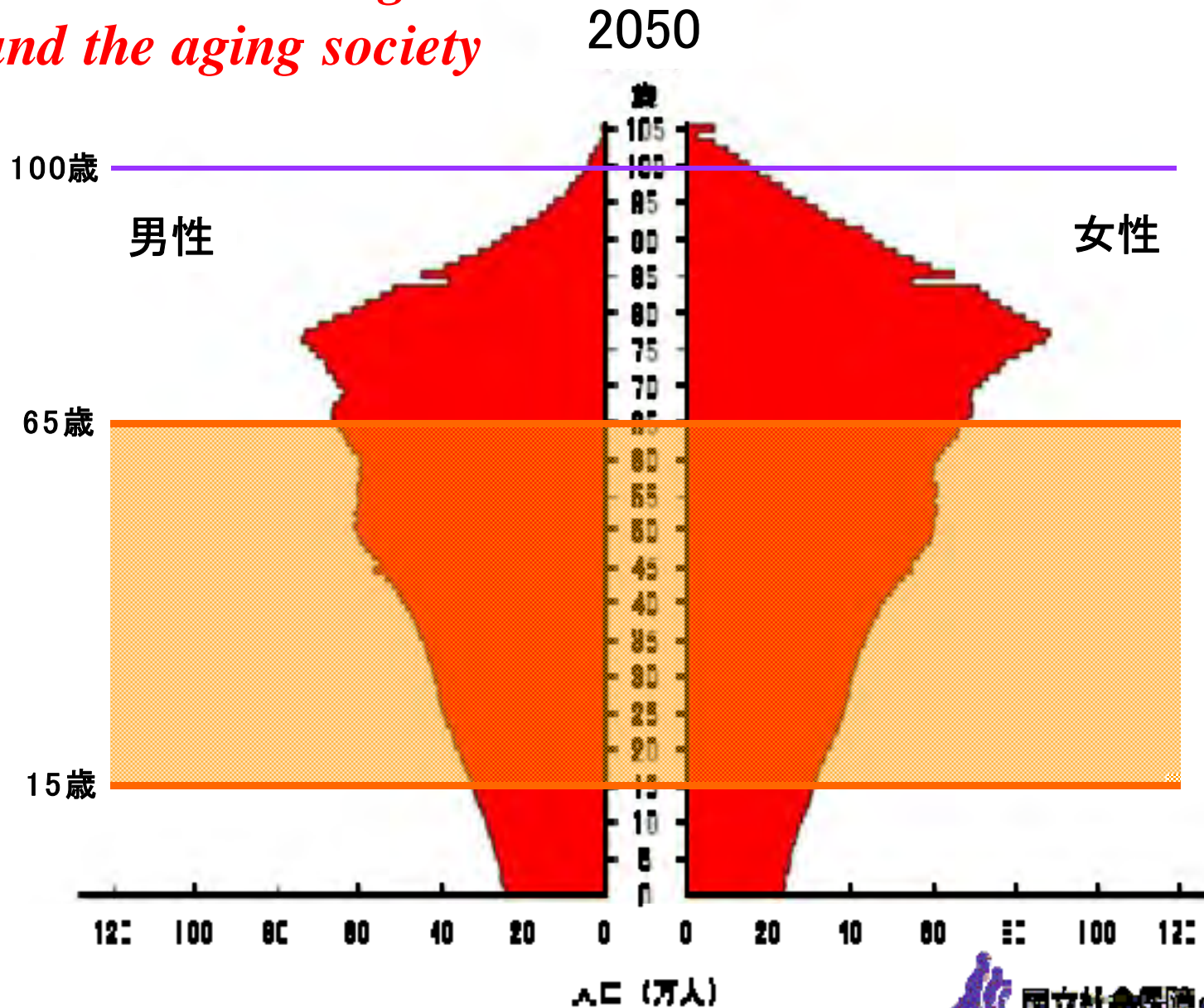
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AMED : Japan Agency for Medical Research & Development
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**Aging is a world problem**

# Demographic Changes in Japan

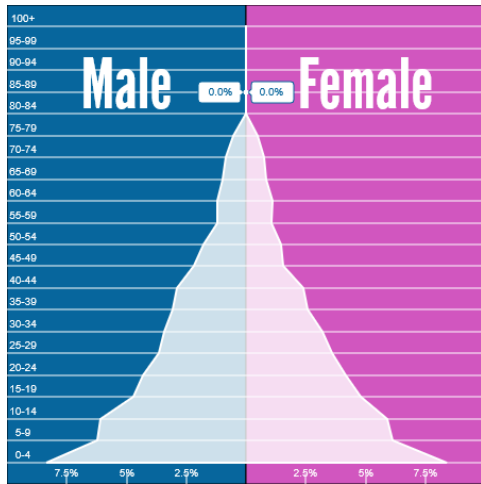
*response to the declining birth  
rate and the aging society*



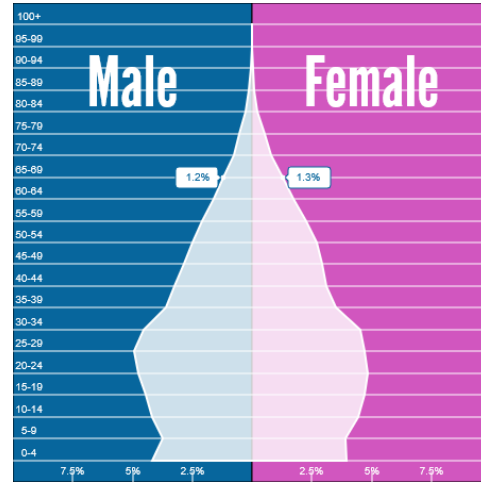
# Population Pyramids

## Malaysia

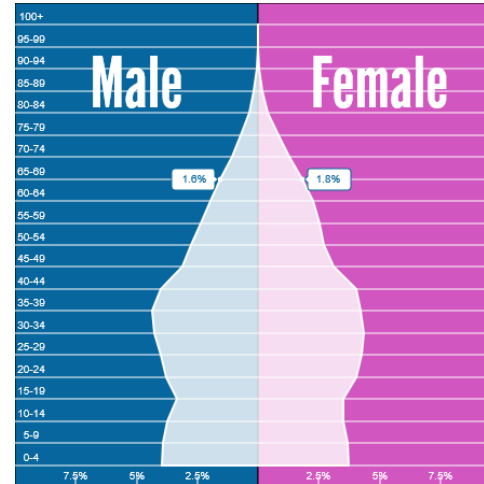
1950



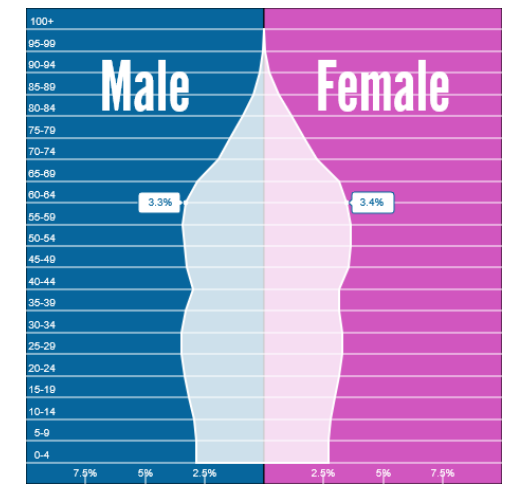
2015



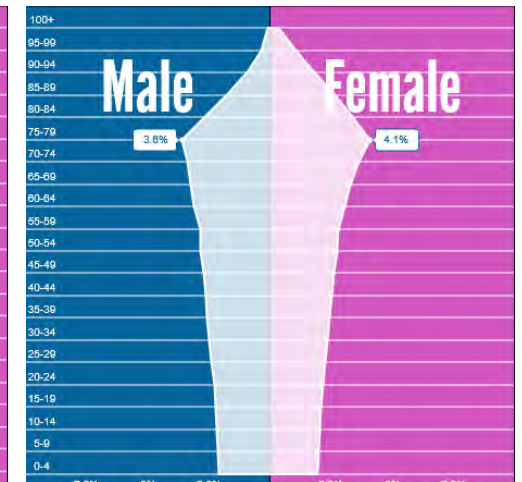
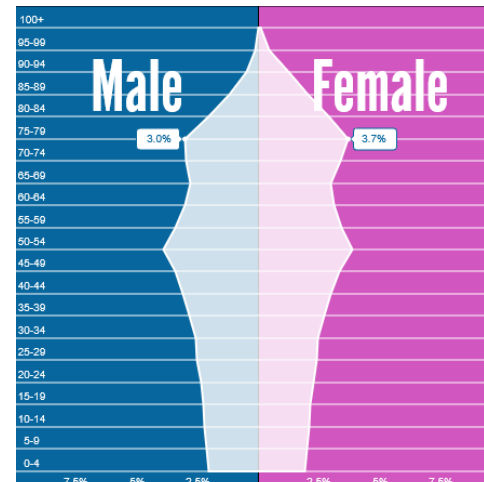
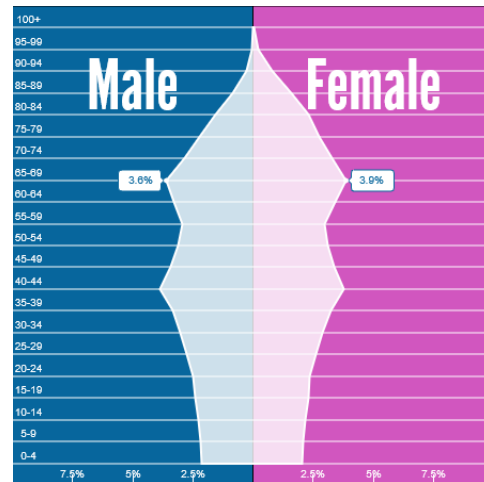
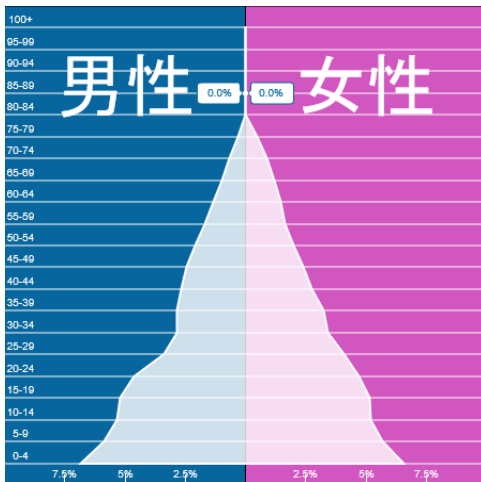
2025



2050



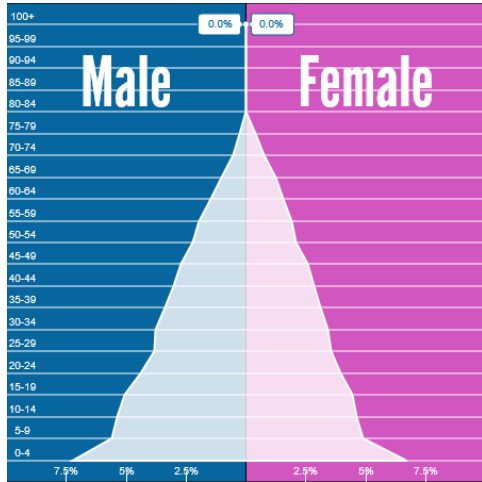
## Japan



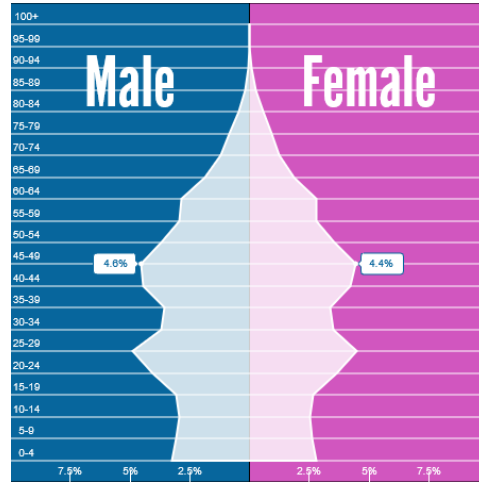
# Population Pyramids

China

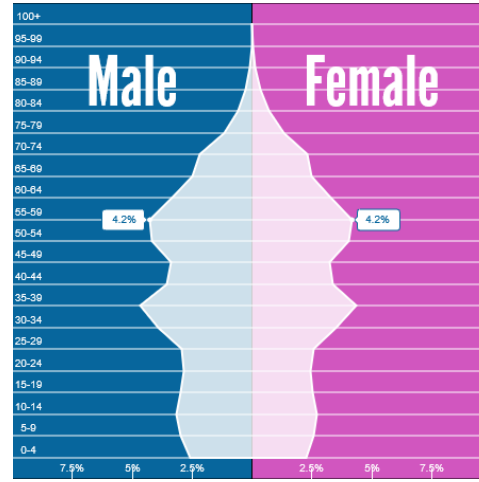
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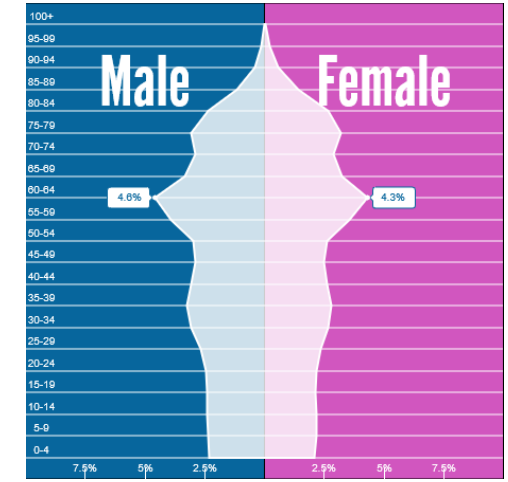
2015



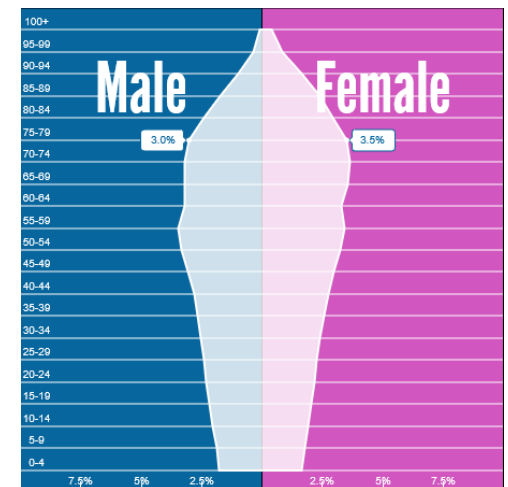
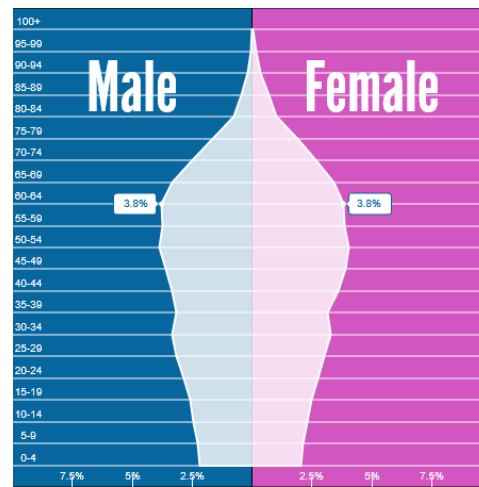
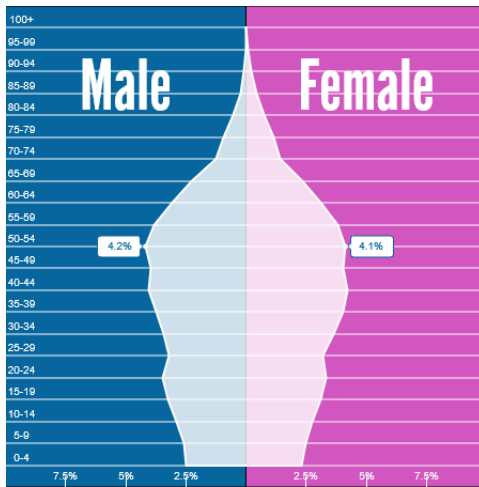
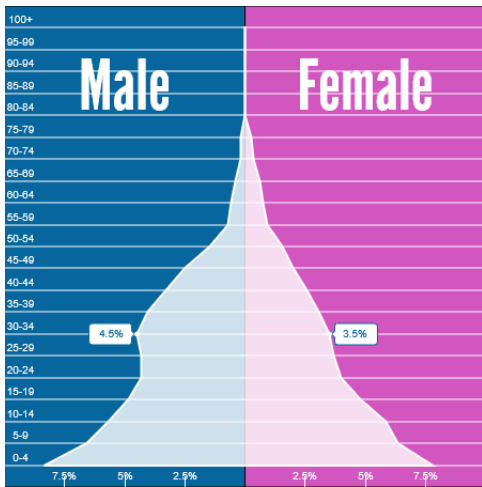
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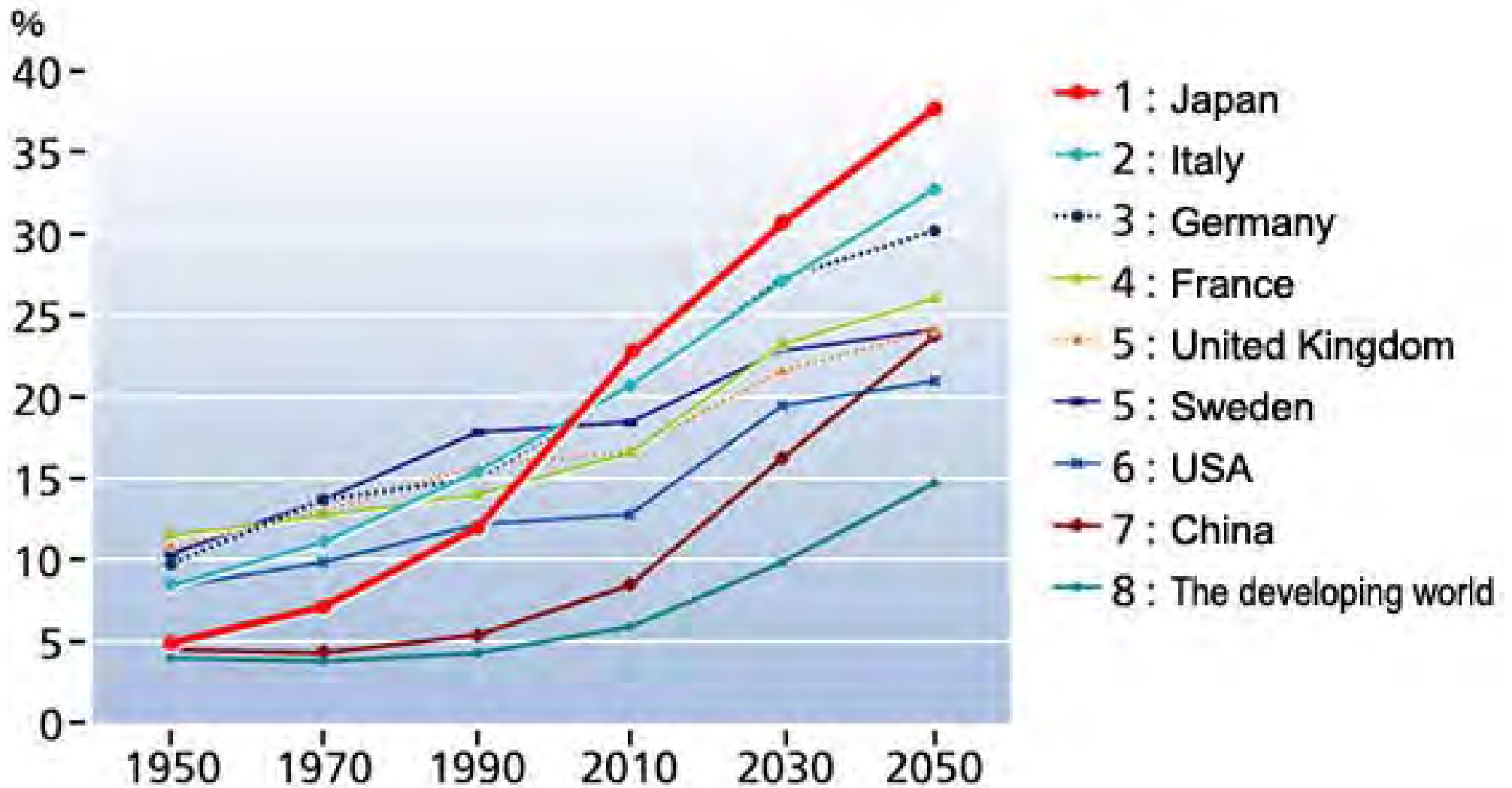
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Singapore



# Aging Ratio



# **What are the real problems about aging?**

**Aging itself is NOT a problem.  
It is how we take into account the solutions  
for a better life of the aging.**

# Typical Nursing home in JAPAN



# Big Problem : the number of people who require health care is ever increasing.

## Prediction in 2003

**83%** of elderly people active

the total number of people with dementia would be approximately

**2.3million in 2012**



## in 2012

The number of people with dementia

**4.6million**

and those approaching is actually **one quarter** of the total elderly,

**8million!!**

*Japan's health care system has concentrated on overly protected care for the elderly and has not instituted a system of independent living*

# The real problem of Japanese care system

Care facilities worry too much about risk,  
so discourage activity and rely too much on mobility  
machines such as wheelchairs

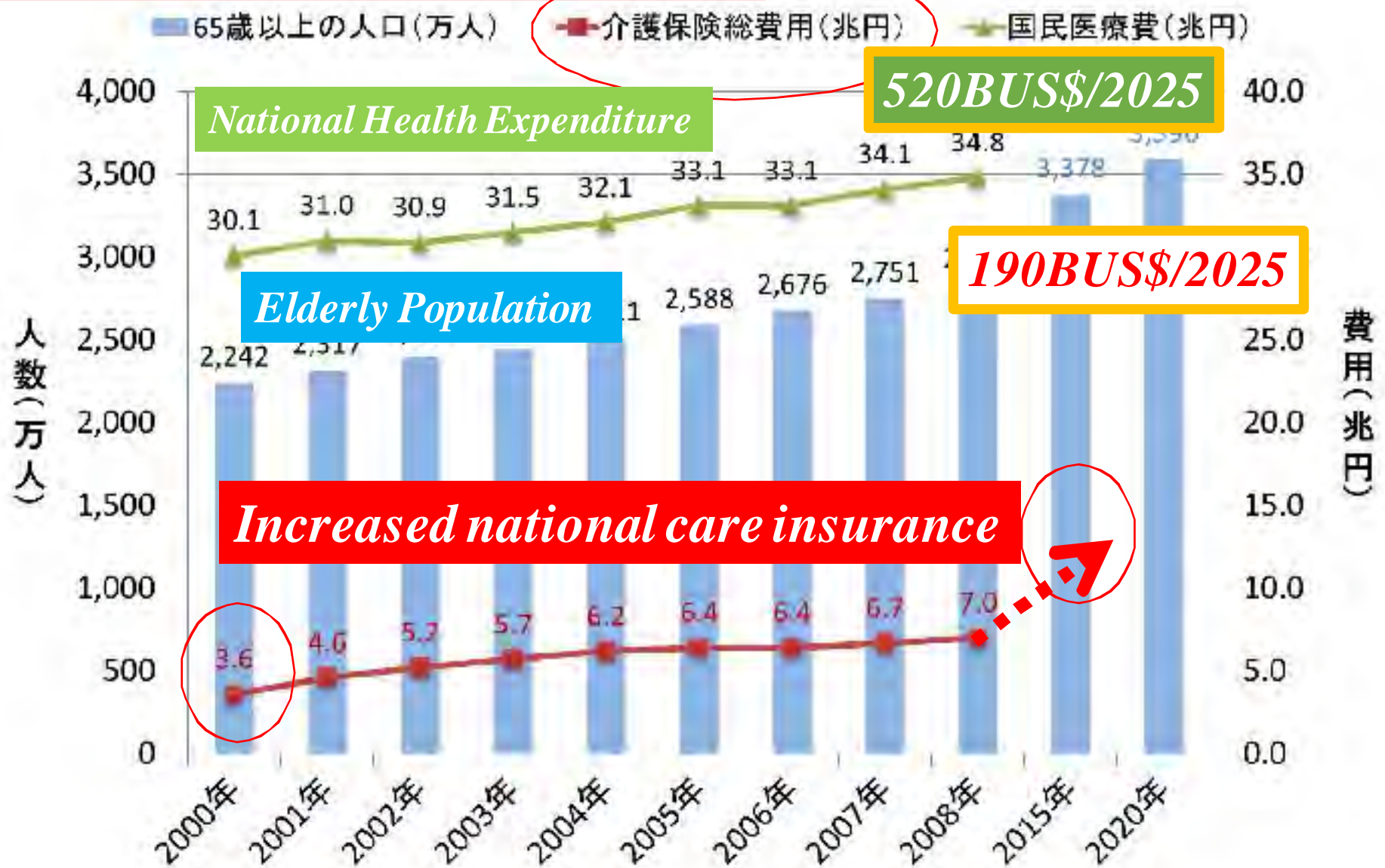


動かせば怪我をする  
訴訟リスク……  
出来るだけベッドから動かさない  
車椅子を使う



# Current Japanese situation

**National Budget: 1TUS\$/2016**



# Current Japanese care system is NOT good for the elderly



**Our efforts at rehab must result in  
a more normalized society**

# What is Normalization?

- Rehabilitation is part of the medical profession
- Normalization is self –independence  
& self-responsibility  
using Robots and AI technologies  
under cloud services

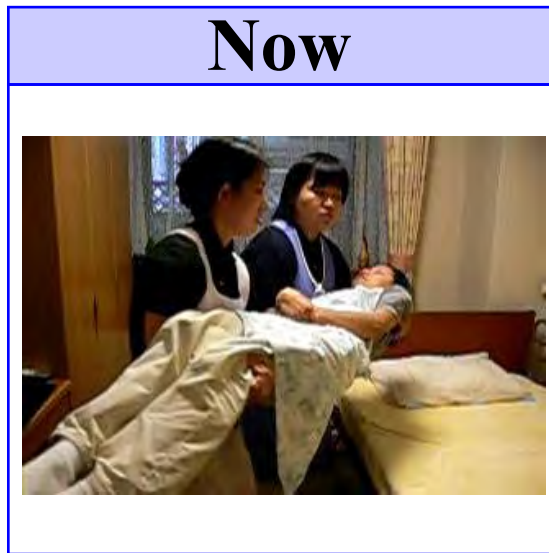


*A Robotic Care system which focuses on normalization will actually decrease the national health expenditure and realize a better well-being for everybody*

**What kind of care robots would be good for the normalization?**

# *Paradigm shift of Robot development is needed*

*from just Care assistance to more Independence*



## **Transfer by care givers**

- Labor Intense
- Task requires two care givers
- Potential for Injury
- Severe back pain



## **Transfer Assist Robot**

- Power assist system of transfer
- Lower burden for caregivers



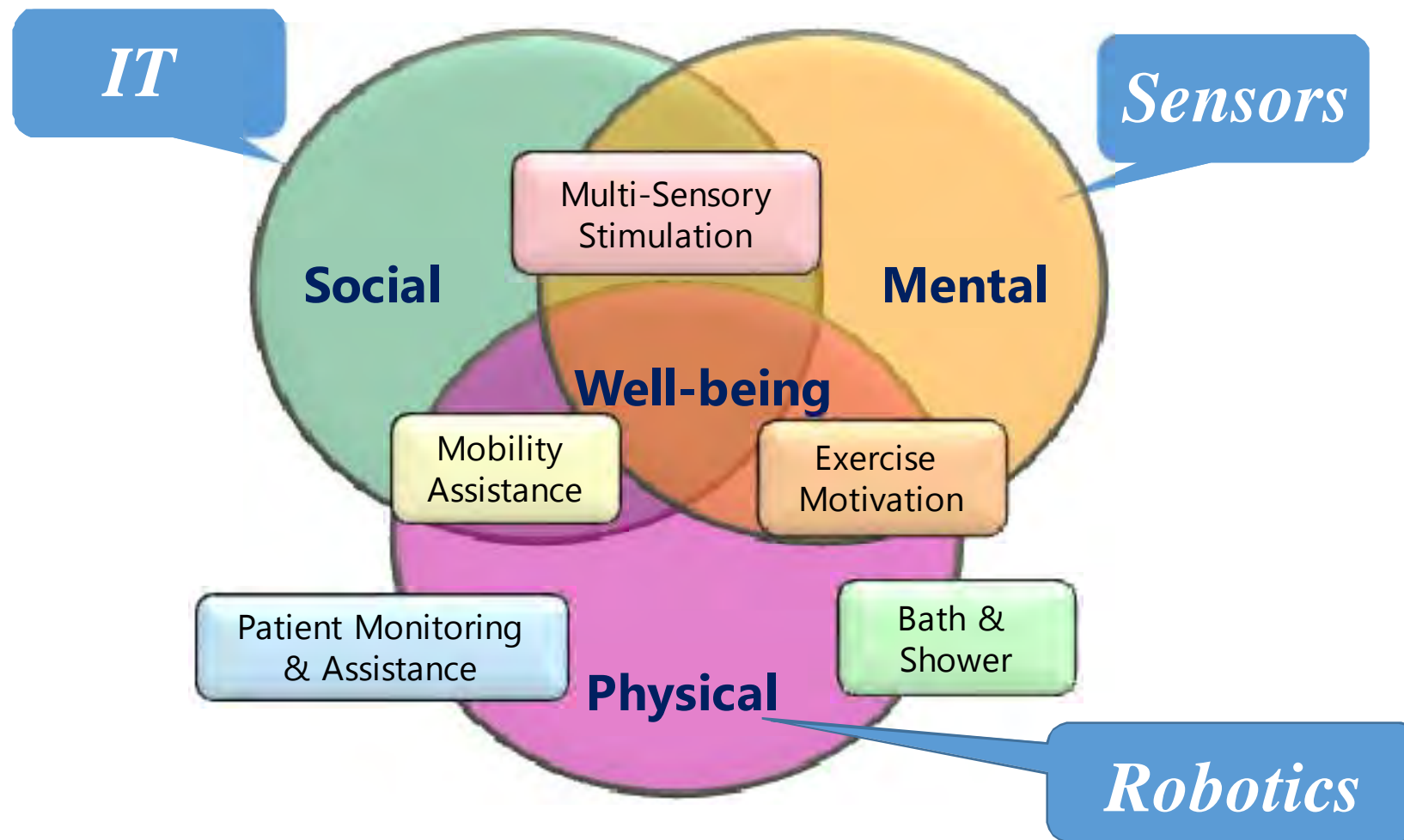
## **Robotic Bed**

- Hybrid system of bed and wheelchair
- NO manual transfer!

- Utilize human abilities
- Protect human dignity

# What do we mean by Well-being ?

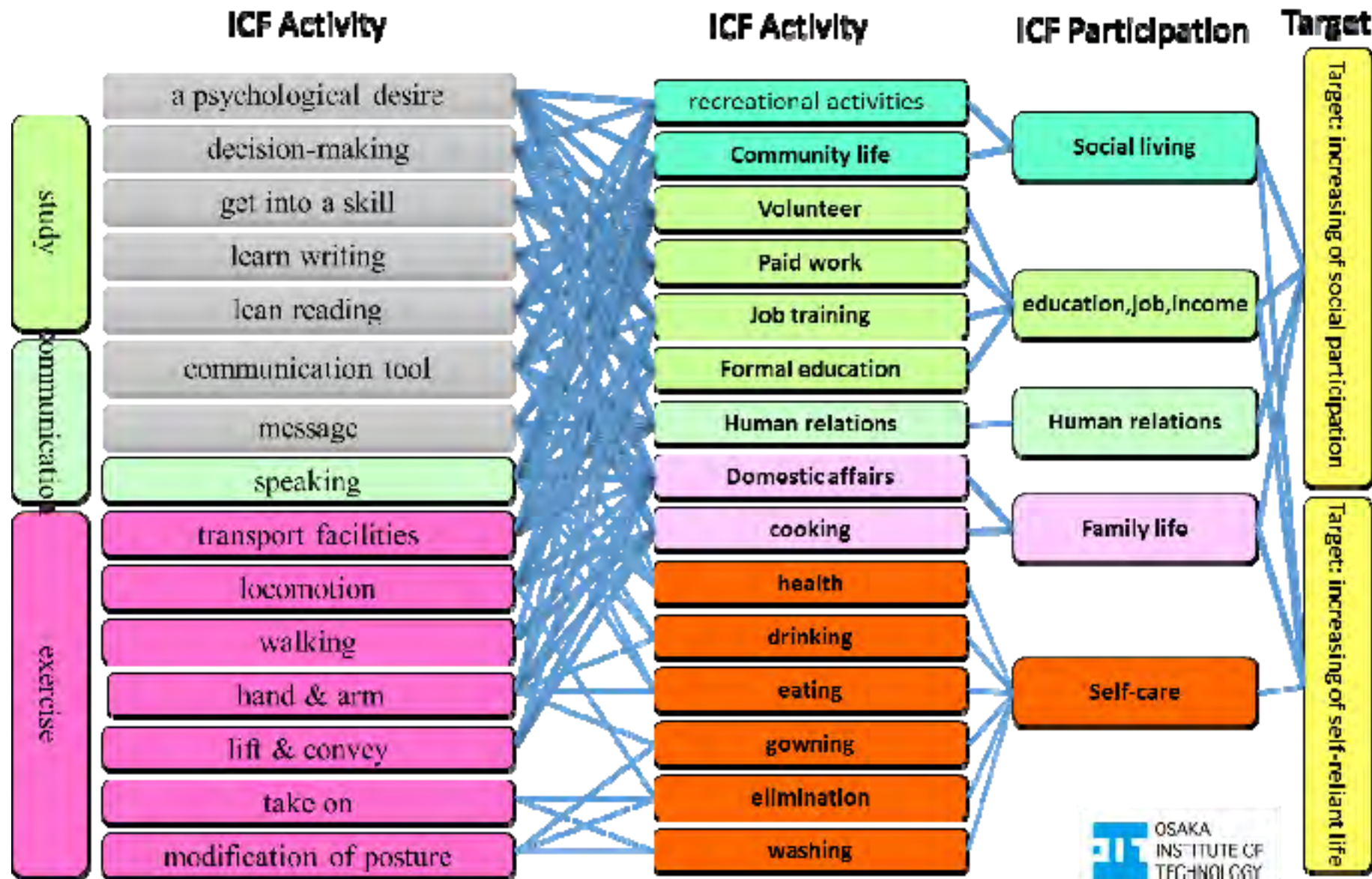
In order to experience well-being, we need to achieve three levels of satisfaction



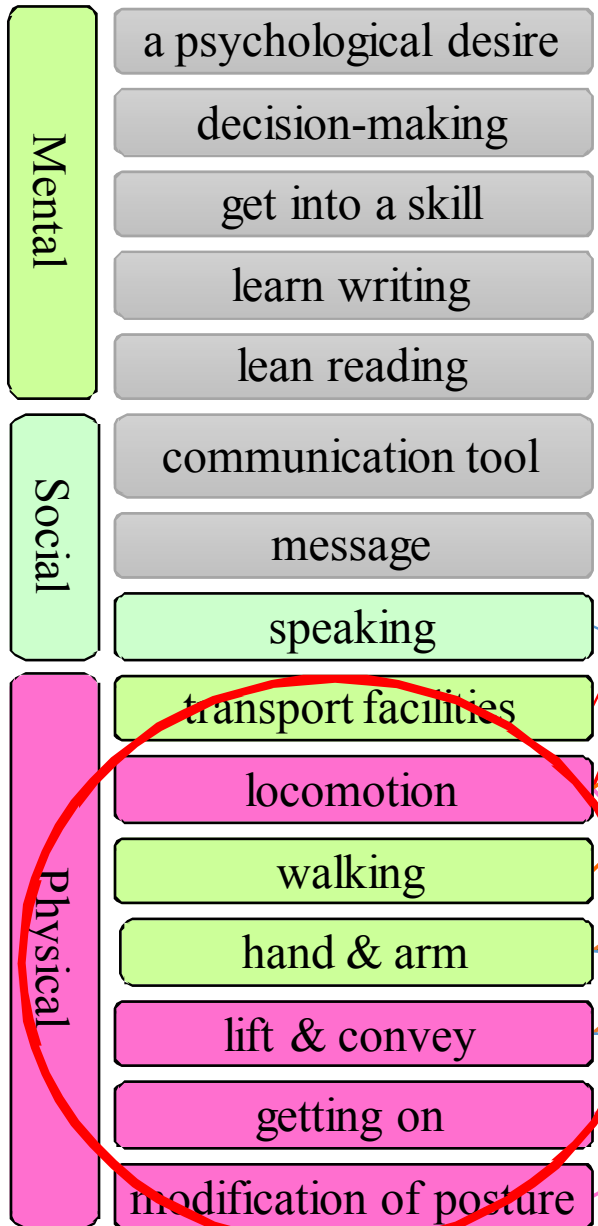
# ICF is a good tool to realize well-being

This chart was developed by WHO

(International Classification of Functioning, Disability and Health)



# Every Robot to date can't cover all three levels of satisfaction



# Example : The phenomenal development of the Smart Phone



**We should take this business success story as a kind of model of how we should develop future robots to meet these needs.**

# Summary

- ✓ **Service Robots must involve the well-being of all people**
- ✓ **Unfortunately robots to date can't cover the three levels of satisfaction**
- ✓ **So we propose the development of a robot system that covers all three levels of satisfaction**

# Robot Solution System developed by Panasonic



*Introduction of Japanese Government AMED  
healthcare robot Project*

AMED : Japan Agency for Medical Research &  
Development

# Robotic Devices for Nursing Care Project



**Transfer assist** □



□ **Mobility Aids** □



**Toilet assist**



□ **Safety Surveillance  
by Smart Sensors** □



**Bathroom assist**

# Goals of the Robotic Care System according to AMED

AMED : Japan Agency for Medical Research & Development

The establishment of a Robotic Care Management System

Starts with Activity and Burden

Inclusion of Care Service Records and Data from all the Devices

Risk Management

and Analysis of the Records and the Logged-in Data

Safety Surveillance



In Nursing Homes



At Home



Outdoors

Mobility Aids



Transfer



Smart Toilet



Improved Bathing methods



Walking Aids



**The aim is to establish preventive measures to keep people from becoming bedridden!!**

# Robots developed to date



Robotic Bed (Panasonic)



ROBOHELPER  
SASUKA  
(Muscle)



Robot Suit HAL  
for Care Assist  
(Cyberdyne)



Muscle Suit for  
Care Assist  
(Kikuchi)



Transfer Assist  
Device (Fuji  
Machinery)



Neos+Care  
(Noritsu Precision)



(Azbil)



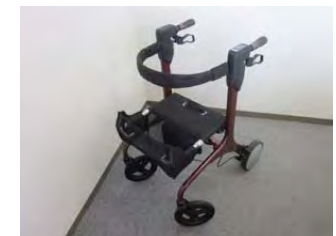
(RT Works)



Transfer Support  
Device (Yaskawa)



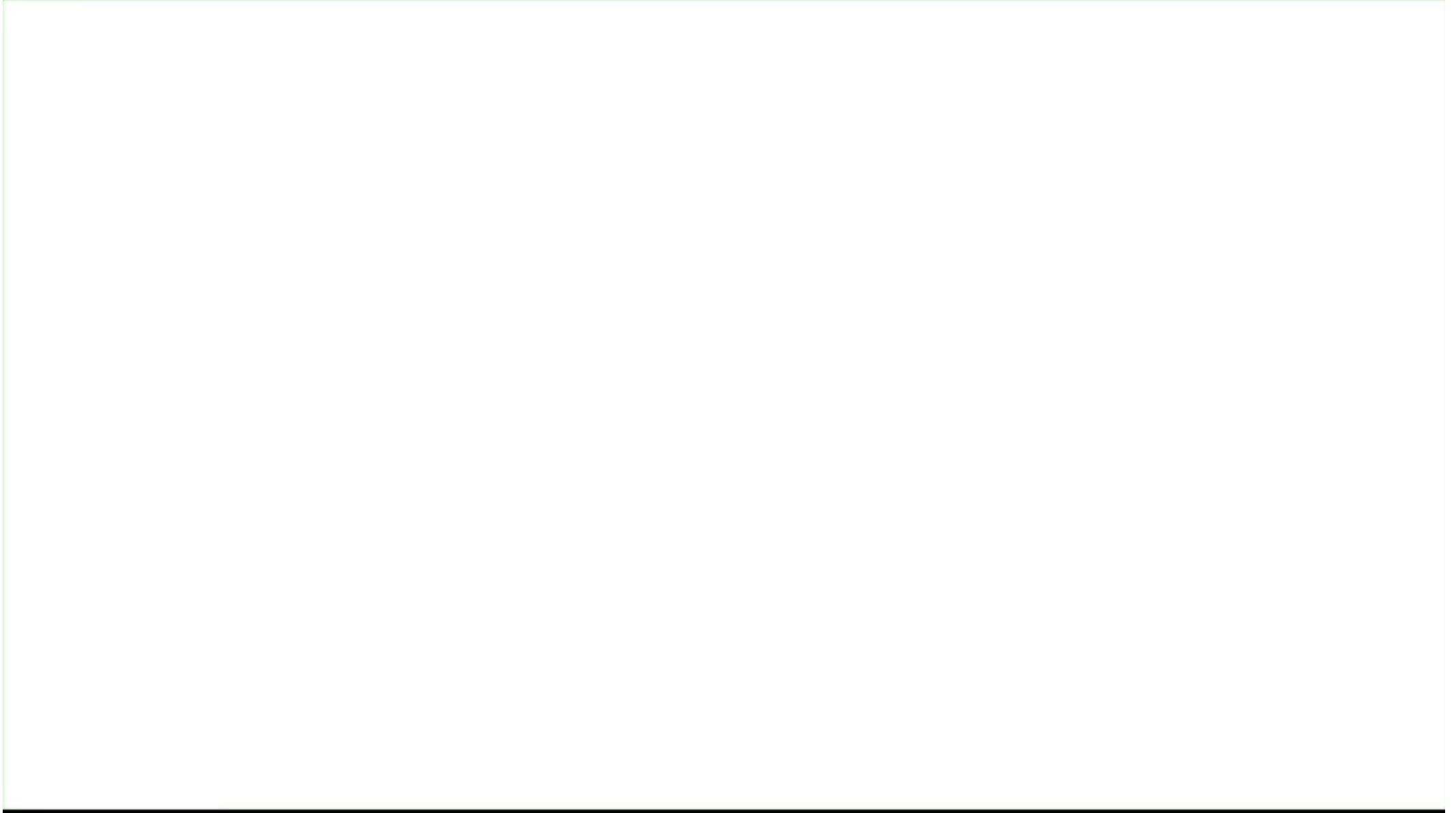
(Imasen Engineering)



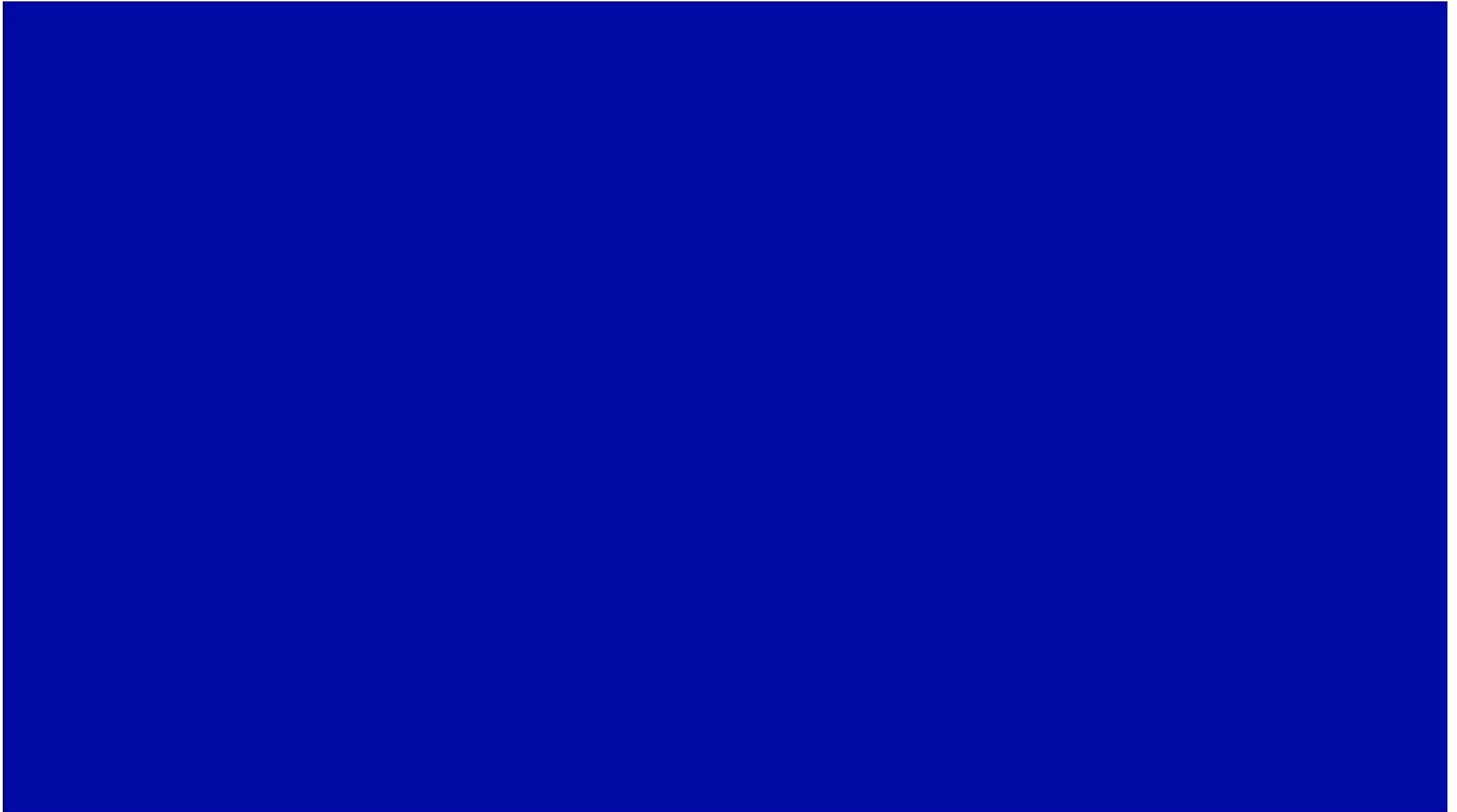
(Kawamura Cycle)

# **Mobility Aids**

# video



**Hands free toilet robot is useful to prevent pandemic disease (one application of robotic hand)**



# **Safety Surveillance by Smart Sensors**

# Safety Surveillance System using Smart Sensors for Nursing Homes

➤ *Main purpose is to assist patients with dementia*



(NK Works)

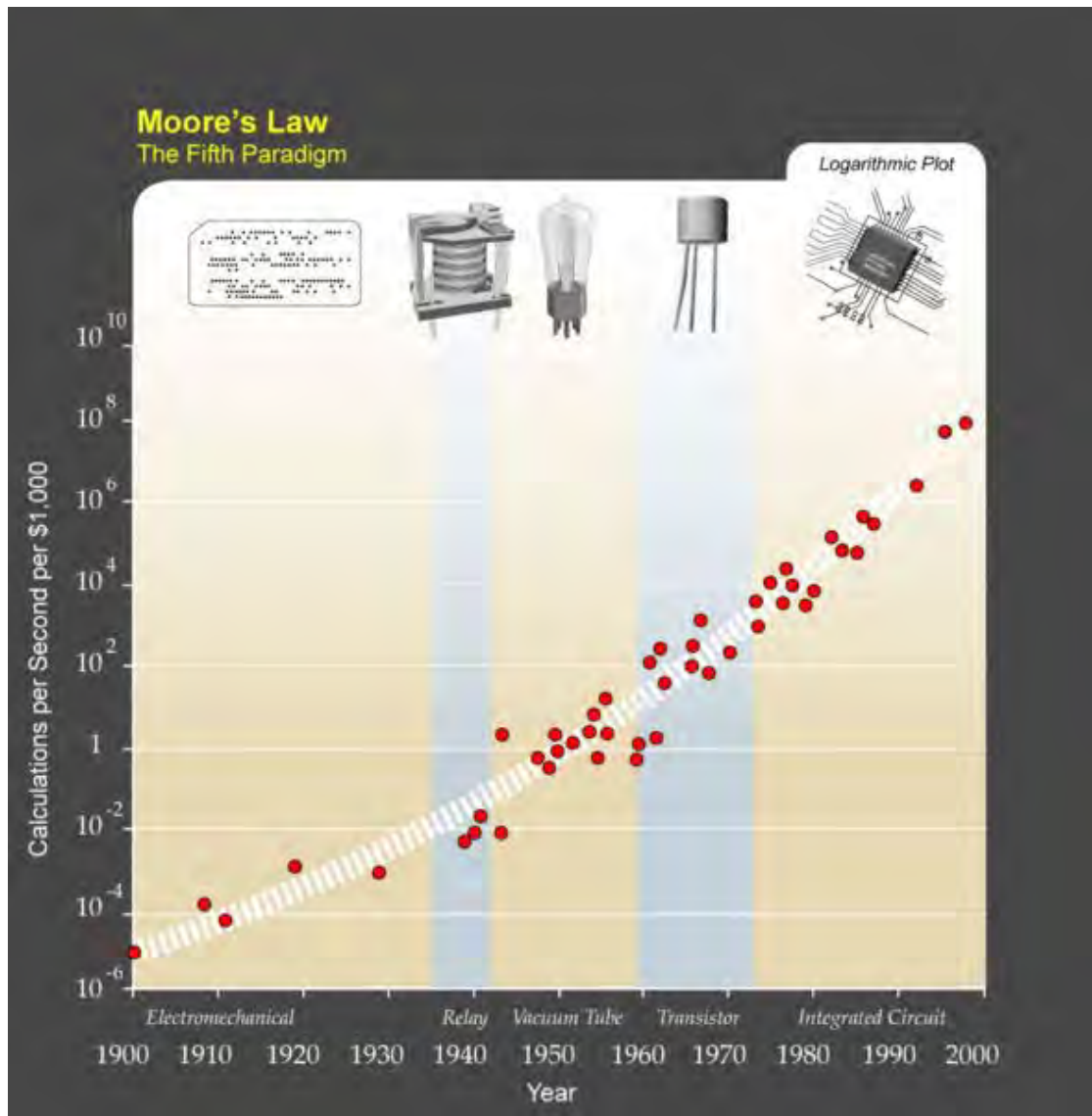


(Sumitomo Riko)

**A short break**

**Future Technologies**

# Moore's Law

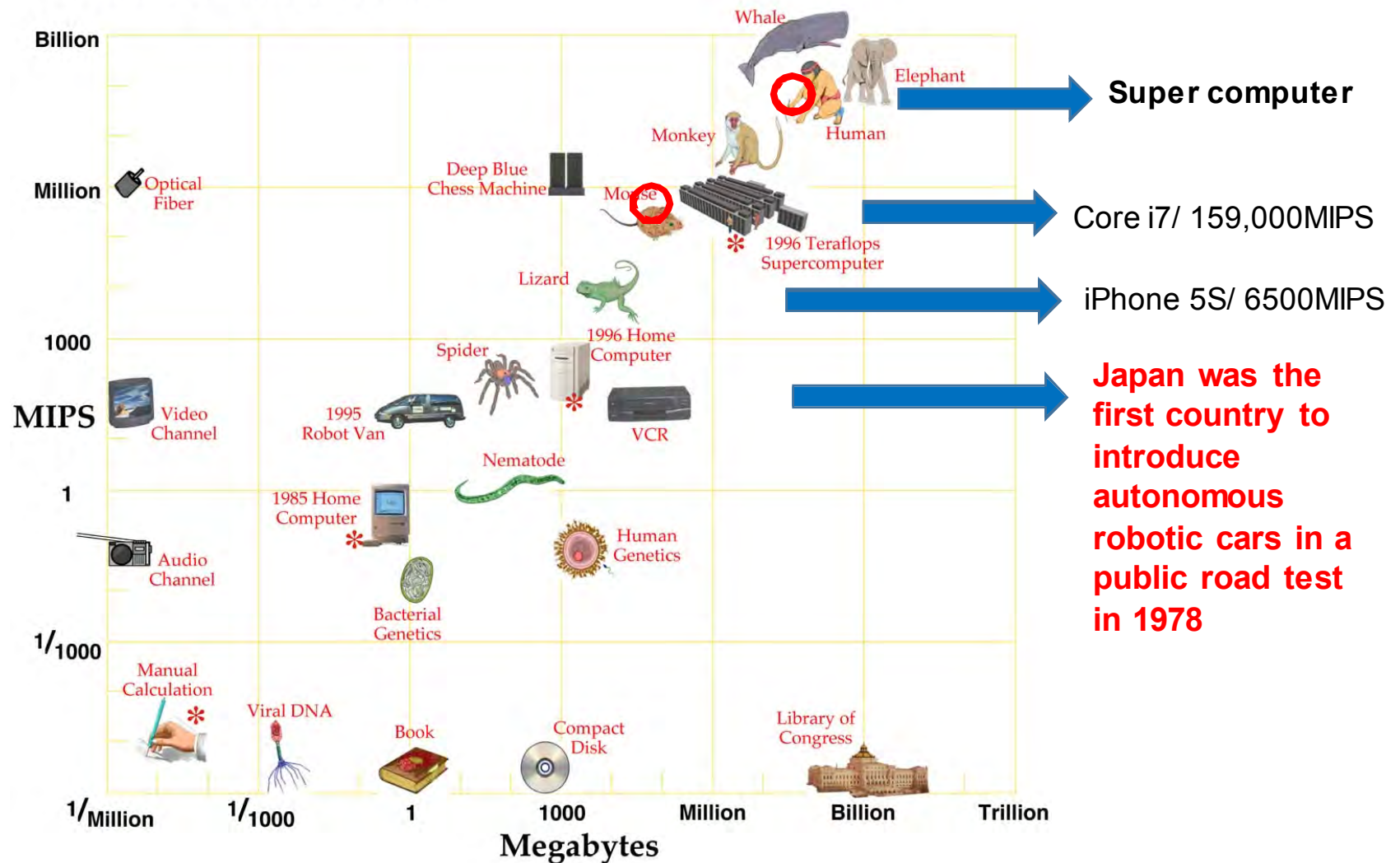


$$P=2^{n/1.5}$$

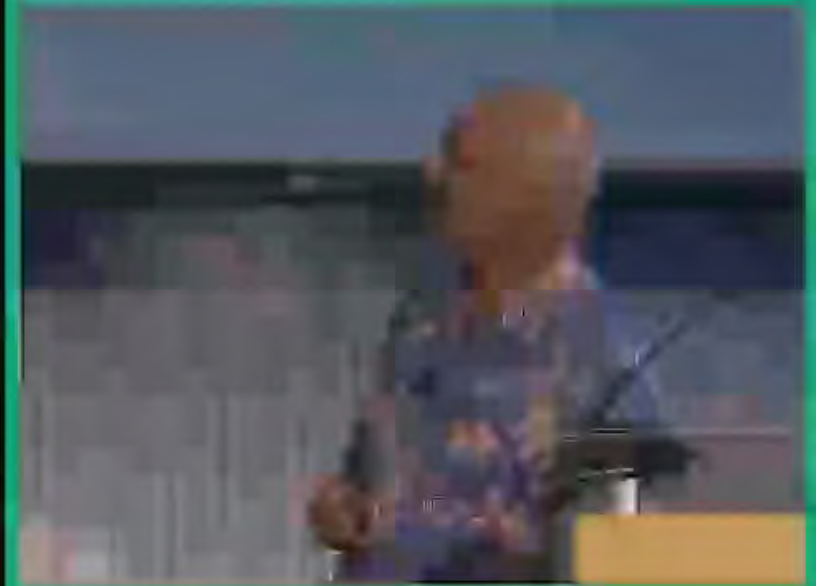
# Moravec's Paradox

It is comparatively easy to make computers exhibit adult level performance on intelligence tests like playing checkers, and difficult or impossible to give them the skills of a one-year-old when it comes to perception and mobility

All Things, Great and Small



**Robot technologies are still  
in an infancy state now,  
but nobody knows what the future holds!**



# How about the robots in the Micro-World?

**NewScientist**

**Big bionic ants team up to move objects**

# Possibility of Cyborg

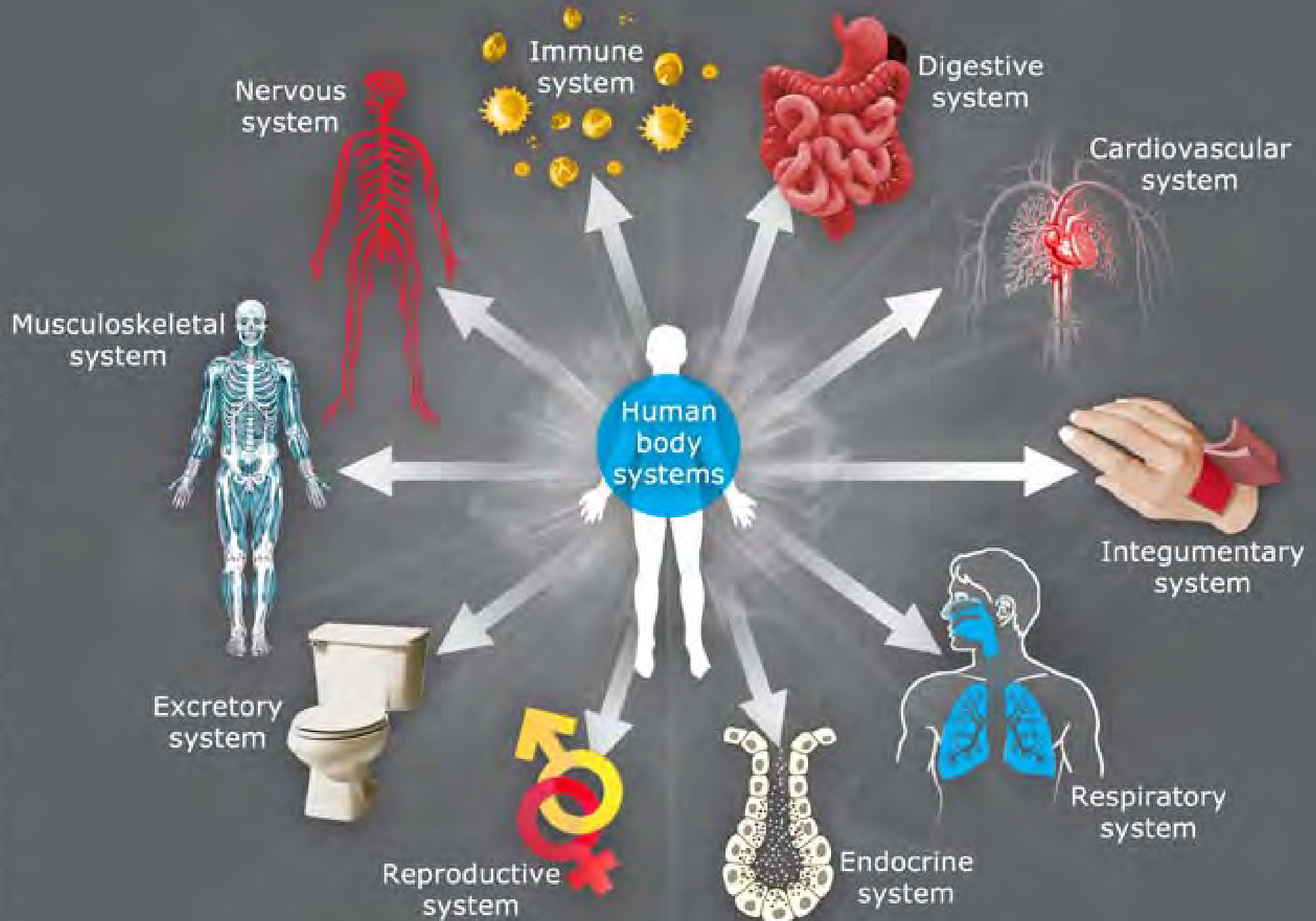


# Can be Applied to Living Creatures?

**Must consider the implications  
robot technologies have on people!!!**



# The study of BioMimetic Design



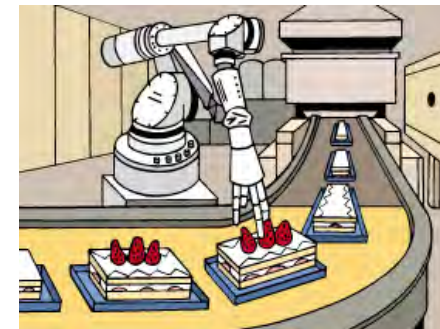
**How to overcome  
the safety issue?**

# Safety Issue is a main Concern

- ◇ Manufacturing Industry  
= Capital-Intensive Industry



*Replacement is very easy with robots!*



- ◇ Hospital & LTC facility  
= Labor-Intensive Industry



*However, Replacement can be very difficult because of safety issues!*

# Innovative technologies can be completely meaningless unless they can be used freely by the public despite the risks involved

## Ex. Red Flag Act



- Not to exceed 4 mph (6.4 kph) on the open road and 2 mph (3.2 kph) in towns.
- Be preceded by a man on foot waving a red flag to warn the public.

## Ex. Autobahn



- No speed limit, but has some rules:
  - No passing on the right!.
  - Double check your side-view mirror before moving into the left lane!
  - Slower traffic stays to the right!
  - Always use your blinkers!
  - Take a break every two hours!
  - Go with the flow!

# Summary

- ✓ **We must always take into consideration any possible moral implication and safety**
- ✓ **We must set up a Show Case based upon experience for Service Robots**

**Who will be the winner in the world??**

**Proposal for a collaborative open private  
space enabling the testing of robots for  
future innovation**

# Robot Collaboration Home



Single family House

Care Home & Visiting Care Center

**Ever-ready of some robots for residents**

- ✓ Consultations with all parties concerned
- ✓ Land owner will build the town following our advice
- ✓ Nursing care business company will manage the robot town
- ✓ In this way all the stake-holders will benefit, costs will be reduced, profit will be realized and overall well-being of the people will unfold. By using robots and AI technology, new life innovations will have begun



# **Introduction of my university's (OIT) challenge**

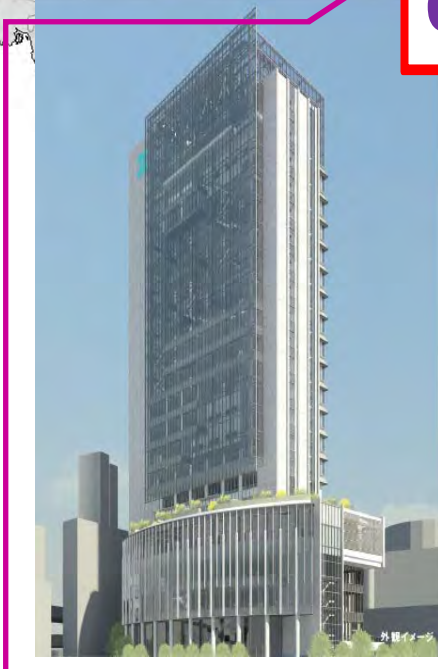
# OIT New Campus in front of Osaka Station

*Technology alone hasn't been able to change people's minds.  
Therefore our challenge is .....*

***Robot (Technology) X Life style Design***



**1<sup>st</sup> Floor is an experience-based  
show case for people to witness  
some of the results of our research  
This will be a public space!!**



# Trial Test at a local shopping street nearby our university



# Establishment of Service Robot's Eco-System

9<sup>th</sup> floor  
Fabrication  
Laboratory

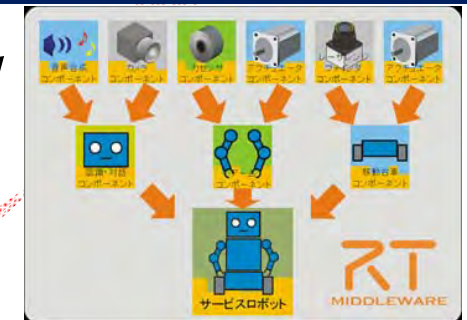
~ Forecasting the future .....

4<sup>th</sup> floor  
Presentation  
hall



Standardizations: RTM

1<sup>th</sup> floor  
Experience  
-based  
Show case



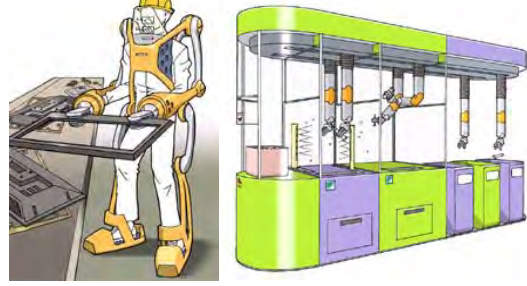
# Summary

The **demographic challenges** we are facing require **new socio-technical solutions** which will cross several disciplines and is being developed in Japan with an open invitation to all.

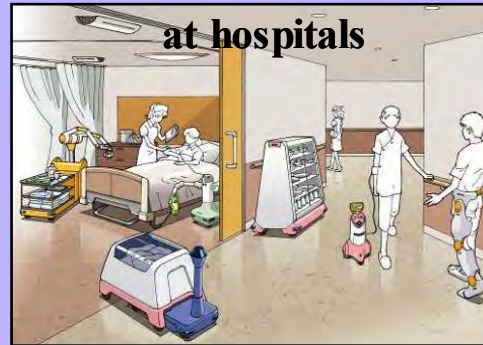
We will continue to **propose new work life systems** with the intent of enabling the future society of Japan to **generate well-being for everybody through a program of social participation in an ageless society.**

# Our Goal

at factories



at hospitals



at care facilities



*To realize the robot  
innovation*

at home



on a street



at a park



at Care house



**Thank you for your attention**