

# HKIE Veneree Club

## The Application of Technology in Rehabilitation: Global and Local Context

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Convener  
AT SIG, HKOTA  
21 February 2024

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- **Compare changes of design in assistive devices**
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- **Collaboration between Therapists & Engineers**

# Use of Terms

**Aids & Gadgets**

**Assistive Technology**

**Rehabilitation Technology**

**Environmental Technology**

**Occupation-Related Technology**

**Therapeutic Technology**

**Health Technology**

**Persuasive Technology**

**Enabling Technology**

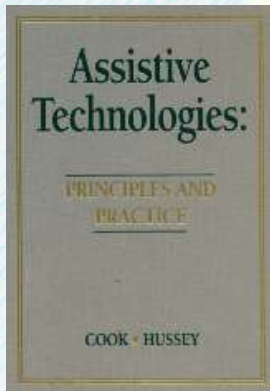
**Gerontechnology**

**Information and Communication Technology**

**Robotic Assistive Technology**

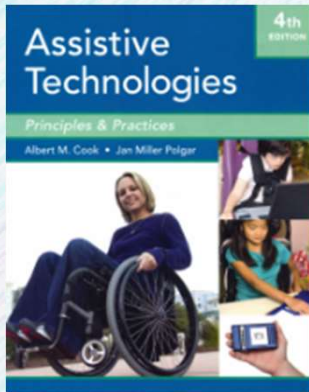


# What is Assistive Technology?



*Cook & Hussey, 1995*

“Any item, piece of equipment or product system whether acquired commercially off the shelf, modified, or customized that is used to increase, maintain, or improve functional capabilities of individuals with disabilities.”



*Cook & Polgar, 2015*

由殘疾人使用的，特殊生產的或通常可獲得的用於預防、代償、監測、緩解或降低殘疾的任何產品、器具、設備或技術系統

# The *Individuals with Disabilities Education Act* IDEA '97 (Public Law 105-17)

## Assistive Technology Services

Any service that directly assists an individual with a disability in the selection, acquisition, or use of an assistive technology device.  
(Section 300.5)

- Evaluating
- Providing devices
- Selecting, Designing, Customizing
- Maintaining, Repairing
- Coordinating
- Training/Technical Assistance –student, family and school service providers

## Assistive Technology Devices

Any item, piece of equipment or product system, whether acquired commercially off the shelf, modified, or customized that is used to increase, maintain, or improve the functional capabilities of children with disabilities.  
(Section 300.5)

**Any Technology can be Assistive!**

**Active Rehabilitation**

**Enhance Function**

**Care**

# The Importance of Rehabilitation after Hand Surgery

**Success in Surgery +  
Failure in Rehabilitation  
= Failure**



# Splints that Previously designed in Hong Kong



# Robotics

00s

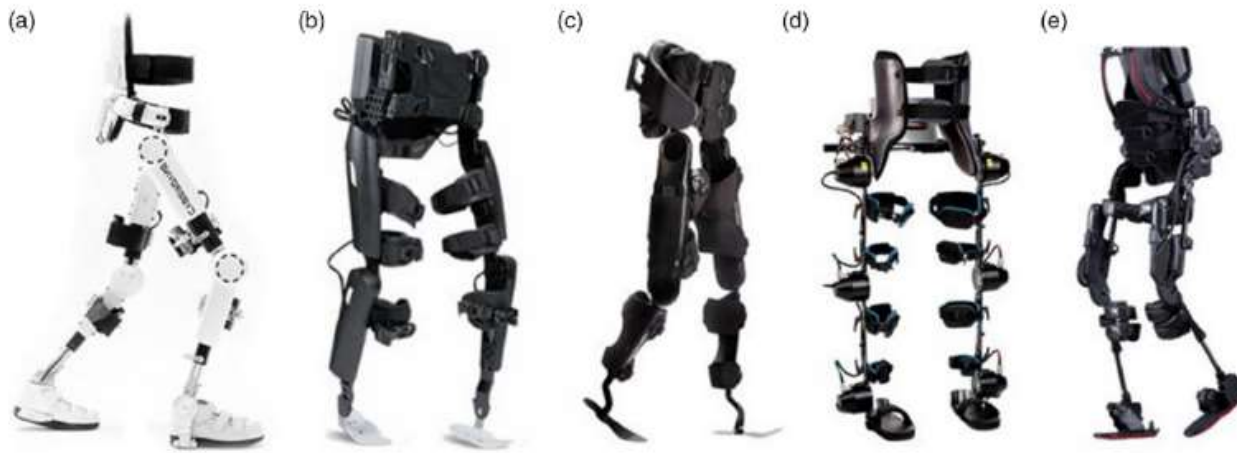
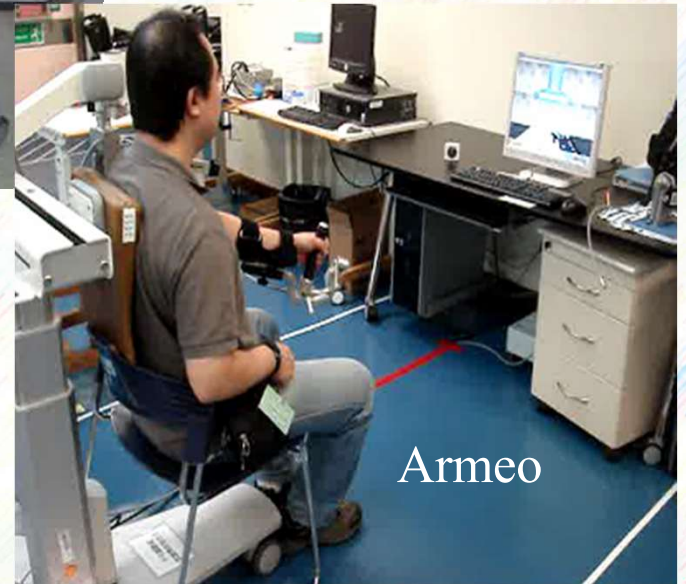
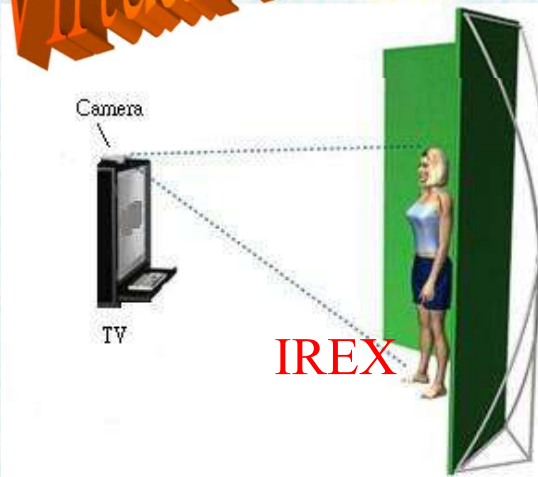
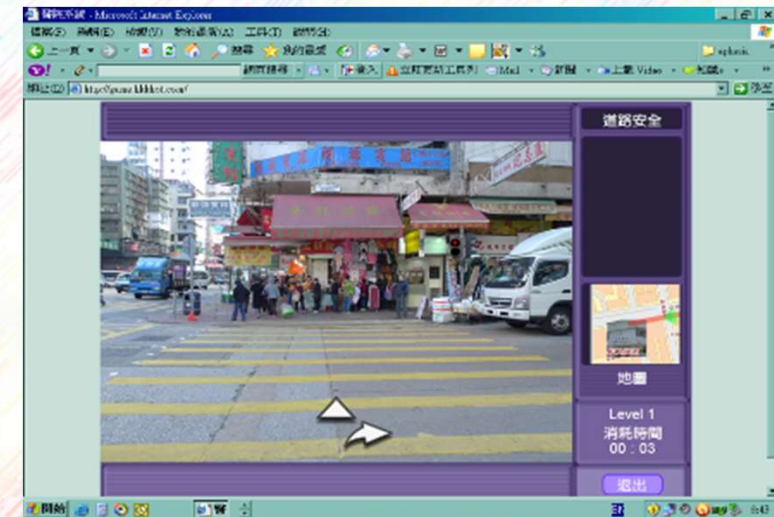


Figure 1. Some of the commercially available exoskeletons: a) Hal,<sup>[4]</sup> b) ReWalk,<sup>[3]</sup> c) Indego,<sup>[1]</sup> d) Exo H3,<sup>[2]</sup> and e) Ekso GT.<sup>[5]</sup>

# Virtual Reality



00s



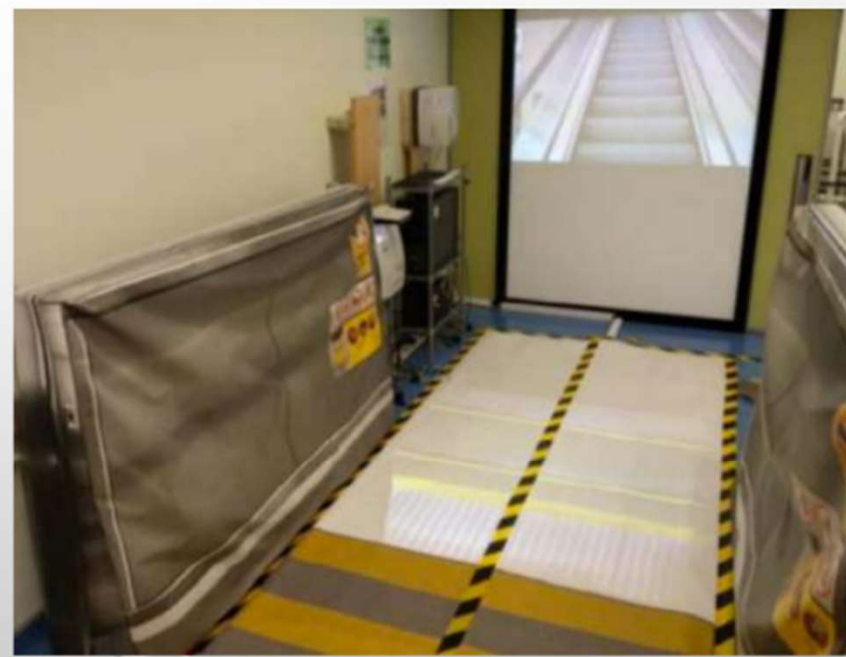
Play Motion

# 虛擬現實訓練在港發展之簡介

Augmented Reality

## 「混合式」虛擬現實訓練系統

- 使用自動扶手電梯及安全使用馬路的訓練



# *OT and 3D Printing*

## Splint & Assistive Devices



The background of the slide is a light gray surface covered with numerous white, three-dimensional heart shapes. The hearts are scattered across the entire area, creating a textured, layered effect. The text is centered over this background.

# The design of Assistive Devices in Caring in the past 30 years

# Grooming and Personal Hygiene



**Enlarged or  
lengthened handles**

*The above products are for illustration purpose only, there is no intention of recommendation*

# Grooming and Personal Hygiene

## Mouth cleansing



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# Grooming and Personal Hygiene

## Combing or Shaving



**Enlarged or lengthened handles**



**Universal cuff**

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# Toileting

## 80s Commode



**Packing the wastes**

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# Bathing

## Shower chair



- Electrical
- Seating system
- Convenient in cleansing different body parts



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# Bed

## Previous design



Non-adjustable



Manual adjustment

## Multi-functions in new design



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# Bed

## Height adjustment

80 cm

Optimal nursing position

For carer



41 cm\*

Safe mobilization at chair height

For transfer



27 cm\*

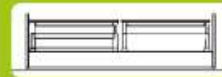
Fall prevention during sleeping phases

For fall prevention



200 cm

Bed length of 200 cm:  
The divided side guards offer  
protection without a central gap  
> 318 mm\* and without a protector



210 cm

Alternative bed length of 210 cm:  
Protection with longer side guards  
at the foot end without accessories  
and without a gap > 318 mm\* \*



220 cm

Bed extension to 220 cm:  
is temporarily adjustable with  
divided side guards for seniors -  
complete protection through  
foot-end protector (accessory)  
is guaranteed



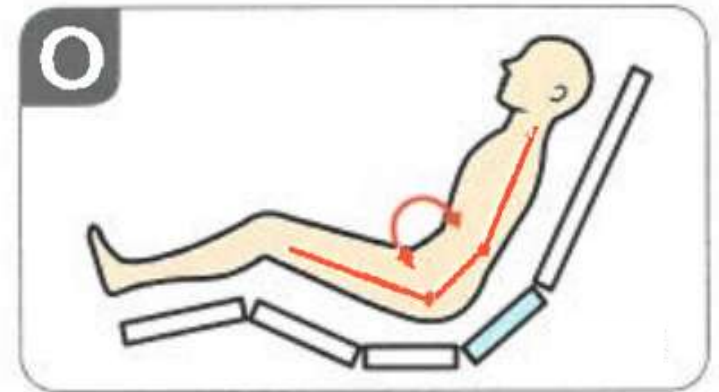
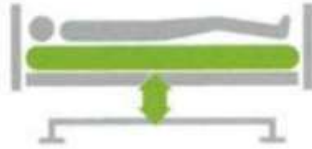
Bed extension with express release (option)

Adjustable length for accommodation in smaller area

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# Bed

**Bed frame adjustable  
for special needs**



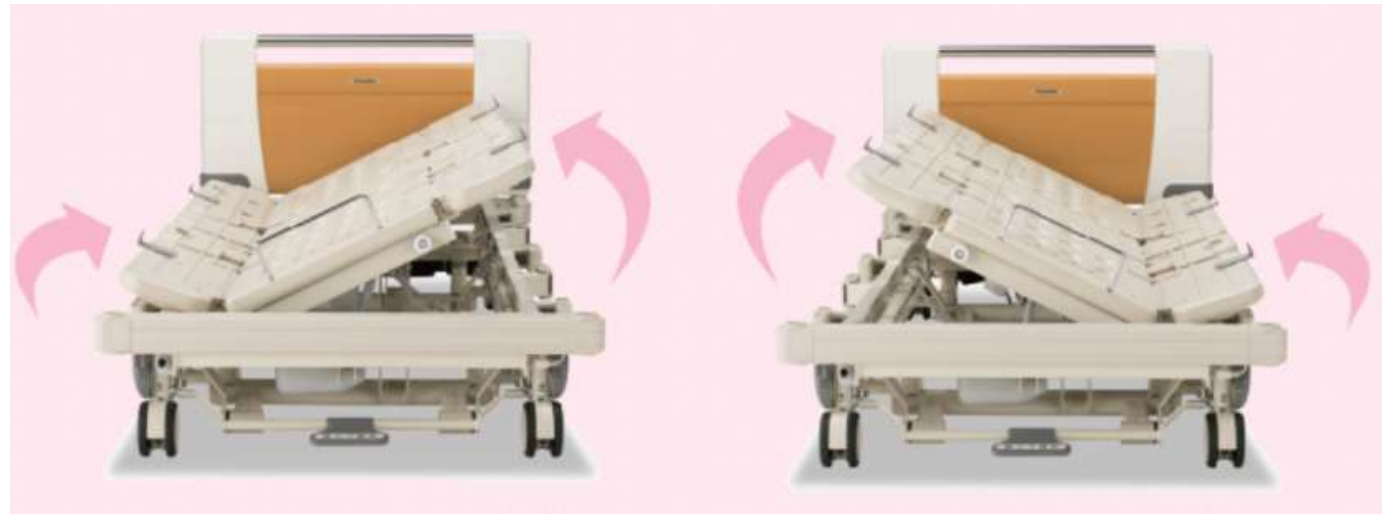
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# Bed



- Bed frame can turn to left & right
- Can program time for turning

- Prevention of pressure sore
- Relieve the workload of carers



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# Bed



- **Bed can be turned into wheelchair**
- **Save space**
- **Reduce the workload of carer in transferring the client**

*The above products are for illustration purpose only, there is no intention of recommendation*

# Bed



- Can turn client from lying to sitting position
- Reduce the workload of carer in transferring the client

*The above products are for illustration purpose only, there is no intention of recommendation*

# Bed



**Mattress angle is adjustable**



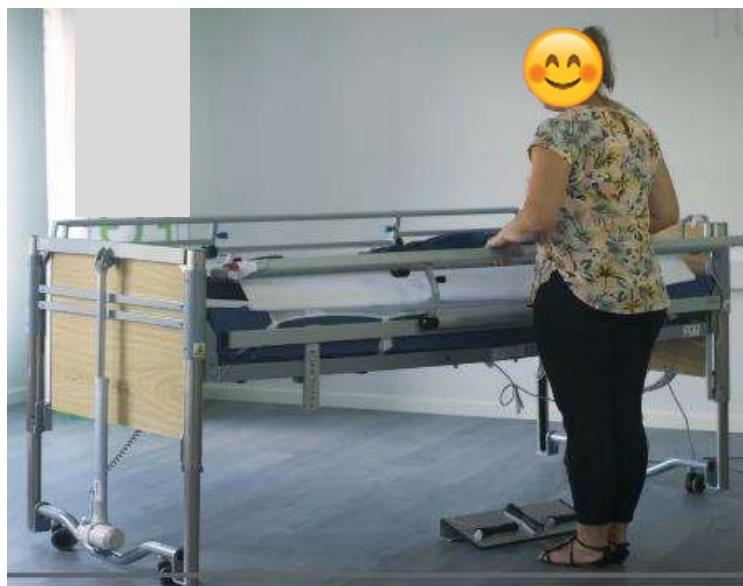
*The above products are for illustration purpose only, there is no intention of recommendation*

# Bed

Left-Right



Up-Down



Device to assist transfer in bed

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# Transfer Aid / Hoist

Design in 30 years ago



**Outlook,  
handle,  
frame and  
materials**

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# Transfer Aid / Hoist



**Suspension  
design**



**Frame design**



**Can reach  
floor level**

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# Transfer Aid / Hoist



**Shift of CG design**



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# Transfer Aid / Hoist



**Different  
support  
design**



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# Transfer Aid / Hoist

Mobile and height adjustable

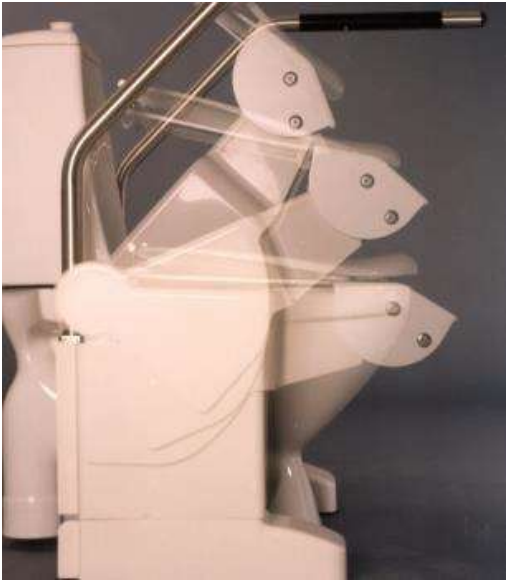


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# Transfer Aid

Sit ↔ Stand device

Handle design



**Electrical  
and height  
adustable**



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# Transfer Aid

Sit ↔ Stand device



**Mobile**



**3-level design**

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# Transfer Aid / Stick

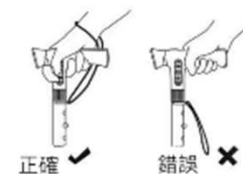
## Multi-function and Smart design



前置LED照明燈角度調節方法  
4個角度可供自行調較 (箭咀指示方向)



正確使用手杖方法



安全紅色警報燈

不停閃爍，引起注意，確保路上安全



手繩自動鬆脫設計

避免用家因手杖意外被卡住或跌下而跌倒

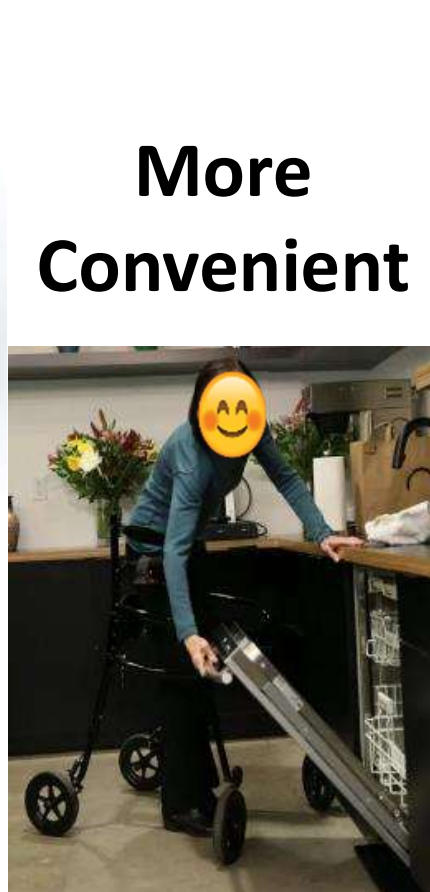


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# Transfer Aid / Walking Frame



**New design**



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# Mobility Aid

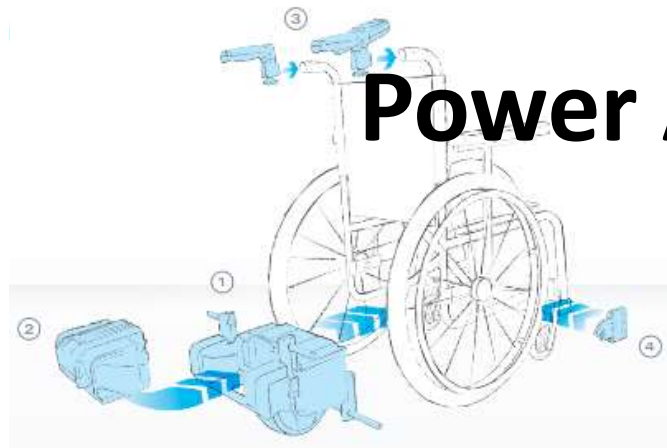


Wheelchair-  
Walking Aid  
Interchangeable



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# Mobility Aid



## Power Assist



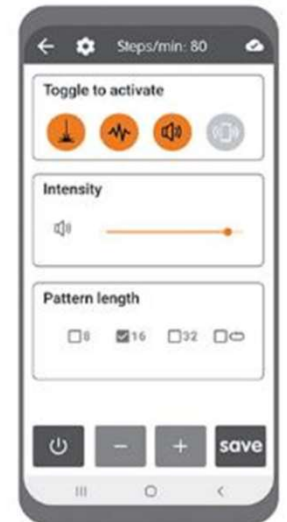
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# Mobility Aid

## Walking aid for Parkinson Disease



Design in 30  
Years ago



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# Mobility Aid

## Power Wheelchairs



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# Mobility Aid



**Power  
add-on**



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**What is Gerontechnology?**

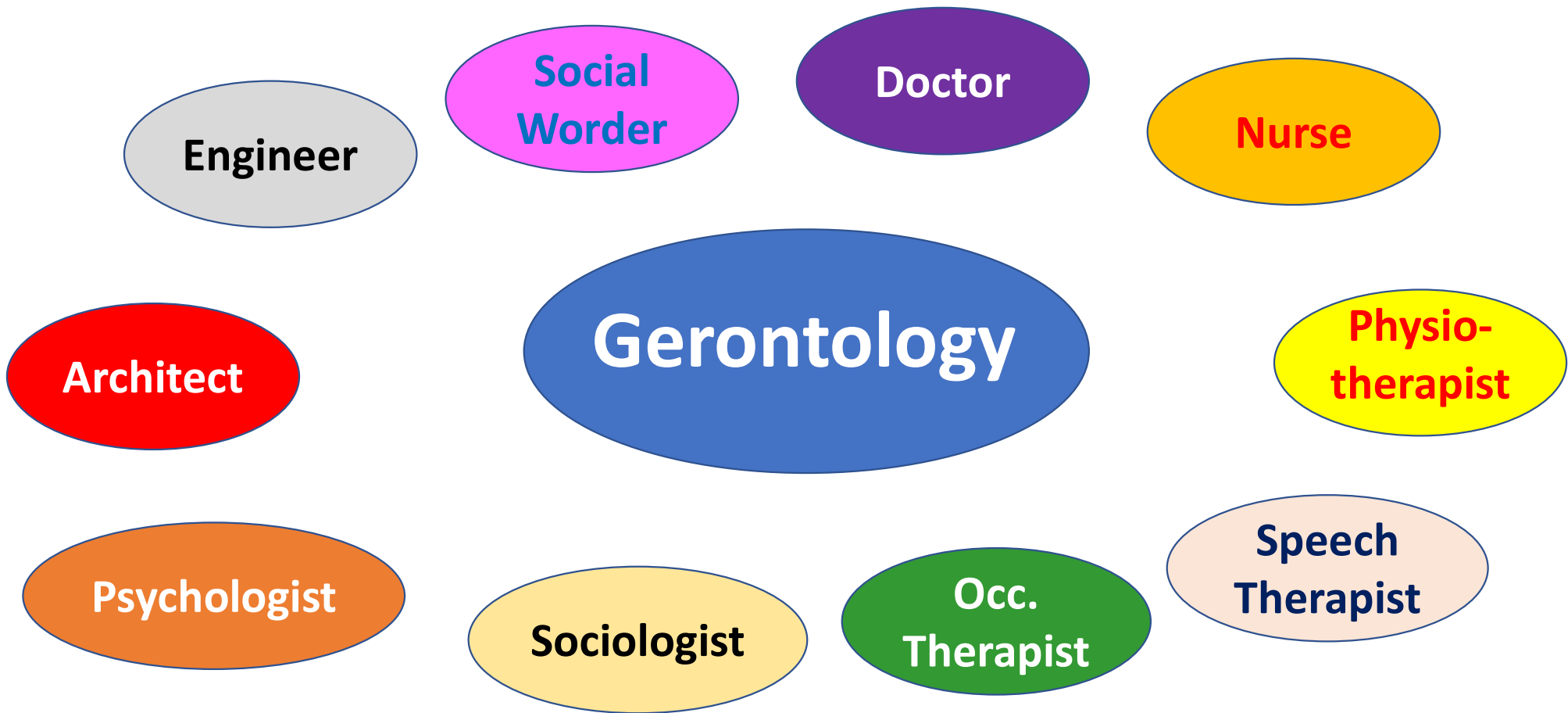
**What is the difference between  
Assistive Technology and  
Gerontechnology?**

**Function vs Ageing**

# Gerontechnology

Gerontology + Technology

# Multi-disciplinaries



# Development of Gerontechnology

- Engineers, Architects, Industrial Designers contributes to products in health, housing, transportation, work, leisure aspects for the older persons in 70s
- Universal Access / Inclusive Design
- Journal – “Gerontechnology” (2001 to present)
- International Symposium – 1991, 1996, 1999, 2002, 2005, .... 2020

*(Bronswijk, 2009)*

## Gerontech and Innovation Expo cum Summit (GIES) in Hong Kong since 2017



<https://gies.hk/zh-hk>

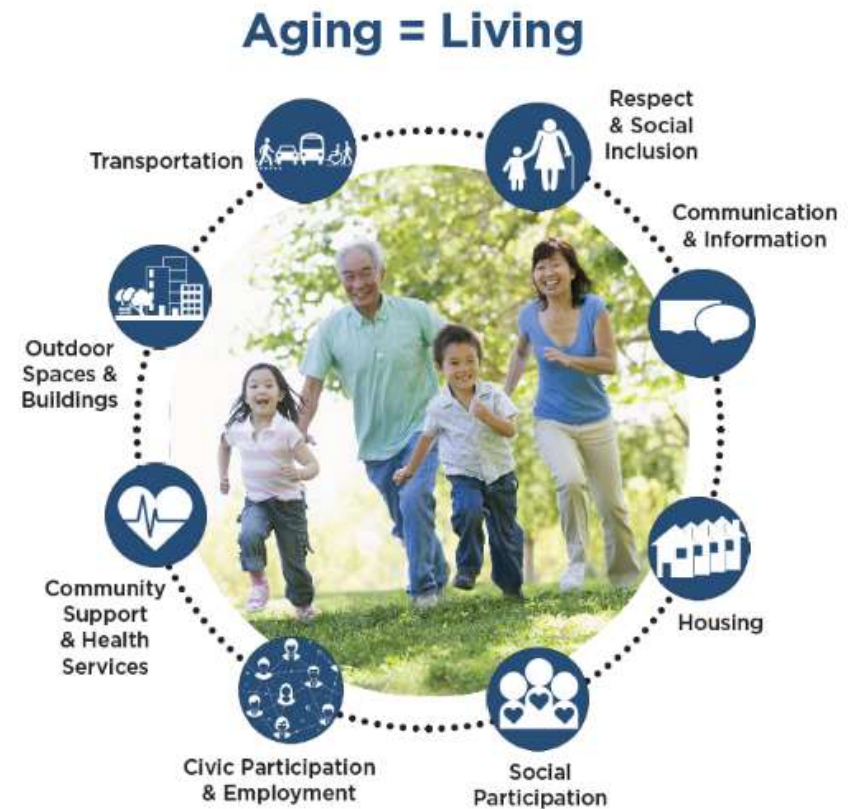


# Common Problems in Elderly

- **Physical Capacity – muscle weakness, painful joints, balance, etc.**
- **Cognitive impairment – deterioration in memory & executive function**
- **Degenerating sense organs – poor vision, hearing problem**
- **ADL – personal hygiene, dressing, transfer, walking, bathing, etc.**
- **Social deprivation – loss of family members or friends**
- **Psychological problem – loneliness, depression**
- **Environmental barrier – use of public transportation, technology, etc.**

# Gerontechnology Related:

- **Tele-health/medicine/rehabilitaton**
- **Lifelong learning**
- **Assistive & Rehabilitation technology**
- **Fall detection & prevention technology**
- **Psychosocial / Emotional related technology**
- **Environmental technology**



*(Fernandez-Caballero, 2017)*

# Gerontechnology Related:

- Information & Communication Technology (ICT)
- Internet, 5G
- Internet of thing
- Sensor technology
- Smart home
- Big data
- AI / Machine learning
- VR / AR / XR / ER



*(Fernandez-Caballero, 2017)*

2015

# Wearable Device



(a)

(9)

Smartwatches  
Wristbands

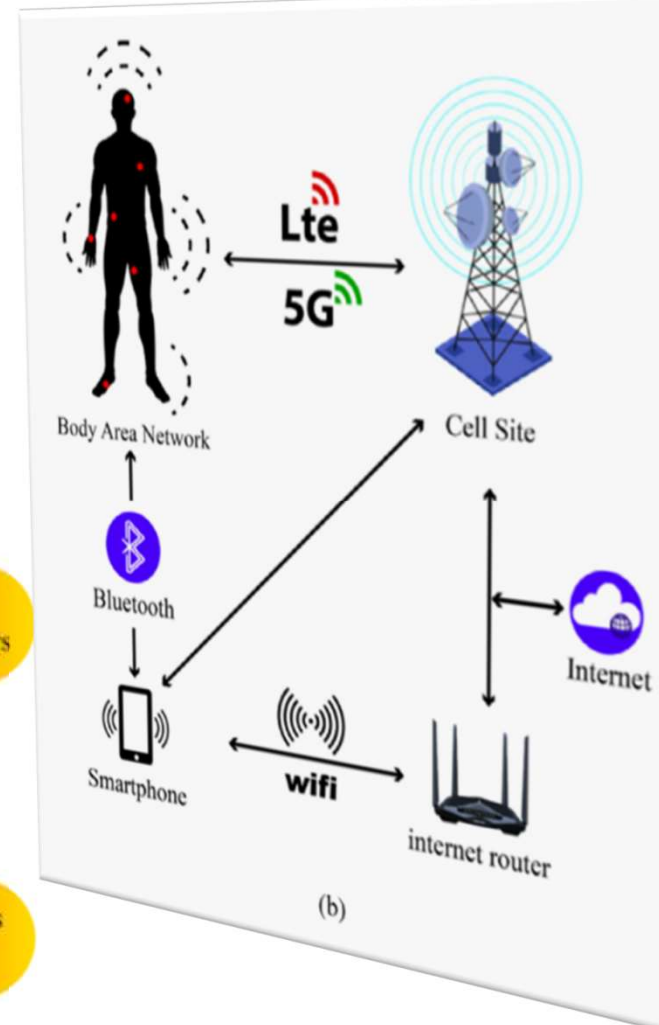
Smart eyewear  
Headsets

Smart Jewellery  
rings and chains

Smart Garments  
Smart T-Shirts and wears

Sensor Patches and  
E-tattoos

Smart wearable sensors  
smart bracelets



(b)

# Wearable Device

## Smart watch / Smart phone



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# Health Monitoring



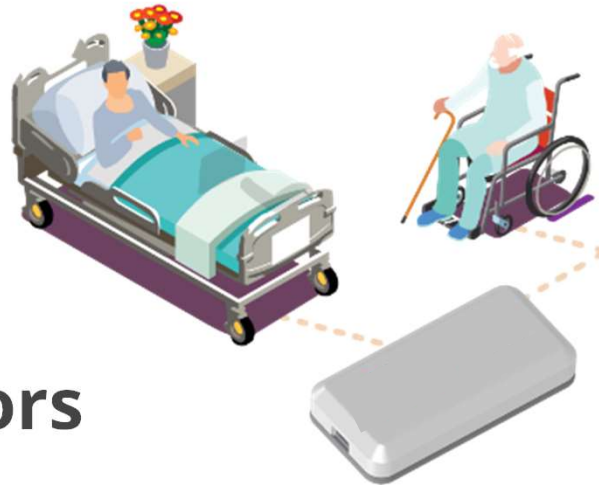
**Non-contact**

**Blue tooth**



**Smart design,  
Telehealth**

**Smart sensors**



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# Health Monitoring

## Health Data Collection Devices

Vital Sign Monitor with Rolling Stand and Bar Code Scanner for measurement of

- Non-Invasive Blood Pressure System
- Blood Glucose
- Ear Temperature
- Peripheral Oxygen Saturation



- ✓ Health-data Collection System which can be integrated with personal electronic health records.
- ✓ Abnormal data alert to caregivers

## Central Control and Monitoring System

Send out alert signal to the caregiver station by emergency call devices

Efficient care service delivery with existing user's record in system.

Monitor staff's service by recording the response time.



Display Panel

Nurse Station



Mobile Nurse App

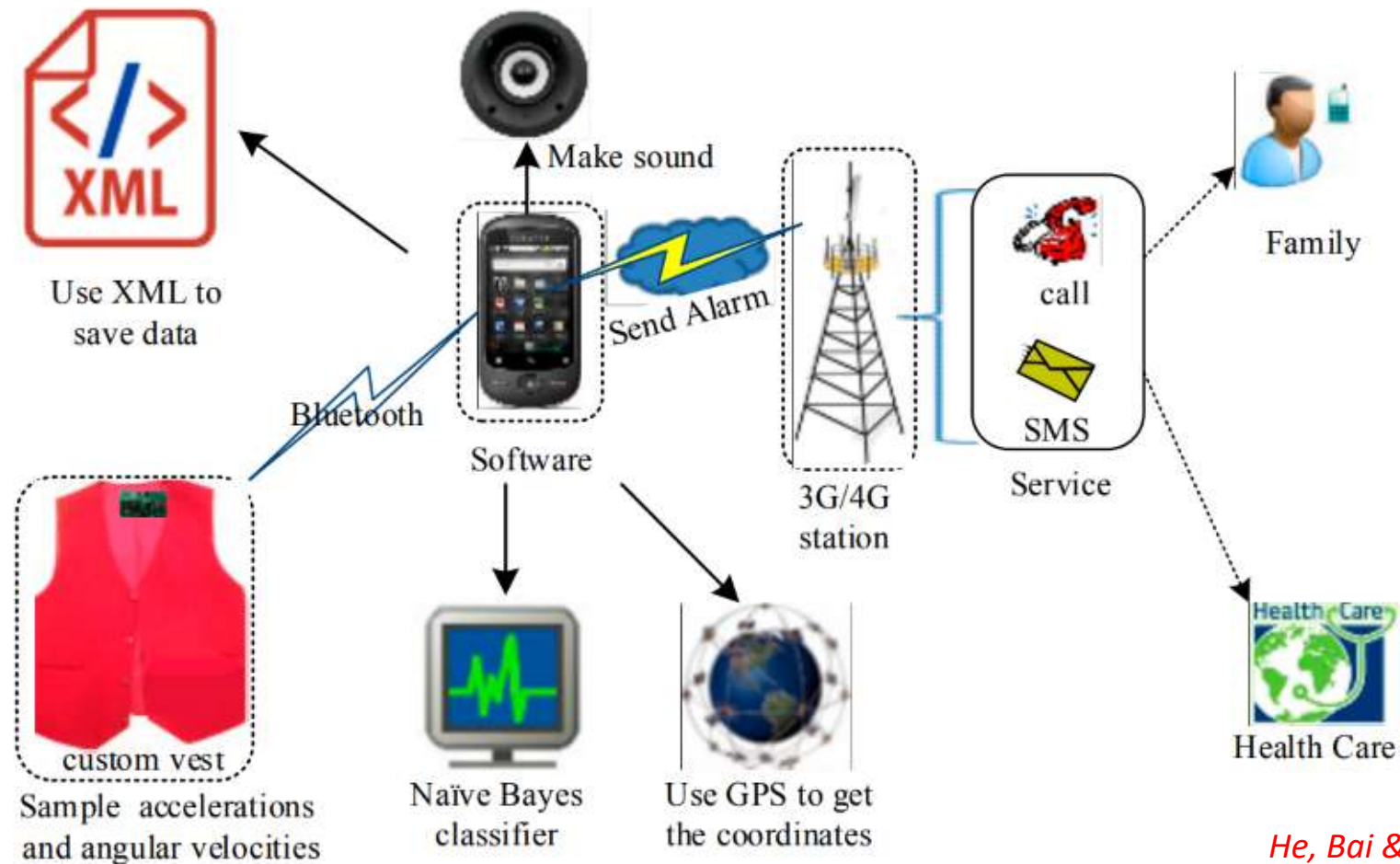


Call status & control at mobile phone

## System for Institutions

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# Example of a Fall Detection System



*He, Bai & Wang, 2017*

# Safety Monitoring

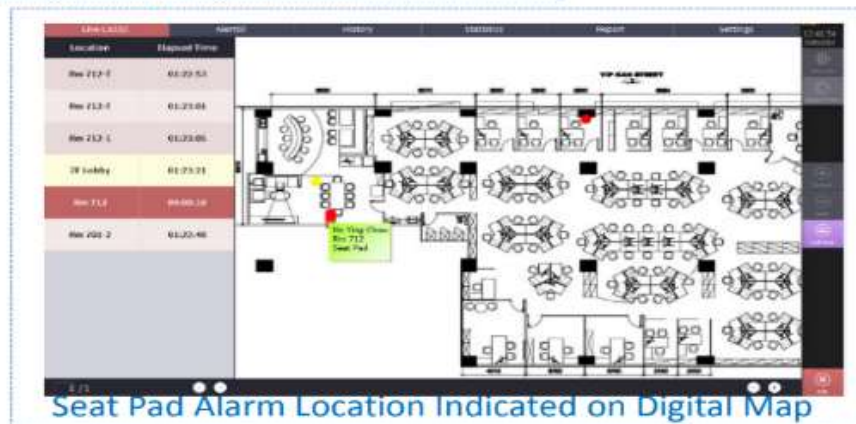
# Health monitoring system in aged home

## Seat Pad and Bed Pad

Integration of wireless signal & WiFi tag to predict the true position of the patient sitting on the wheelchair. Nurse will be alerted once the patient leaving the wheelchair to avoid falling down.



Seat Pad with wireless Transmitter



Seat Pad Alarm Location Indicated on Digital Map

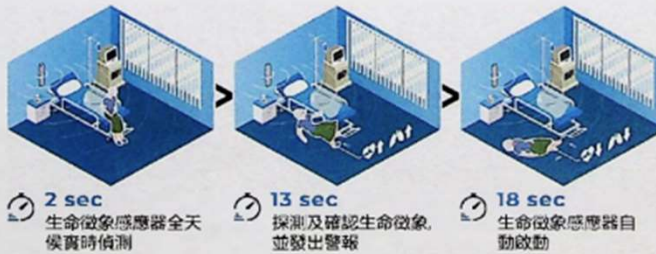
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# Fall Detection

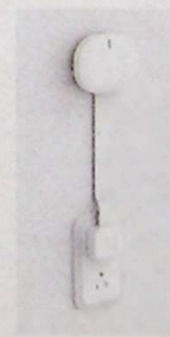
## 生命徵象感應器

非接觸式生命感應器，可持續地在特定空間內進行掃描，當有人跌倒或長時間處於靜止狀態，感應器會立即量度其心跳及呼吸頻率，並在生命徵象出現異常情況時提醒護理人員提供協助，確保生命安全。

專利生命徵象感應器適用於醫院及長者院舍等設施，以及酒店、商業大廈及公共設施的洗手間等隱蔽地點。在房間或浴室等跌倒意外的黑點設置生命徵象感應器，能避免服務對象在獨處時跌倒而不被發現。

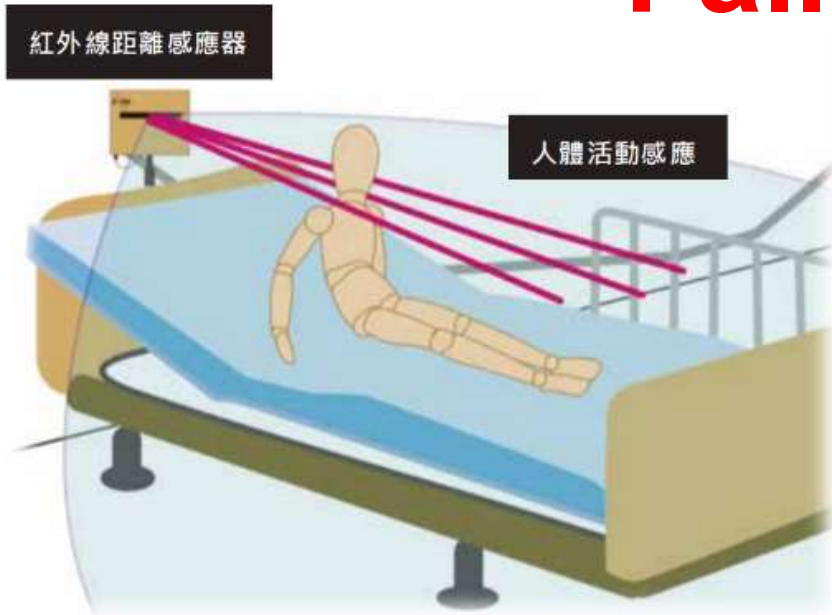


方便	高效	安全	隱私
<ul style="list-style-type: none"> <li>感應器設計簡潔</li> <li>安裝容易</li> <li>適合不同場景</li> <li>配合多方面使用</li> </ul>	<ul style="list-style-type: none"> <li>偵測室內有沒有人</li> <li>偵測臥床對象坐起來及離床的動作</li> <li>偵測跌倒意外</li> </ul>	<ul style="list-style-type: none"> <li>量度呼吸及心跳率</li> <li>遇到異常情況時發出警號</li> </ul>	<ul style="list-style-type: none"> <li>不會收錄影像或圖片</li> <li>絕對保障私隱</li> </ul>



*The above products are for illustration purpose only, there is no intention of recommendation*

# Fall Detection



\*模式 A 能偵測臥床者起床動作而觸發叫喚系統發出警報。這模式透過兩組紅外線傳感器能有效地偵測臥床人士是否起床及減少發出錯誤警報次數。

## Infrared

### 模式 B 及 C

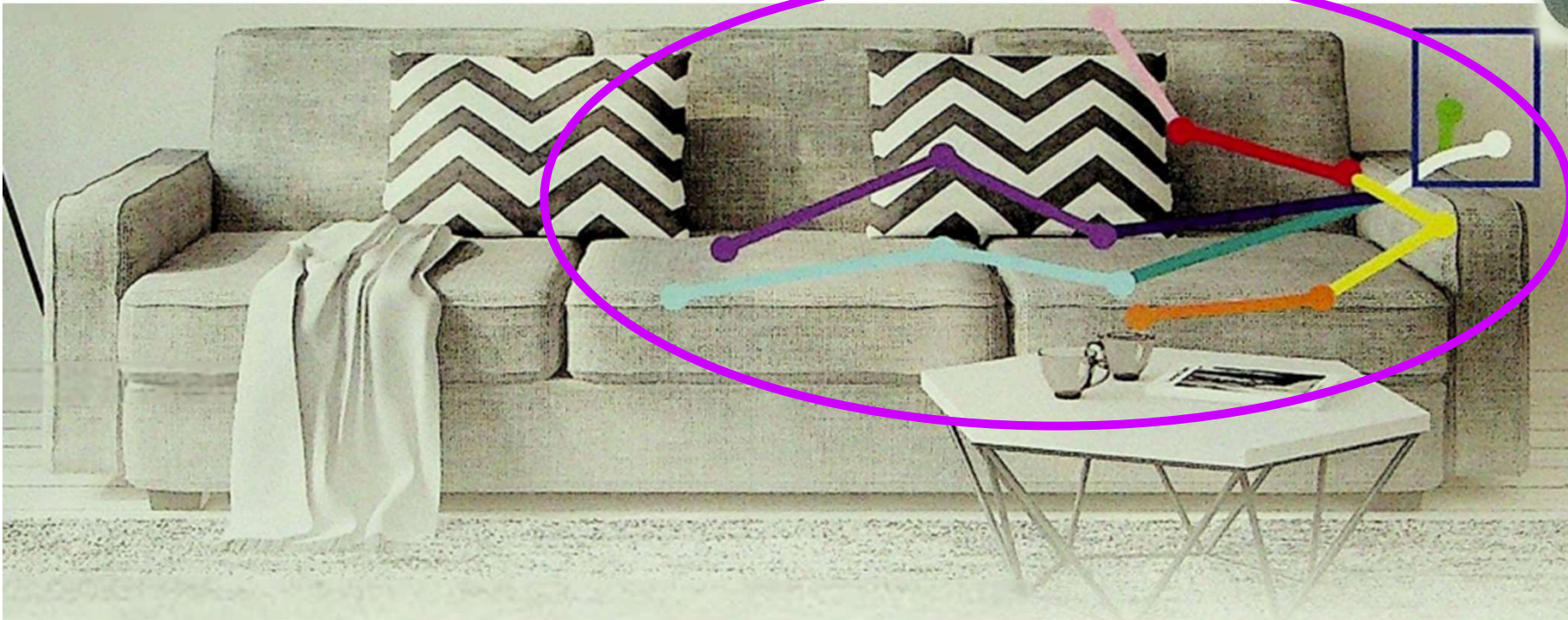
- \*模式 B 主要針對偵測臥床人士的上身位置從而偵測潛在從床上跌倒的機會。
- \*模式 C 主要幫助偵測臥床人士潛在的遊走情況。



*The above products are for illustration purpose only, there is no intention of recommendation*

# Fall Detection

## Privacy



*The above products are for illustration purpose only, there is no intention of recommendation*

# Companion Robots

Emotional  
aspect



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# Companion Robots

**陪伴長者**  
高齡者生活品質、  
人及護理人員的負擔

**安全確認**  
遙距知識長者動態, 慎防意外發生

**娛樂影音**  
為長者提供  
多元化的娛樂及網上即時資訊

**遙距探訪**  
透過內置鏡頭與親友進行  
視像通話與世界聯繫,  
引導長者體驗智慧生活

**語音操控**  
簡易語音操作,  
開啟多元便利長者服務



## 4大功能 Functions

為院舍及親屬提供多元化的服務  
Provide an upgrade to caregiving services

### 遙距探訪 Virtual visits

- 13 MP 高清鏡頭
- 親屬透過手機遙控機器人進行遙距探訪
- 13 MP High-Resolution camera
- Relatives can carry out virtual visits through Tomi Mobile App

### 晚間巡房 Room Patrols

- 中央監控系統操作
- 到達不同房間巡邏
- 更貼心跟進院友
- Controlled by central system
- Ward patrol conducted through predetermined schedule
- More frequent check-up

### 娛樂影音 Audio-Visual Entertainment

- Android 設計為藍本
- 支援 Google Play Store 應用程式, 為院友提供娛樂和多媒體資訊
- Android operational framework
- Provide user-friendly access to multimedia

### 語音操控 Voice Control

- 用戶可透過廣東話語音與機器人互動
- 有便對科技產品不熟悉的長者
- Interact with in-built voice control through multiple languages
- Convenient for non-tech-savvy users



*The above products are for illustration purpose only, there is no intention of recommendation*

# Touch and Music

Emotional  
aspect



接觸



握持



摩擦



敲擊



揉捏

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# Global Context

# International Collaborations

## World RE & AT Organizations



**REAT Light Up Lives**

1-5 Dec 2020 gSIC session  
5-7 Dec 2020 Conference session

Taipei, Taiwan.



14<sup>th</sup>  
**i-CREATE**  
**2020**  
CONFERENCE

International Convention on Rehabilitation  
Engineering & Assistive Technology

## 世界輔助技術組織聯盟

### Opening address

**Prof. Dr. Luc de Witte**

*President*

*Global Alliance of Assistive Technology  
Organizations*





2000 Tokushima Agreement  
AAATE, ARATA, RESJA,  
RESNA

2016 International Alliance  
of Assistive Technology  
Organisations (IAATO)  
RESKO and TREATS joining

2019 Four more  
organisations joining:  
ATIA, EASTIN, BATA, AATA



*Dr. Luc de Witte, 2020*



## Mission

We Believe  
in a world where all  
people can access  
the assistive  
technology they  
need.

# Why global cooperation?

- Still many people that can benefit from it lack access to AT.
- AT is a typical area where we can learn from each other's experiences.
- Together we can support the development of standards, of training, of good practice, of policy.
- Together we can have more influence on choices of governments and international organisations.

There is a need for a global unifying platform where different AT organisations can coordinate their efforts.

# RESNA

## Rehabilitation Engineering and Assistive Technology Society for North America

### RESNA 2023 Conference



## Who is RESNA?

- The
- Tec
- Fo
- A
- I

### Our Me

- *Rehabilitation Engineers specialists*
- *Physical, Occupational, a*
- *Researchers*
- *Educators in AT*
- *Policy advocates*
- *Product developers*
- *Medical professionals*
- *Special education teache*
- *Students*

*Promoting technology solutions for people with disabilities*

[resna.org](http://resna.org)

## What do we do?

### WORK TO PROMOTE AND IMPROVE:

- Research
- Professional development
- Quality AT services and products
- Public Policy
- International relations

25-28 July 2016 at Queen Sirikit National Convention Center, Bangkok, Thailand

**i-CREATE 2016**



10<sup>th</sup> International Convention on Rehabilitation Engineering & Assistive Technology

# The key role of assistive technology information - a global challenge

*Renzo Andrich*

*IRCCS Fondazione Don Carlo Gnocchi, Milano Italy*

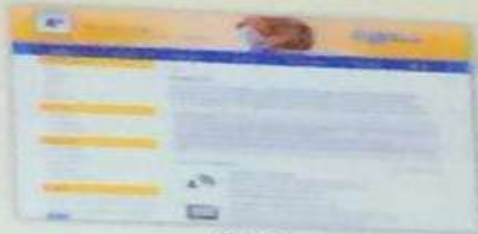
*President, EASTIN Association*

Fondazione  
**Don Carlo Gnocchi**  
Onlus

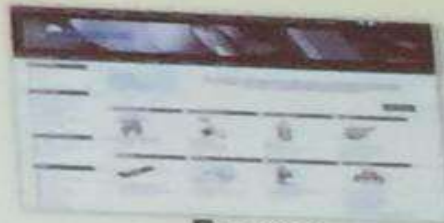
CIT - Centro di Innovazione e Trasferimento Tecnologico  
CIT - Centre for Innovation and Technology Transfer



# Assistive Technology Information systems in Europe



**Italy**  
[www.portale.siva.it](http://www.portale.siva.it)



**France**  
[www.handicat.com](http://www.handicat.com)



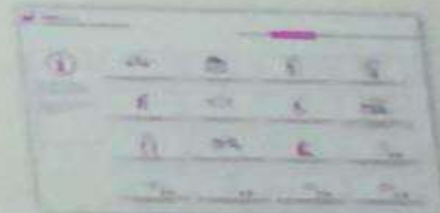
**Germany**  
[www.rehadat.de](http://www.rehadat.de)



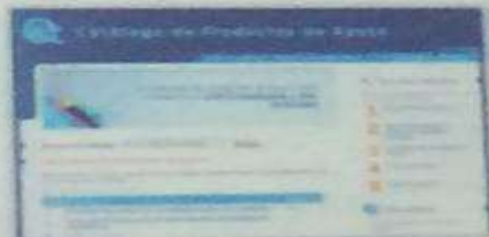
**Denmark**  
[www.hmi-basen.dk](http://www.hmi-basen.dk)



**United Kingdom**  
[www.dlf-data.org.uk](http://www.dlf-data.org.uk)

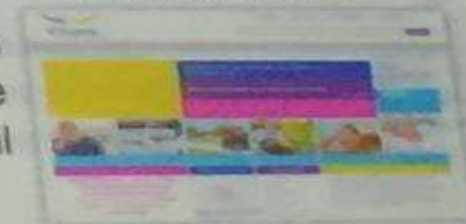


**Belgium**  
[www.vlibank.be](http://www.vlibank.be)



**Spain**  
[www.catalogo-ceapat.org](http://www.catalogo-ceapat.org)

**The Netherlands**  
[www.hulpmiddele  
nwijzer.nl](http://www.hulpmiddele<br/>nwijzer.nl)



## Impact of the EASTIN network

- National information systems are harmonized
- Partners exchange information, expertise, strategies, policies
- A window is provided on the EU AT market, accessible to everybody thanks to linguistic functionalities
- AT products are soon known all over Europe, even if supplied by small companies or individual developers
- It is possible to compare products across countries
- Citizens of countries that have no national database have the opportunity to access information
- Help fulfill the UN Convention in relation to the right to information on assistive technology (art. 4/h)

交換資訊

推廣速度

產品比較

知訊權利



### **Assistive Technology**

---

- ❖ Augmentative and Alternative Communication (AAC)
- ❖ Blind / Low Vision
- ❖ Computer, Mobile Device and Web Access
- ❖ Deaf and Hard of Hearing
- ❖ Environmental Control
- ❖ Mobility Aids

### **Rehabilitation Technology**

---

- ❖ Cognitive Training & Assessments
- ❖ Brain Computer Interface
- ❖ Mixed Reality System
- ❖ Neurorehabilitation Technology
- ❖ Prostheses & Orthoses

### **Biomedical Science & Technology**

---

- ❖ Stroke, Spinal cord Injury, Traumatic Brain Injury, Cerebral Palsy, Dementia
- ❖ Musculoskeletal Injury, Amputation, Respiratory Issues, Gait & Balance, Motor Control
- ❖ Geriatric Rehabilitation, Paediatric Rehabilitation

### **Social & Lifestyle**

---

- ❖ Building & Public Transport Accessibility
- ❖ Disable Sports & Leisure Activities
- ❖ Employment & Training
- ❖ Inclusive Community
- ❖ Public Policy & Service Delivery

25-28 July 2016 at Queen Sirikit National Convention Center, Bangkok, Thailand **i-CREATE 2016**



10<sup>th</sup> international Convention on Rehabilitation Engineering & Assistive Technology



# i-CREATe2017 KOBE, JAPAN

i-CREATe2017

### ROLLER-CLOTHER

Clear flexibility storage solution

Inspired by the elegance of rolling bookshelves we developed this flexible clothing system. This innovative storage solution is easy and fast to install in the workplace and is suitable for storage systems. The Roll-a-Clothes offers convenience and saving by rolling out the items instead of hang.



**KEY FEATURES**

- Rolling mechanism for easy access
- Clear shelves for visibility
- Adjustable height
- Easy to install

**TRIPLE USES**

Rolling clothes rack for office, home, school, hospital, etc.

**HOW TO USE**



**VARIANTS**



### Integrated Training Staircase and Parallel Bars System

Singapore Institute of Technology

Team Japan: 2016/2017  
Team Member: Dr. Muneaki Sano



**OBJECTIVE**

To be the multipurpose facility (exercise and ADL) for the use of the elderly (to improve the body and cognitive function) and to provide a safe and comfortable environment for the elderly (to improve the quality of life) through the use of the integrated staircase and parallel bars system.

**CHARACTERISTICS**

As a facility for training, exercise, and ADL, the system is designed to be used by the elderly and to be used by the elderly in a safe and comfortable environment. The system is designed to be used by the elderly and to be used by the elderly in a safe and comfortable environment.

**DESIGN REQUIREMENTS**

- Weight: 100kg
- Height: 1.5m
- Length: 2.0m
- Width: 0.5m
- Material: Aluminum
- Color: Silver
- Finish: Powder Coating
- Assembly: Easy

**FUNCTIONAL REQUIREMENTS**

- Support the weight of the elderly
- Provide a safe and comfortable environment for the elderly
- Provide a safe and comfortable environment for the elderly
- Provide a safe and comfortable environment for the elderly
- Provide a safe and comfortable environment for the elderly

**CONCLUSION**

The system is designed to be used by the elderly and to be used by the elderly in a safe and comfortable environment. The system is designed to be used by the elderly and to be used by the elderly in a safe and comfortable environment.

### DS2-2 Liberty of wheel



Liberty of wheel including other from being able to use any kind of chair that facility the DD should be go beyond that exclusion and make it an inclusive design as an attitude connecting the people that they need to face on entire new revolution and bring to people that ability because of liberty of wheel not only can support for long term but also ensure a large sum of QOL.

**DESIGN CONCEPTS**

- Easy to use
- Lightweight
- Adjustable
- Comfortable
- Safe
- Stable
- Reliable
- Easy to maintain

**DESIGN REQUIREMENTS**

- Weight: 10kg
- Height: 1.2m
- Length: 0.8m
- Width: 0.5m
- Material: Aluminum
- Color: Silver
- Finish: Powder Coating
- Assembly: Easy

**CONCLUSION**

The system is designed to be used by the elderly and to be used by the elderly in a safe and comfortable environment. The system is designed to be used by the elderly and to be used by the elderly in a safe and comfortable environment.

# i-CREATe2017 KOBE, JAPAN

i-CREATe2017



OT  
職業治療

## Biomedical Engineering 生物醫療工程



Design  
設計

# 2019 i-CREATe gSIC



# *Coalition on Rehabilitation Engineering & Assistive Technology of Asia (CREATe Asia)*



# *CREATe Asia*

## Mission

To promote the advancement and adoption of Rehabilitation Engineering & Assistive Technology for people in Asia.

## Objectives

- A common platform for REAT stakeholders to share resources, knowledge & experiences
- A healthy ecosystem which eventually lead to cost effective and more Asian relevant REAT products
- Collaborations in the research and innovation of REAT solutions across Asia



Global report on  
assistive technology

辅助技术全球报告



世界卫生组织



# Global Report on Assistive Technology

Key findings and recommendations  
for i-CREATE 2022

**Chapal Khasnabis**

khasnabisc@who.int

@ChapalKhasnabis



# Access to assistive technology

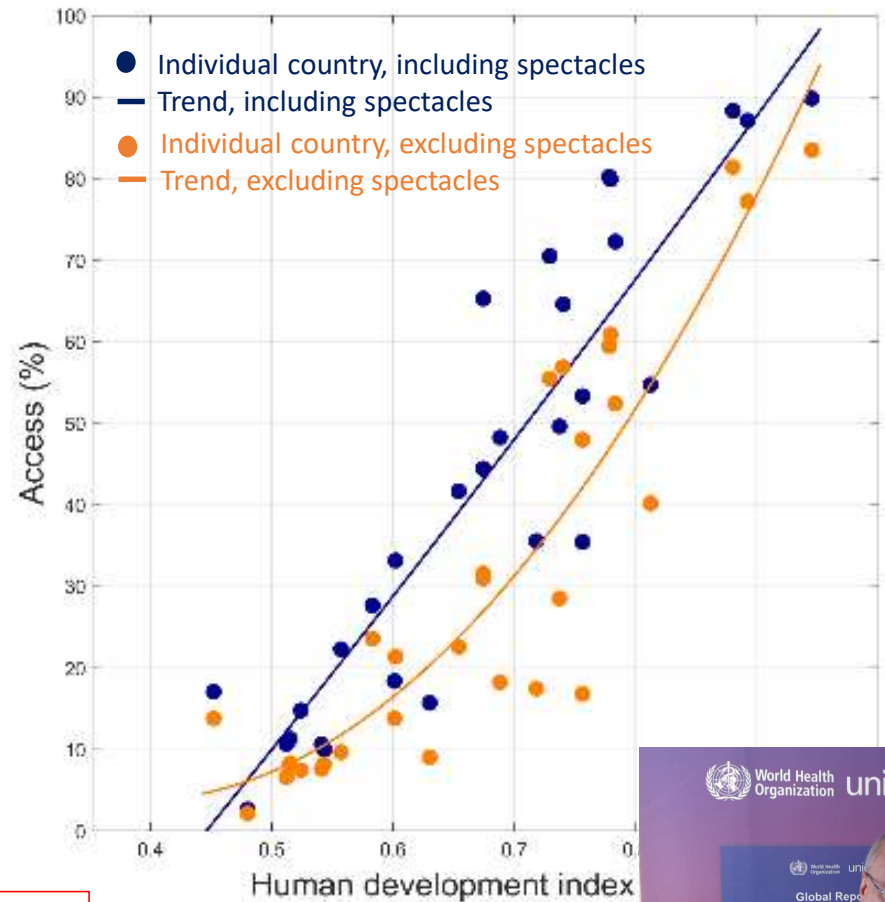
Inequity in access to assistive technology across countries is huge.

From 3% to 90%

From 2% to 84%

Access: prevalence of met need as a proportion of prevalence of need in the population

很多有需要人士未能获得辅助技术





# Moving forward

1. Improve access to assistive technology within **all key development sectors**

2. Ensure that **assistive products are safe, effective and affordable**

3. Enlarge, diversify and improve **human resource capacity**

4. Actively **involve users** of assistive technology and their families



5. Increase **public awareness and combat stigma** surrounding assistive technology use



6. Invest in **data and evidence-based policy**

7. Invest in **research, innovation** and an enabling **ecosystem**

8. Develop and invest in **enabling environments**

9. Include assistive technology in **humanitarian responses**

10. Provide technical and economic assistance through **international cooperation** to support national efforts





## WFOT参与全球有关AT的合作

World Federation of  
Occupational  
Therapists and Global  
Cooperation on  
Assistive Technology

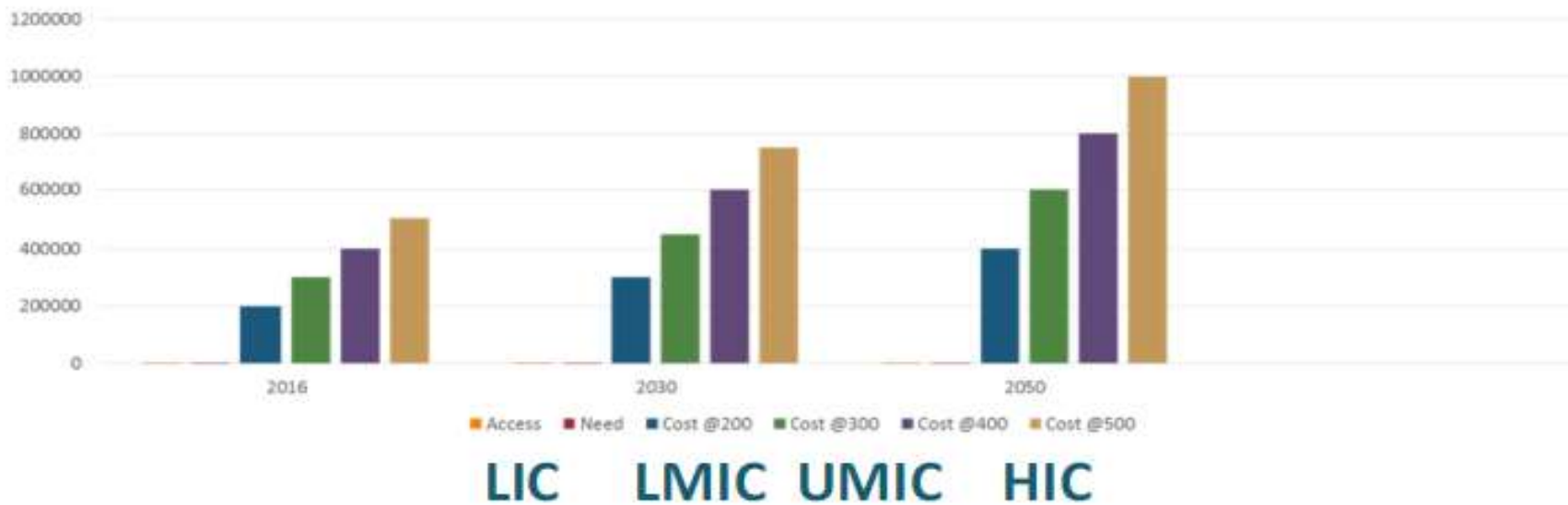


Marilyn Pattison, WFOT  
President





# \$200 Billion to \$1 Trillion market AT market



*Marilyn Pattison, President, WFOT*



**GATE**



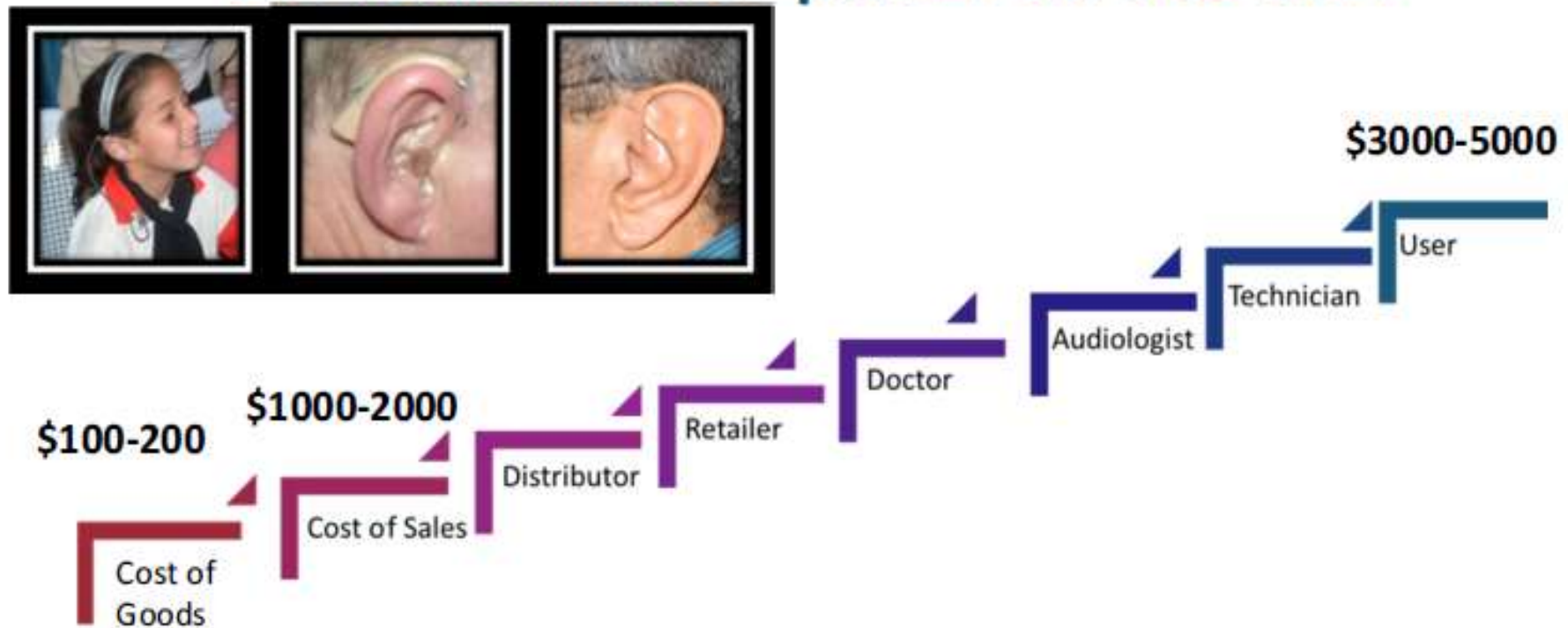
## 2. Problem: cost - over-priced products



*Marilyn Pattison, President, WFOT*



## 2. Problem: over-priced service cost



*Marilyn Pattison, President, WFOT*



### 3. What WHO is doing? APL



Learning, Doing, and Inspiring

#### Priority Assistive Products List

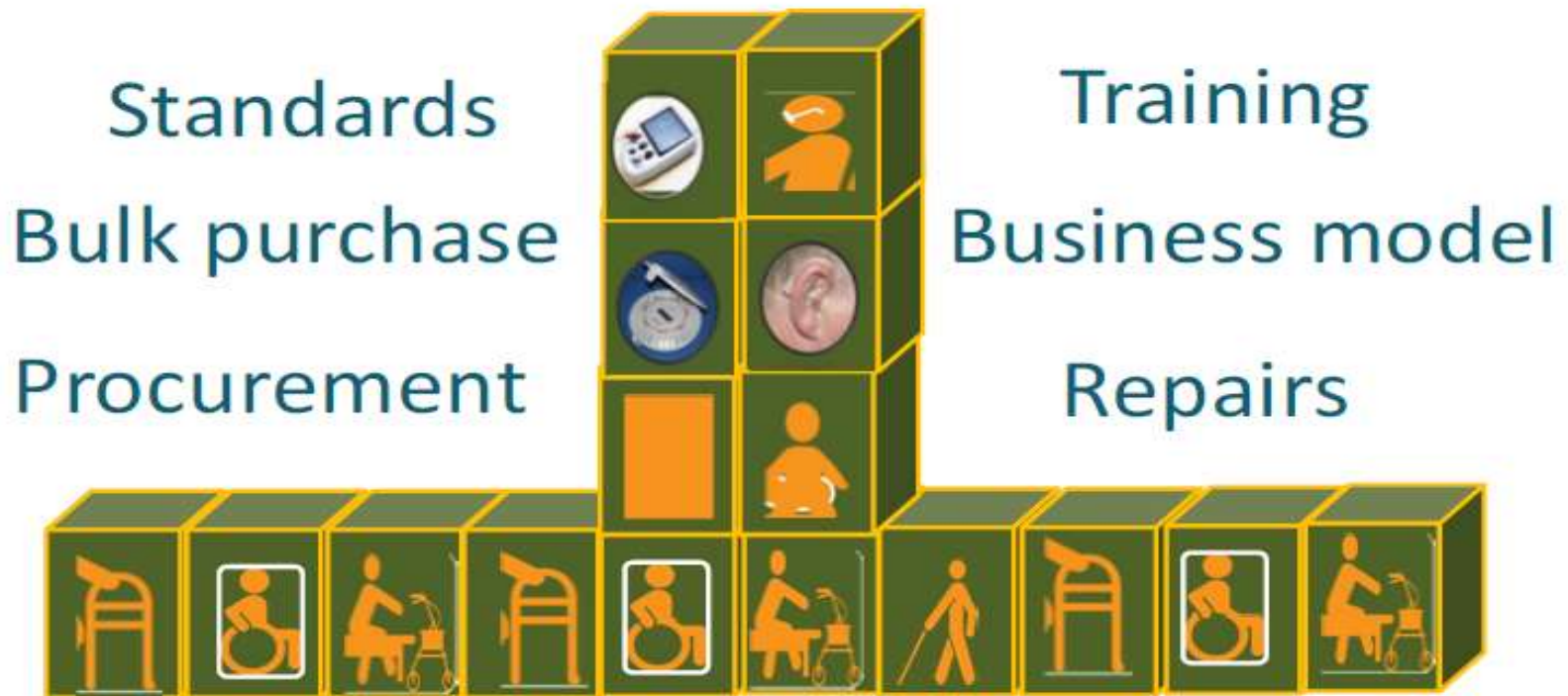
Improving access to assistive technology for everyone, everywhere

USAID The GATE Initiative



Taking steps to make quality assistive products affordable and available

*Marilyn Pattison, President, WFOT*



3. 25 Priority assistive products box for CBR or  
PHC

*Marilyn Pattison, President, WFOT*



### 3. 25 Priority assistive products and spares - APL box

Magnifiers, optical	Hearing aids (digital) and batteries	Walking frames/walkers	Alarm signalers with light/sound/vibration	Watches, talking/touching
Reading glasses	Crutches, elbow	Chairs for shower/bath/toilet	Time management products (magnetic white board)	White canes
Pill organizers	Crutches, axillary	Pressure relief cushions	Orthoses, lower limb (off-the-shelf AFO)	Communication boards/books/cards
Therapeutic footwear; diabetic, neuropathic, orthopaedic	Canes/sticks	Ramps, portable	Audioplayers with DAISY capability	Tripod, quadripod sticks
Incontinence products, absorbent	Rollators	Wheelchairs, manual for active use	Braille writing equipment/Braille slate and stylus	Clubfoot braces

*Marilyn Pattison, President, WFOT*

# AT is becoming more and more Important!



## Statistics on Disabilities in China

★ 6.34% of Chinese have disabilities—one in sixteen

★ A total of 85,020,000 have disabilities

Physical disability-24,720,000

Hearing disability-20,540,000

Visual disability-12,630,000

Psychiatric disability-6,290,000

Intellectual disability-5,680,000

Speech & language disability-1,300,000

Multiple disabilities-13,860,000



Statistics based on 2nd National Sample Survey conducted by CDPF in 2006

2006年的統計

中國殘疾人士  
占人口**6.34%**，  
約 八千五百萬

He Chuan

Department of Rehabilitation

China Disabled Persons' Federation (CDPF)



## An aging society of China

### ★ Population of the elderly (by end of 2013)

Over 60 - 202,430,000 (14.9% of total)

Over 65 - 131,610,000 (9.7% of total)

### ★ The trend of aging means increase of AT needs

to prevent injuries

to enhance functions

to live more independently

to ease burdens on families or caregivers, etc.



人口老化，  
對 **AT** 的需求大增

防跌

促進功能

獨立生活

減輕照顧者的負擔

He Chuan

Department of Rehabilitation

China Disabled Persons' Federation (CDPF)



## Challenges we are facing

- ★ The development of complex AT needs of persons with disabilities (not only basic needs we're try to meet)
- ★ Capacity building in all levels of service network  
Especially in basic service units
- ★ Development of AT professionals  
A long-term task
- ★ Standardization in assistive products and services  
Started by still have a long way to go



## 面對的困難

發展複雜AT的需求

建立不同水準服務網路

培訓AT專業人員

AT產品及服務的標準化

He Chuan  
Department of Rehabilitation  
China Disabled Persons' Federation (CDPF)



## Assurance of Service System

### ★ A nationwide service network

3 regional AT resource centers  
33 provincial AT service centers  
300 municipal AT service centers  
2000 county-level AT service units  
Villages, communities...



服務系統

全國性服務網路

AT資源/服務中心



He Chuan  
Department of Rehabilitation  
China Disabled Persons' Federation (CDPF)



## Building of workforce

### ★ Professional training and certification

More than 10,000 professionals have been trained.

Certification system for AT practitioners has been set up.



建立人手團隊

專業訓練及認證

已訓練超過一萬  
名專業人士

建立AT專業人員認證系統

He Chuan

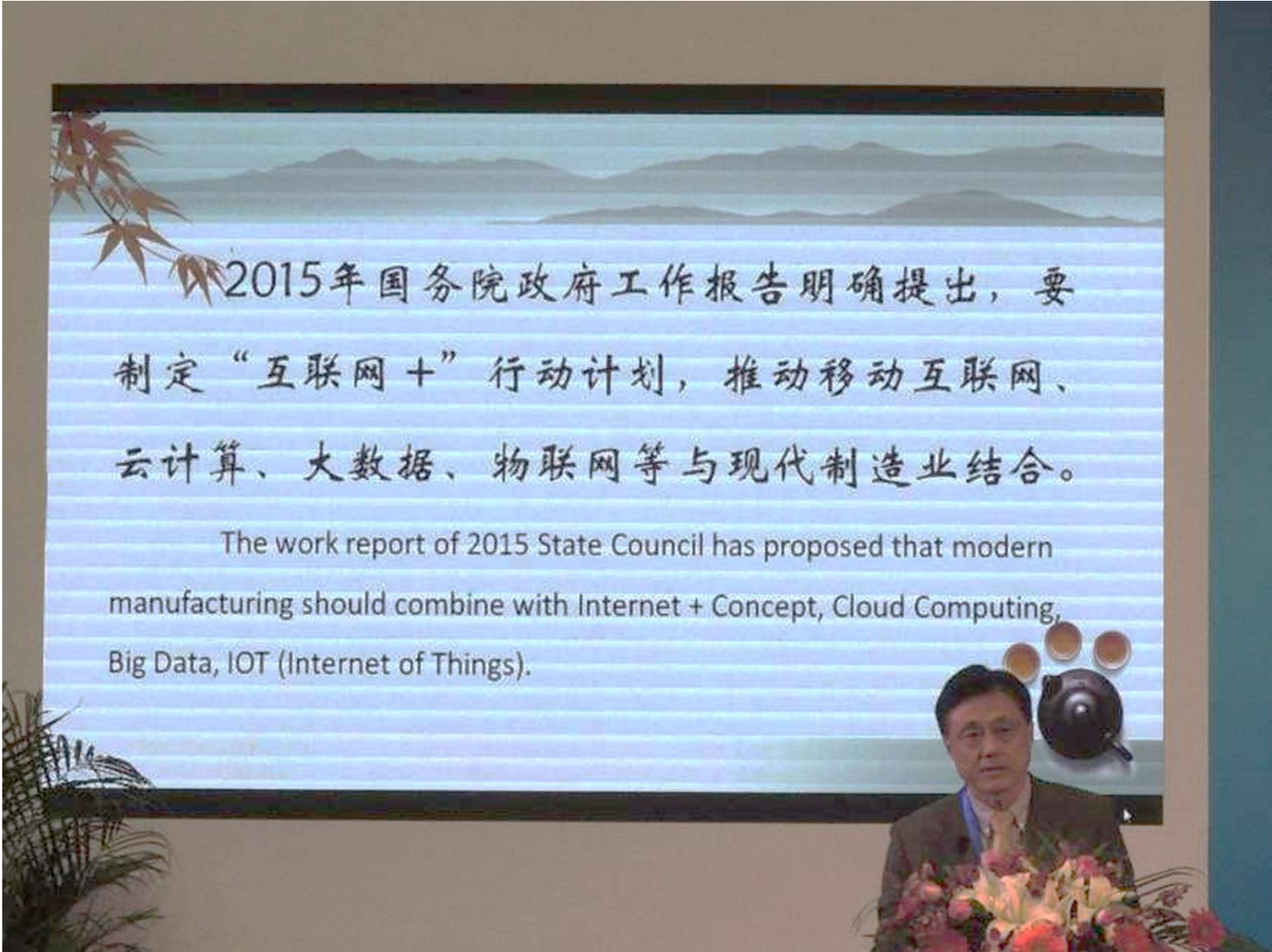
Department of Rehabilitation

China Disabled Persons' Federation (CDPF)



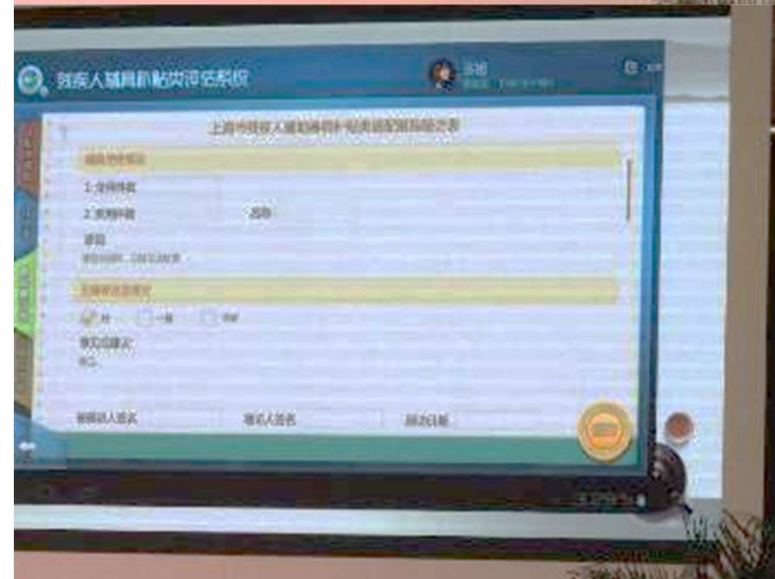
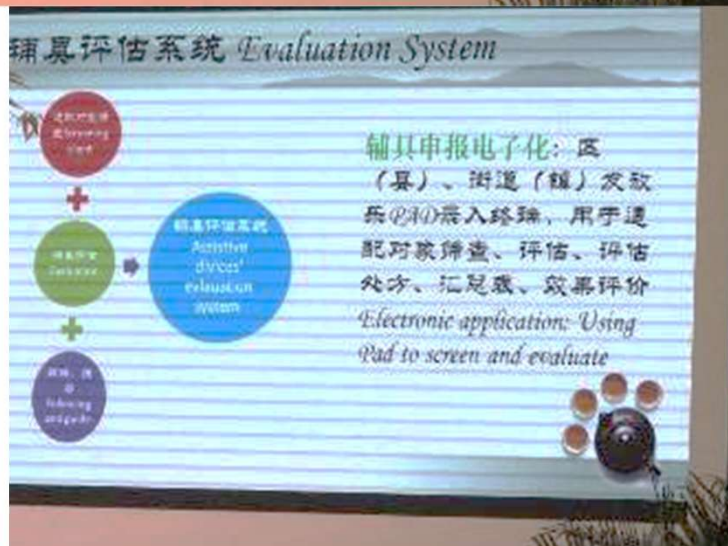
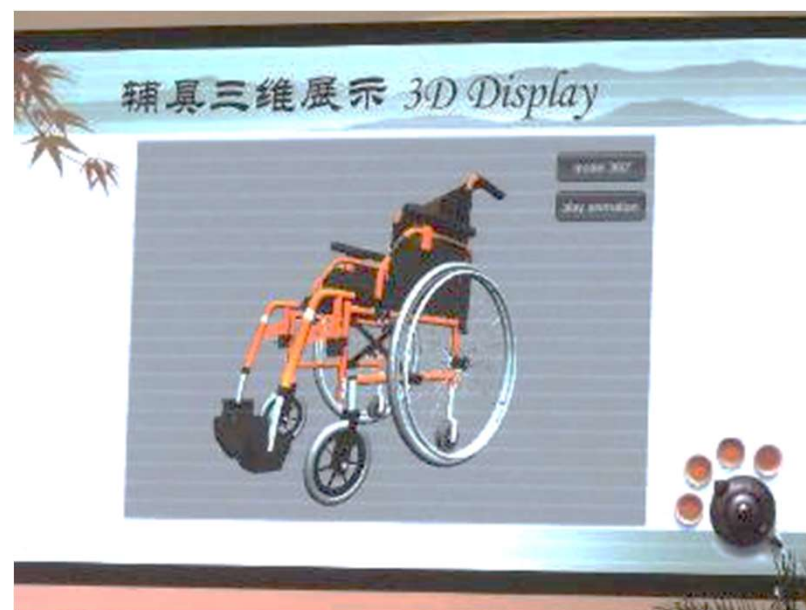
# China Disabled Peoples' Federation AT Centers





2015年国务院政府工作报告明确提出，要制定“互联网+”行动计划，推动移动互联网、云计算、大数据、物联网等与现代制造业结合。

The work report of 2015 State Council has proposed that modern manufacturing should combine with Internet + Concept, Cloud Computing, Big Data, IOT (Internet of Things).



Globalized  
Products

Reliable  
Quality

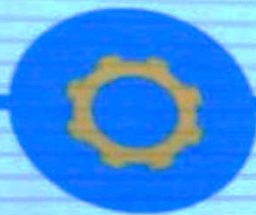
Lower  
Price

More  
Display  
Method

Compare  
price  
on-line



商品  
全球化



可靠的  
质量



优惠的  
价格



商品展现模式  
多样化

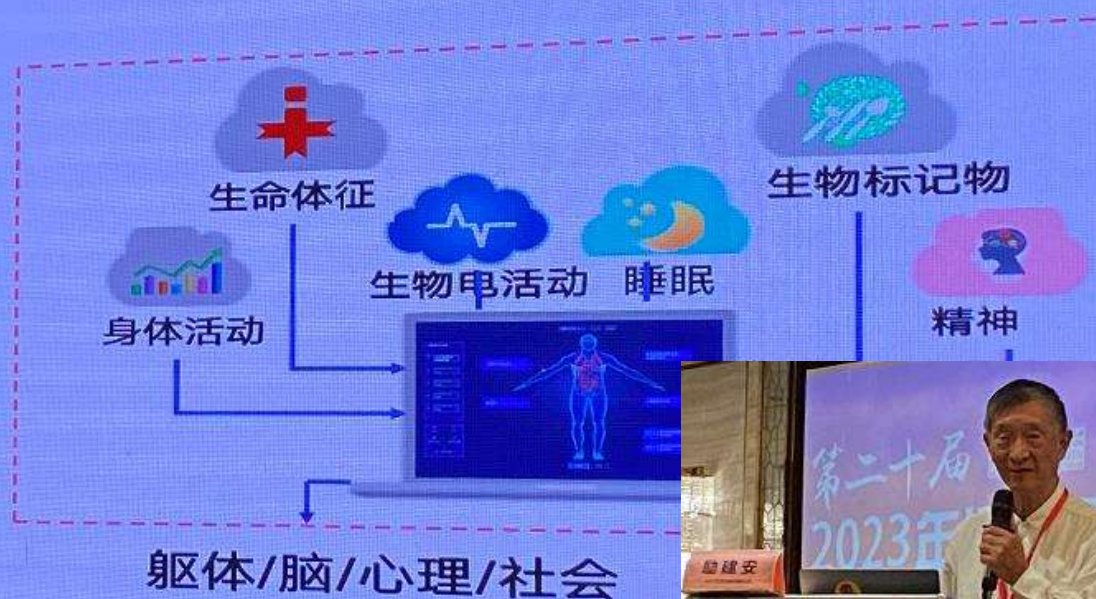


商品  
在线对比

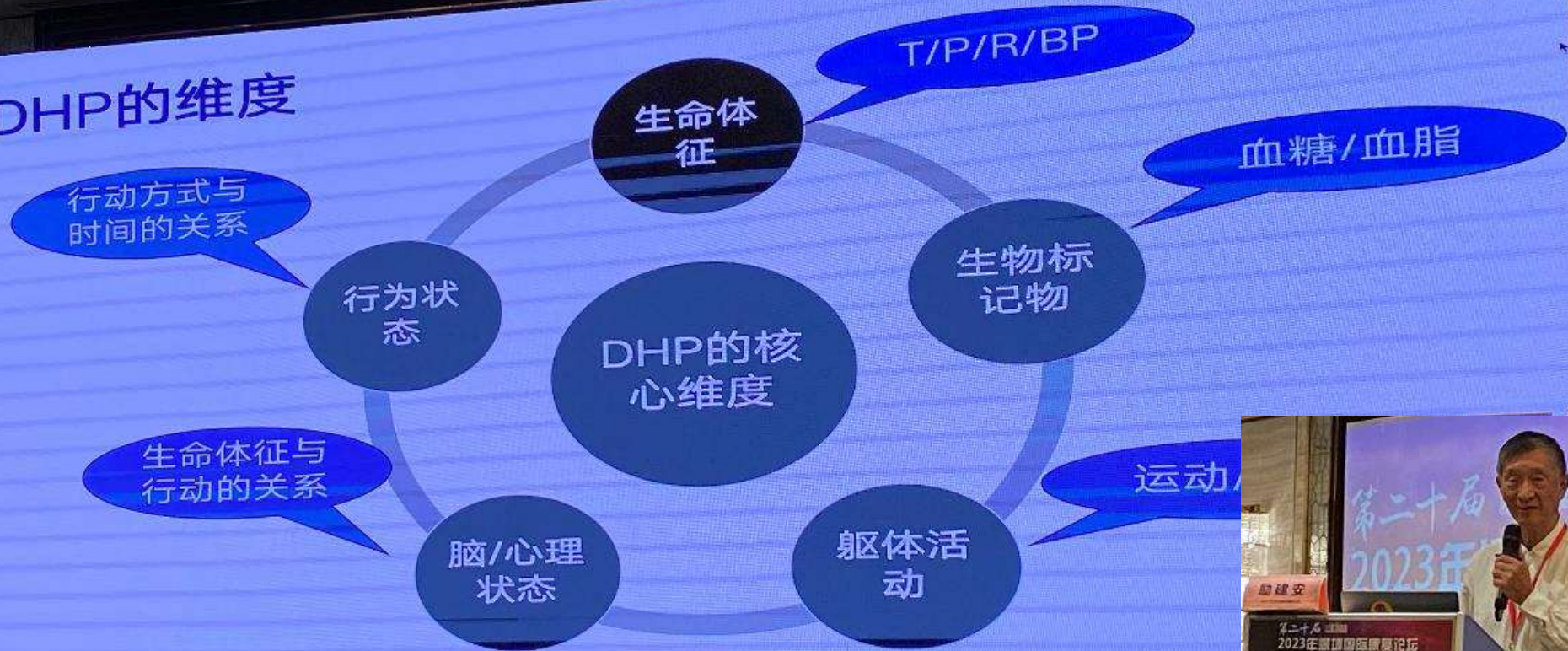
“商品展现模式多样化”

# 数字化健康画像 (DHP)

- ◆ Digital Health Portrait (DHP): 将健康状态用数字化画像的方式表述
- ◆ DHP: 可穿戴装备+人体物联网 (Human Internet of Things (HIoT))
- ◆ 目的: 实现连续数字化、定量化、个性化反映个体的健康指数。
- ◆ 用于: 健康和功能评定、医疗价值和质量的关键指标、协助卫生政策和医保政策制定、临床医疗和康复方案制定与调整等。



# DHP的维度



## 活力计 Vitality Meter

- 小型6轴惯性传感器 (0.5厘米厚度, 1平方厘米面积)
- 监测身体位置: 卧、直立(坐站)、走、跑
- 身体平衡状态
- 推算日常能耗
- 边缘计算和信号传输 (网关/手机/4G/5G)
- 实时/动态反映身体活力状态和行为
- 与生命体征和生化指标结合可以反映心理/精神/代谢
- 适用范围:

各类人群的生命活力监测、患者和老人病情数字化判断/诊断、临床/康复疗效分析、新型治疗/康复方法验证、医疗和长期照护保险给付依据、运动/健康的价值



# 人体物联网+可穿戴装备是数字健康画像的基石

05:45

## 可穿戴装备



Remote, continuous and real-time collection of vital signs (ECG, HR, breath, temp, BP, O2), motion and balance, daily activities

## 数字健康画像



Digitally expressing vital signs, physical, mental, social and daily living behavior

# 个人的数据 Digitalized patient monitoring in ward

2021-01-01 星期五 09:27:12 晴 10°C

上海物联网有限公司

人体物联网数字康复平台

## 基本信息

姓名: 李平 45岁  
ID: 18820886  
病房: 2-306 2床

## 康复团队

冯金强 医生  
邱泽芳 护士  
周江北 康复治疗师  
李伟 康复治疗师

## 实时动态

- 10:12:43 离开房间活动
- 08:26:12 呼叫护士

## 当前位置



## 体温监测 TEMP

当前体温: 36.2°C 今日平均体温: 37°C



## 心电监测 ECG

当前心率: 87 平均心率: 75 P: 87ms  
QRS: 90ms P-R: 128ms QRS: 0ms



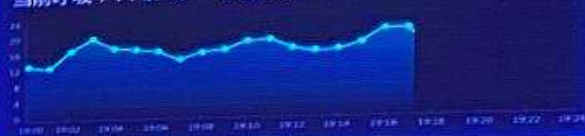
## 血压监测 BP

收缩压: 180mmHg 舒张压: 90mmHg



## 呼吸监测 RR

当前呼吸: 17次/分 平均呼吸: 18次/分



## 血氧监测 SpO2

血氧饱和度: 99% 脉率: 79bpm

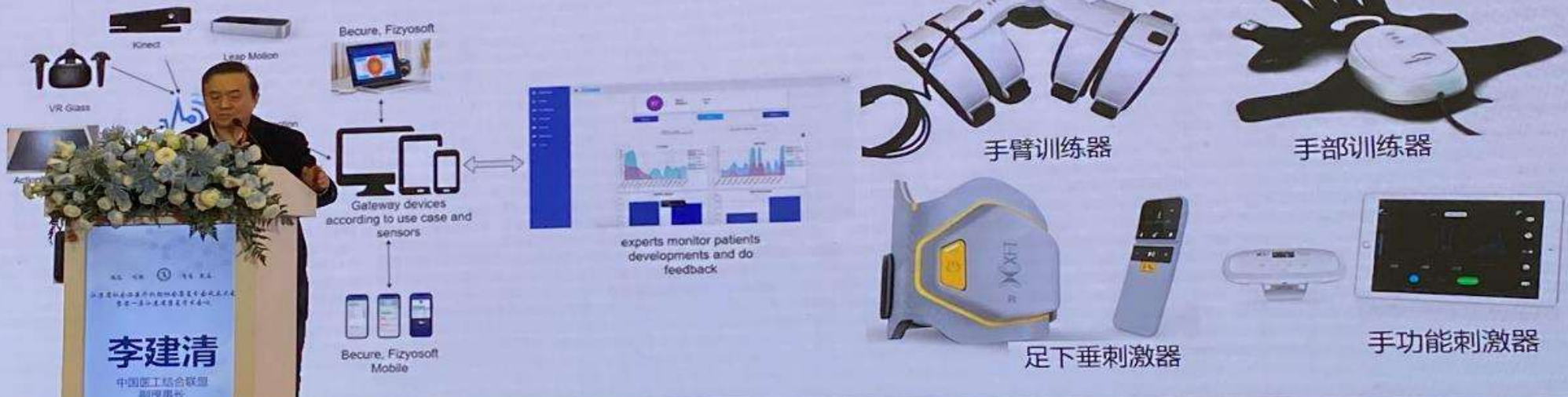
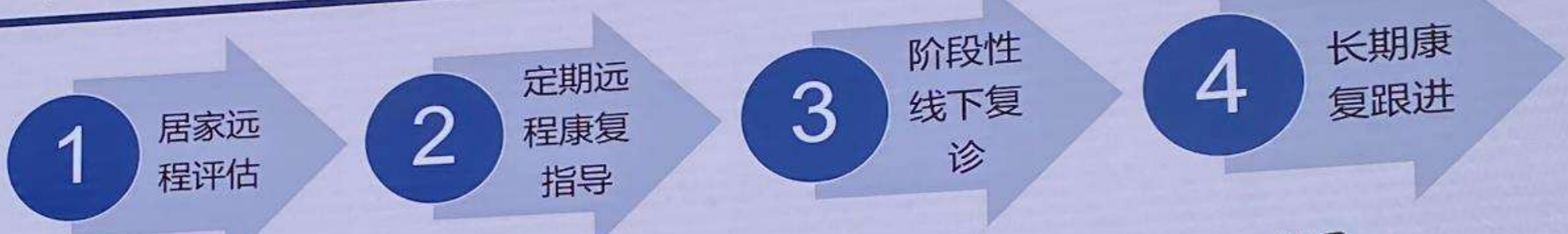


## 平衡姿态监测 Active

当前活动: 行走 摆动角:



# 4、远程康复



## 2、智能运动辅助/训练



04:44

Nanjing Medical University



智能假肢



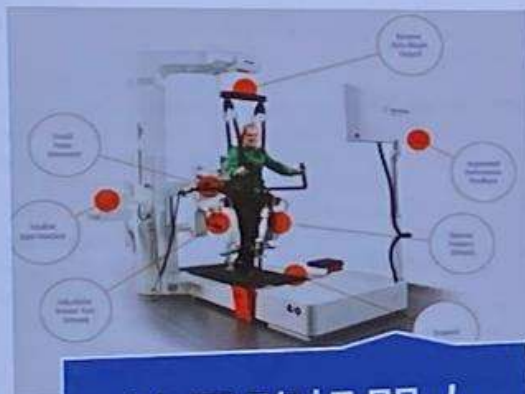
智能矫形器



智能助行器



智能轮椅



外骨骼机器人



软体机器人



可穿戴机器人



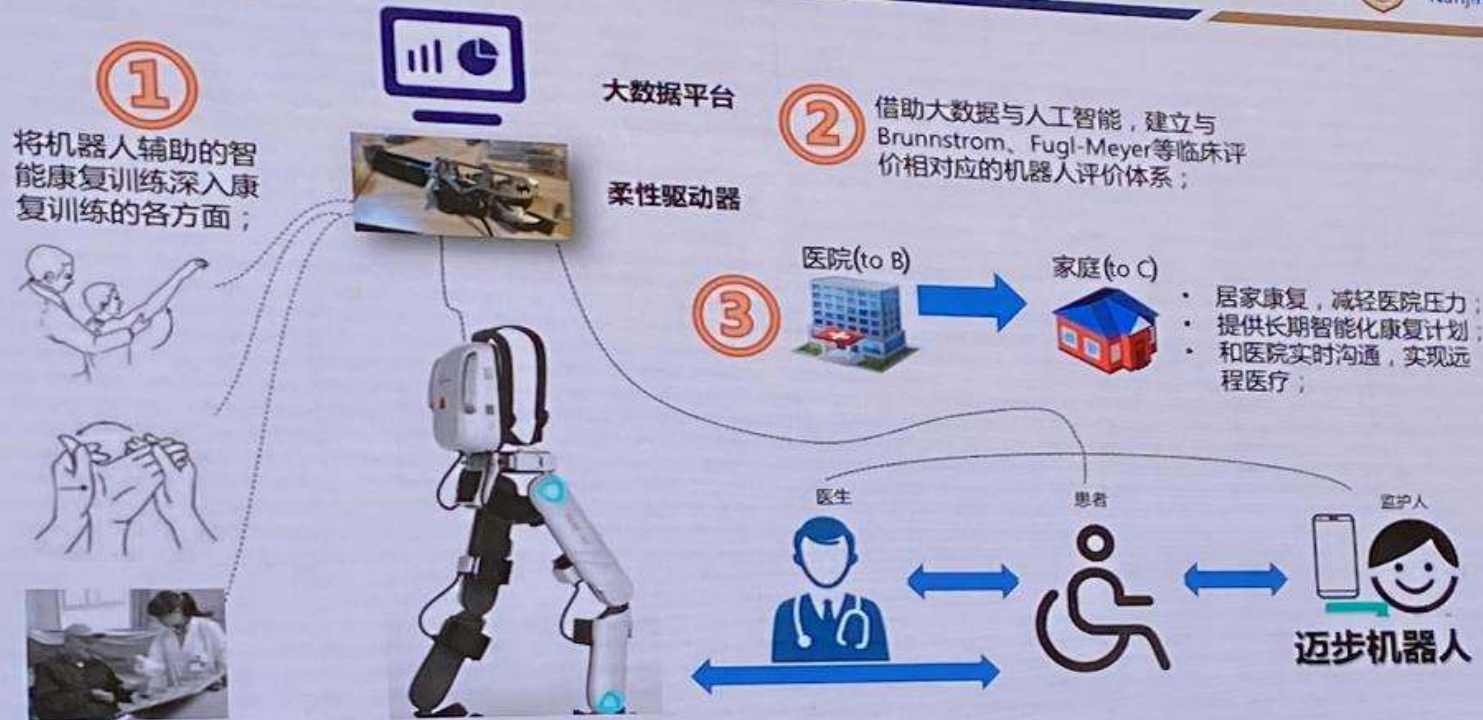
可穿戴生理

# 人工智能在康复机器人中的作用



03:16

Nanjing Medical University



机器人辅助康复训练：借助大数据与人工智能，逐步建立与临床评价相对应的评价体系  
适的临床干预方式，最终实现**个性化、精准化、智能化**康复训练。

# 预期成果形式

## 老年人虚拟现实认知康复训练系统



02:02  
Nanjing Medical University



增强现实式康复系统



洞穴式VR康复系统



头戴式VR康复系统



南京医科大学  
Nanjing Medical University

# 预期成果形式

## 针对主观认知下降老人 研发增强现实康复训练系统

现在是绿灯  
可以过街。  
心跳有点快，  
慢点走哦



南京医科大学  
中国医工结合联盟  
南京医科大学中心

**李建清**  
中国医工结合联盟  
副理事长

# 预期成果形式



01:2  
Nanjing Medical University

## 老年人虚拟现实 针对轻度认知障碍老人 研发洞穴式VR康复训练系统

主观

认知场景交互  
-视觉、语音、手势

活动范围  
-有氧运动  
-安全可控

- 环幕视觉
- 穿戴式柔性少数导联  
脑电、心电、皮电、血氧
- 轻量化力触觉交互

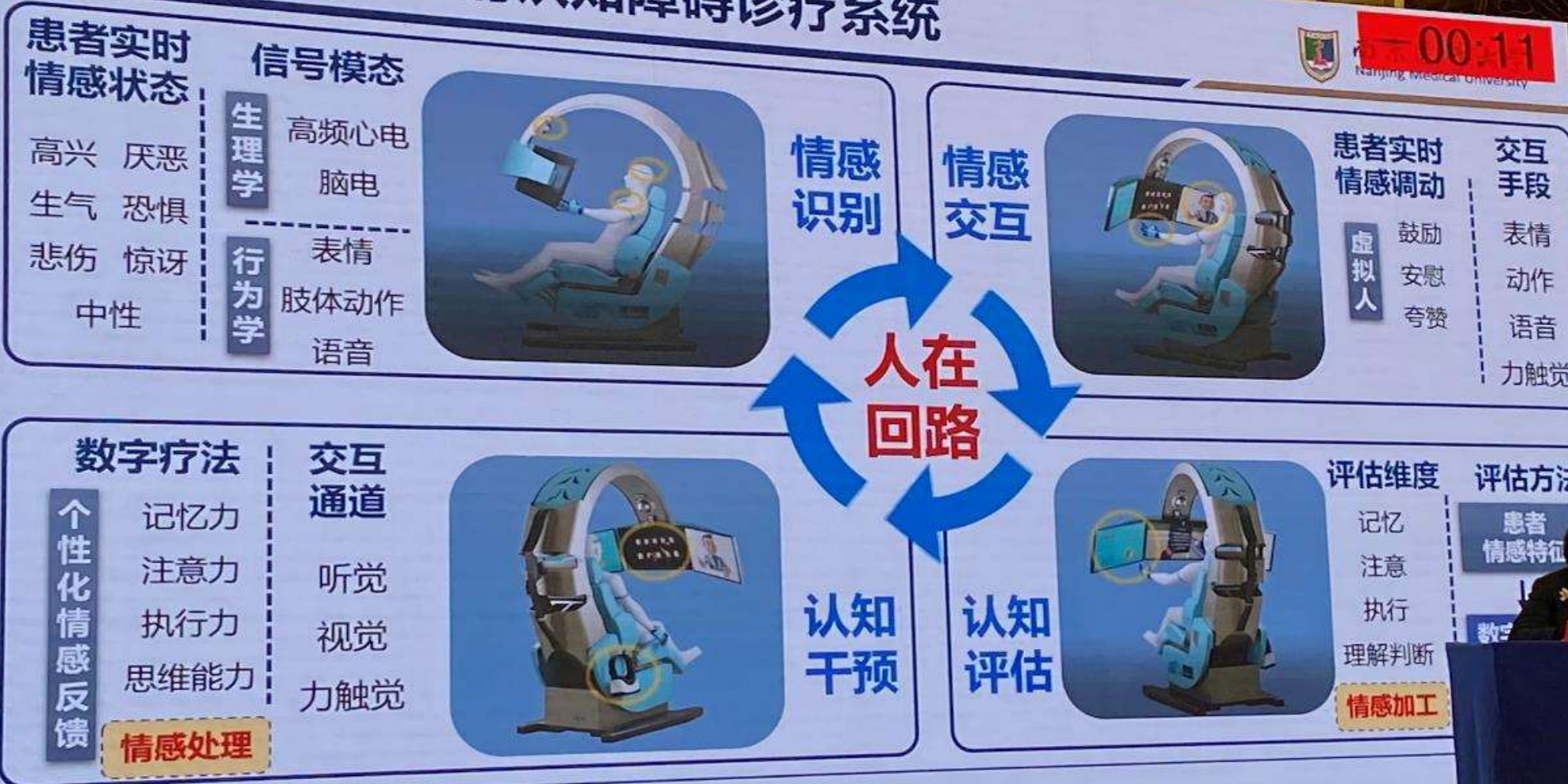
增强现实

津发科技 KINGFAIR

# 基于情感交互的认知障碍诊疗系统



00:11  
Nanjing Medical University



# Aging Gracefully across Environments using technology to support Wellness, Engagement, and Long Life



Canada's technology and aging network

[About](#) [Research](#) [Publications](#) [Training](#) [News & Events](#) [Partners](#) [Innovation Hubs](#)

A dark grey banner with the text "AGE-WELL" in large white letters. Below it is the tagline "Aging Gracefully across Environments using Technology to Support Wellness, Engagement, and Long Life". The banner features a series of colorful circles and icons: a lightbulb, a computer monitor, a couple holding hands, a smartphone, a person on a bicycle, and a globe. Text boxes are placed around these icons: "Healthy Life" (cyan), "Our Innovative Solutions" (red), "Independent Living" (grey), and "Social Life" (orange).

**AGE-WELL**

Aging Gracefully across Environments using Technology to Support Wellness, Engagement, and Long Life

Healthy Life

Our Innovative Solutions

Independent Living

Social Life



**Disrupting OT Practice in Aging:  
From Smart Homes to Robots**  
拓展老龄化领域的作业治疗实践：  
从智能家居到机器人



*Mihailidis 2018*

**Alex Mihailidis, PhD PEng**  
**Professor & Scientific Director**  
University of Toronto / AGE-WELL NCE

# Emerging Areas 新兴的领域

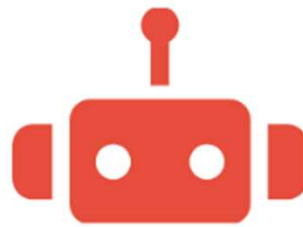
New approaches are leading to new promising areas of research, leading edge technologies, and changes in OT practice  
新的方法正在将我们领入更有前景的研究领域，更前沿的技术，并将改变OT实践



*Mihalidis 2018*



**Smart Homes**  
智能家居

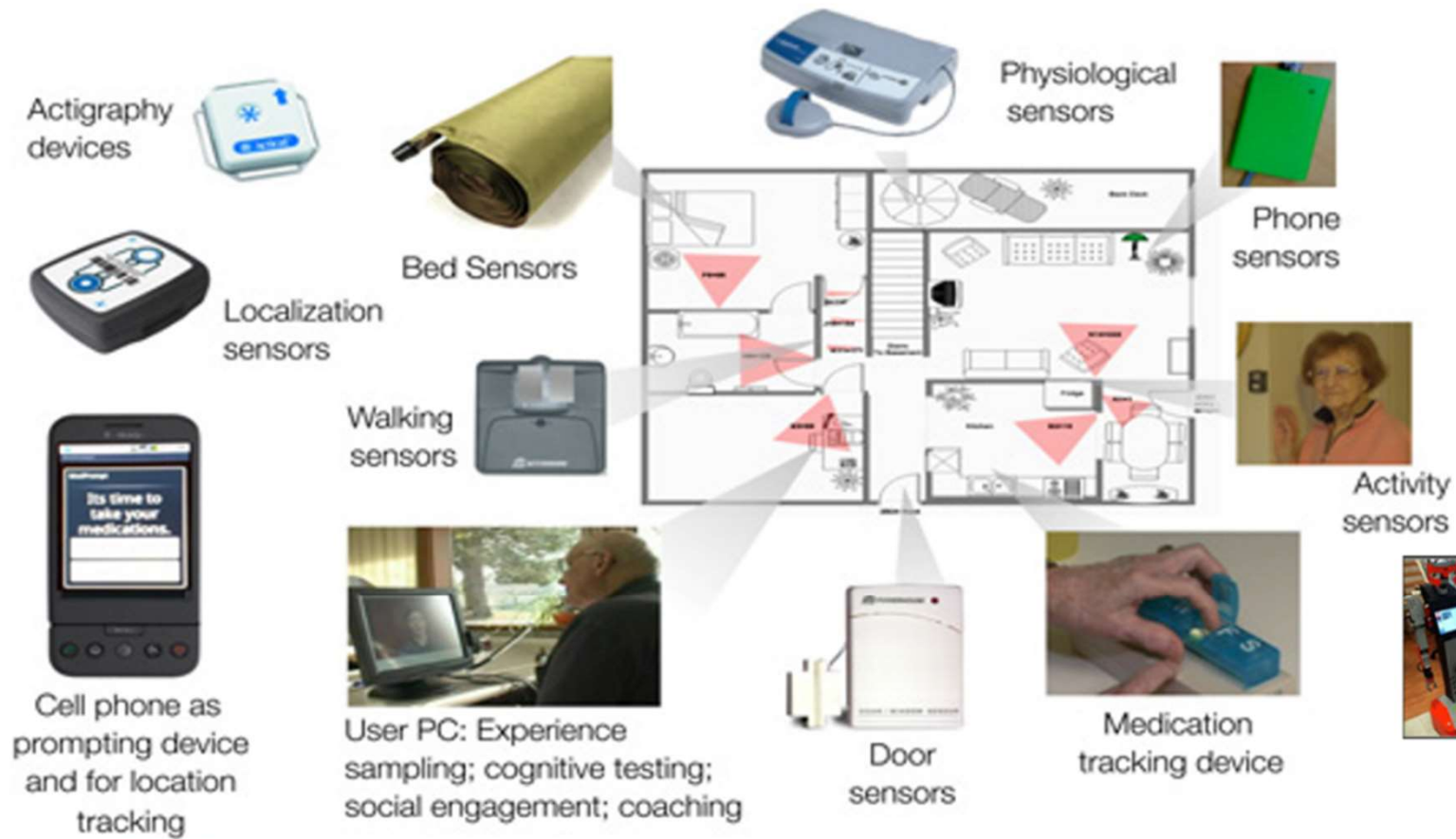


**Robotics**  
机器人



**Big Data**  
大数据

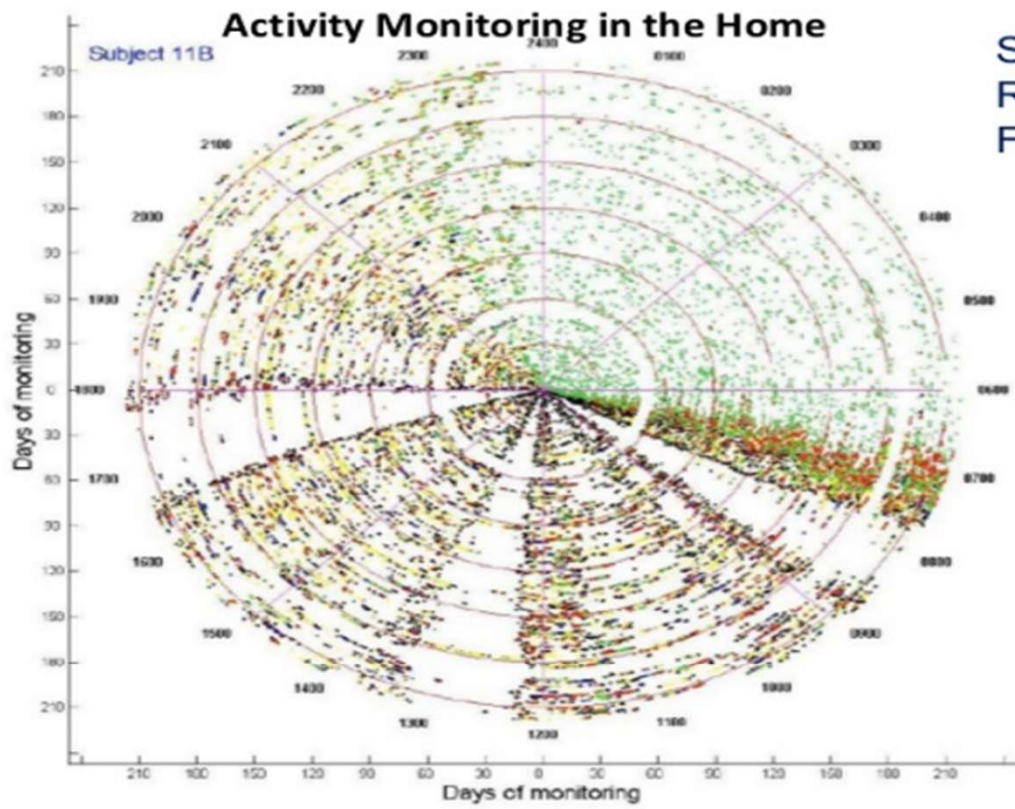
# Big Data in the Home 居家大数据



Mihalidis 2018

# Big Data – Patterns of Living

## 生活模式的大数据



Sensor Events  
Residential  
Facility

- Bedroom
- Bathroom
- Living Rm
- Front Door
- Kitchen



Mihalilidis 2018

Kaye et al. (OHSU)

ご来場ありがとうございました

Thank you for visiting H.C.R. 2019

次回のご案内 / H.C.R. 2020

第47回

**HCA** 国際福祉機器展

47th International Home Care  
& Rehabilitation Exhibition 2020

2020年10月21日(水) ~ 10月23日(金) 西・南展示ホール  
October 21(Wed.) - 23(Fri.) 2020 West・South Halls



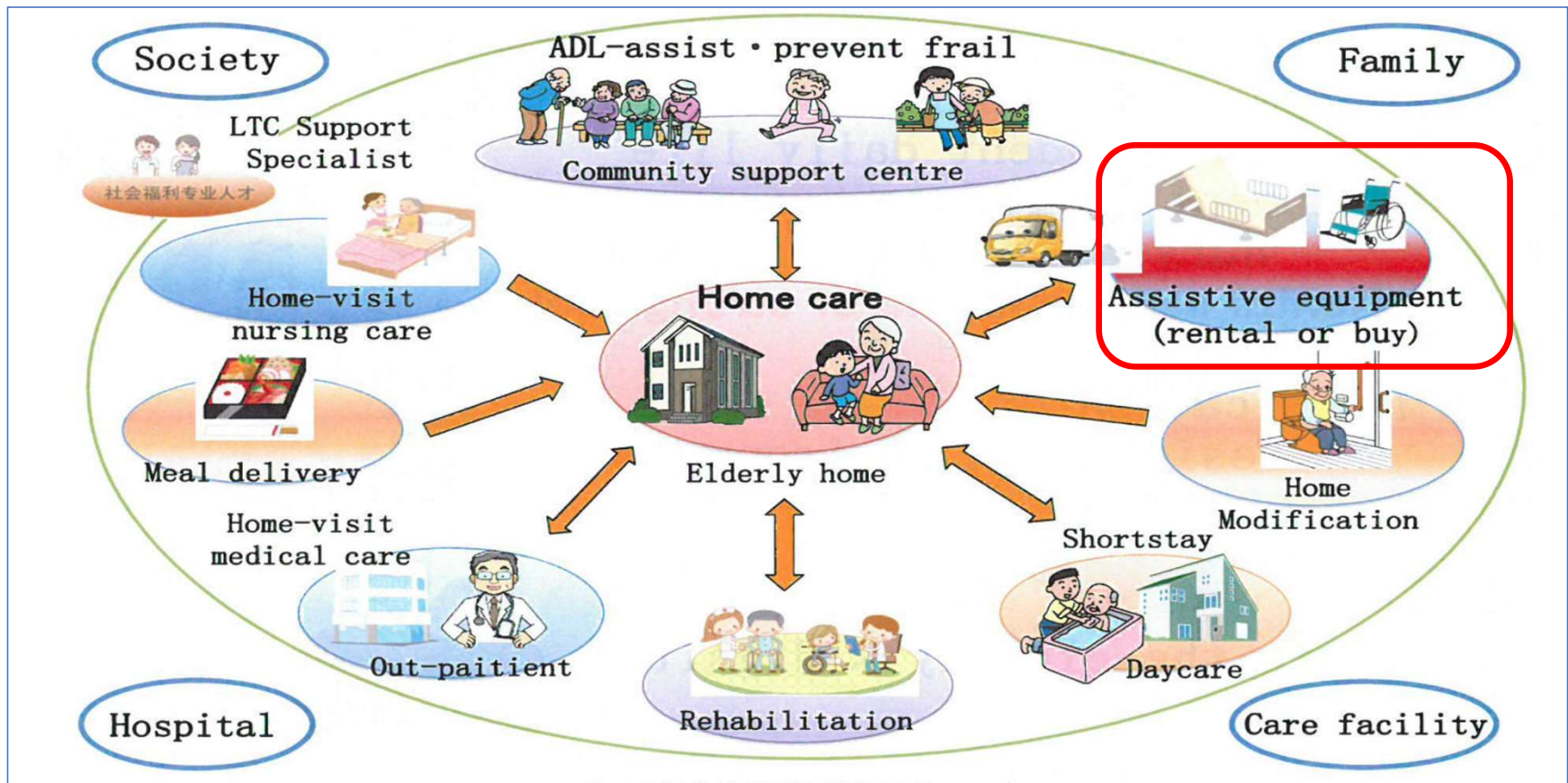
# Home Care & Rehabilitation Exhibition, Japan



The background of the slide is a dense, overlapping field of white and light beige spheres, creating a textured, bokeh-like effect. The spheres vary in focus, with some appearing sharp and others blurred, giving a sense of depth. The overall color palette is soft and neutral, dominated by whites and light tans.

# **Aids Loan or Rental Services**

# Service Model in Japan

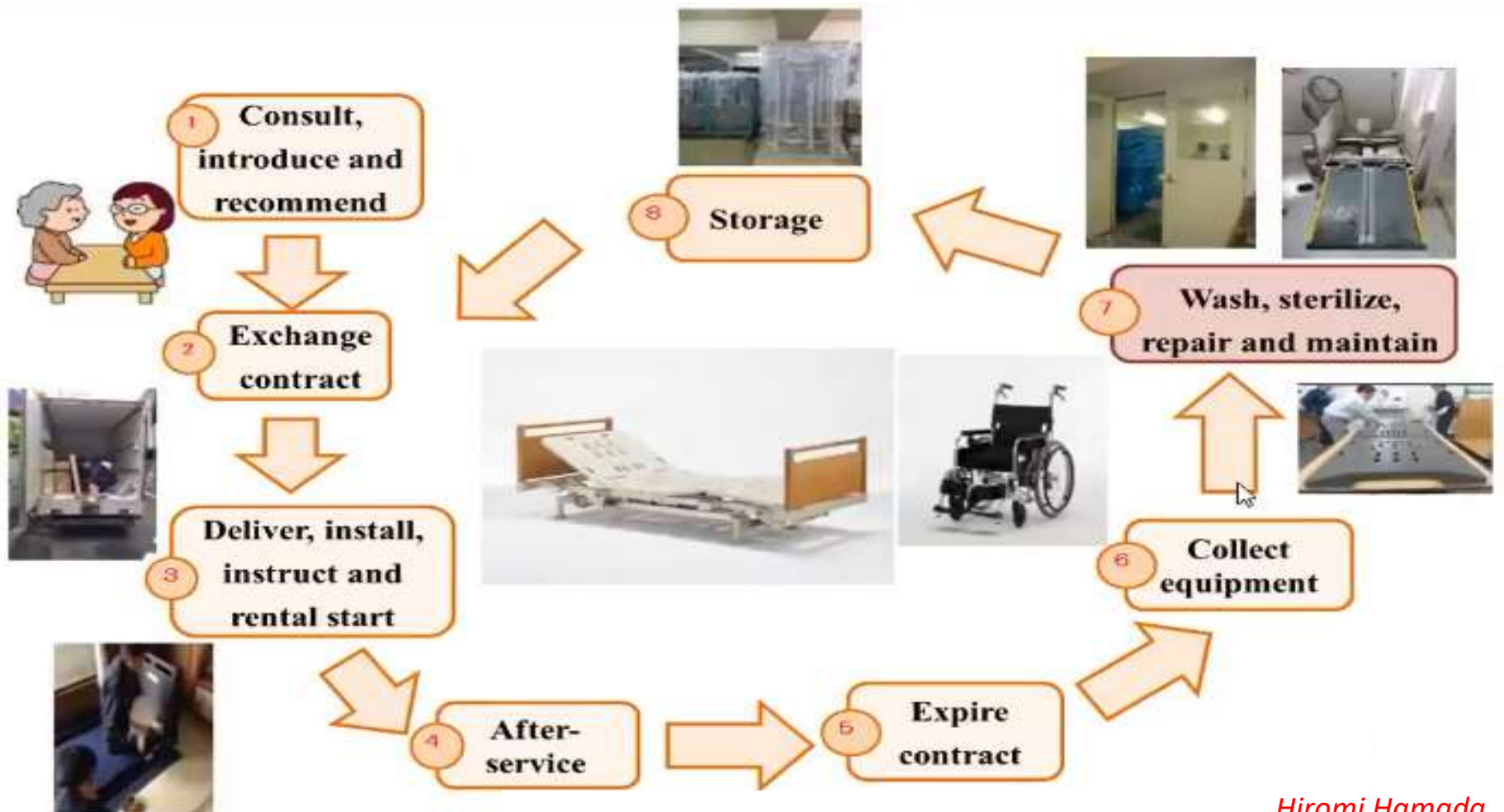


Hiromi Hamad, 2021

# Development of Rental Services in Japan

<b>1963</b>	Establish the Act on Social Welfare for the Elderly (Affected by Public Assistance Act).
<b>1969</b>	On this Act, started to provide nursing equipment for facilitating elderly's daily life activities.
<b>1983</b>	France bed started "Rental Service" of nursing equipment as private company. (customers' request – Business trigger)
<b>1984</b>	Some municipalities (local governments) appreciated FB's service and took in this rental service for their service.
<b>1986</b>	Ministry of Health and Welfare (present MHLW) added to read the article as not only to provide but also to lend nursing equipment for elderly.
<b>1989</b>	MHW decided on a 10 years plan to expand the measure of health and welfare for elderly, it is so-called "Gold Plan"
<b>2000</b>	"Long-Term Care Insurance system" implemented formally. Rental service of nursing bed, wheelchair and so on become popular.
<b>2021</b>	Market size of nursing equipment rental service under Long-Term Care Insurance System reached JPY325 Billion

# Rental service business process in Japan



Hiromi Hamada, 2021

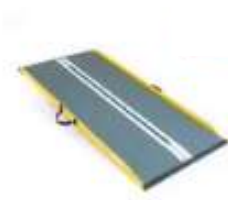
# Types of Loan Items in Japan



Nursing bed (accessories included)



Anti-bedsores mattress



Portable slope

Divided into 8 parts

Knock down style ⇒ Easy for delivery and maintain



Wheelchair (accessories included)



Walker, rollator



Crutch, stick



Sensor for dementia person wandering



Hoist and ceiling lift (except sling)



Portable handrail

# Jockey Club Age At Home



**Public Education, Rental and Cleansing Services**

# 居家安老，由a講起

Ageing in Place, Attitudes to Embrace

為打破長者與「樂齡科技」的隔閡，本計劃透過「a」為首的文字作引子，推廣以正向態度面對年長的挑戰，配合全面的服務，令長者在黃金歲月裡增強信心及享受生活。

Ageing can be discouraging at times, and technology too seems perplexing. "age at home" would like to offer an approachable passage to the multifaceted aspects of ageing, and brings an optimistic outlook to one's senior years.

aware<sup>覺察</sup>

認識樂齡科技資訊，明白改善生活質素的各種途徑

Learn more about gerontech on how to improve the quality of life

act<sup>實踐</sup>

立即行動，讓我們為你提供最適切的協助

Contact us now for the most appropriate support

adapt<sup>調適</sup>

學習並習慣使用器材，感受生活的改變

Welcome gerontech into your daily life

affirm<sup>自信</sup>

重拾自主生活，享受晚年

Build confidence to take good care of yourself

appreciate<sup>欣賞</sup>

長者與照顧者共同努力，相互見證付出

Elders and carers work closely together for a common goal

# Age at Home Service start with “A”



➤ **ASSESS**

➤ **ASSIST**

➤ **ASSEMBLE**

➤ **APPLY**

➤ **ASSURE (quality)**



# 清潔及保養服務

Cleaning and Maintenance Service

## 一站式中央處理

One-stop centralized processing



### 從使用者家中回收器材

Equipment collected from users' homes

- ① 產品接受初步檢查  
Initial inspection on received equipment
- ② 第一次消毒  
Primary disinfection
- ③ 徹底清洗及高溫消毒  
Thorough cleaning and high-temperature disinfection
- ④ 低溫乾燥  
Low-temperature dehydration
- ⑤ 徹底檢查及維修保養  
Thorough inspection and maintenance
- ⑥ 包裝  
Packaging
- ⑦ 倉存保管  
Storage at the warehouse

→ 送到使用者家中  
Deliver equipment to users' home

## 制定本土流程及標準

Develop local workflow and standard





The background of the slide features several strings of colorful bunting flags in shades of red, yellow, green, blue, and purple, set against a light blue and white background. The text is centered and rendered in a large, orange, rounded font with a thin white outline.

# Promotion of Gerontechnology in Hong Kong

# Gerontechnology Landscape Report



OUR HONG KONG  
FOUNDATION  
匯 結 香 港 基 金

**Gerontechnology  
Landscape Report**

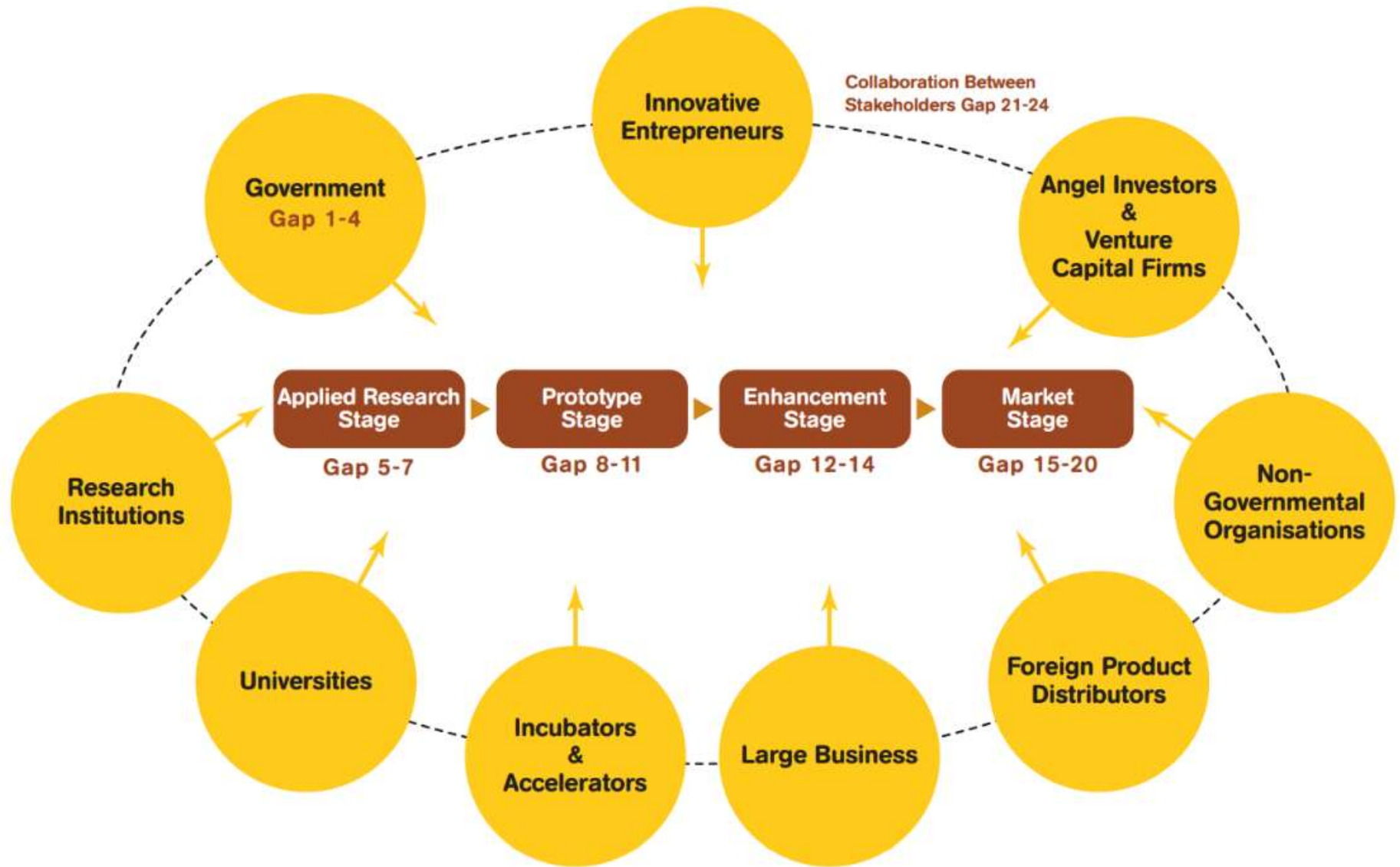
## Gap Categories

- 1 – Government (Gap 1-4)
- 2 – Applied Research Stage (Gap 5-7)
- 3 – Prototype Stage (Gap 8-11)
- 4 – Enhancement Stage (Gap 12-14)
- 5 – Gerontechnology Market – Producer (Gap 15-17)
- 5 – Gerontechnology Market – Consumer (Gap 18-20)
- 6 – Collaboration (Gap 21-24)

- 6 – Collaboration (Gap 21-24)
- 2 – Gerontechnology Market – Consumer (Gap 18-20)

# 24 Gaps Identified

1. Lack of Awareness
2. Highly Risk Averse
3. Outdated Regulatory Systems
4. Insufficient Retirement Protection
5. Shortfall in Applied Research Funding
6. Lack of Human Resources
7. Systemic Issues in Academia
8. Obstacles in Spin-off and Licensing Procedures
9. Lack of Support for Start-ups
10. Risk of Idea Sharing
11. Exhausting Registration Process for Medical Devices
12. Product Design not Catered to Elderly Consumers
13. Lack of a Testing Ground for New Products for Use in Elderly Homes
14. Cultural Differences and Difficulties in Product Localisation
15. Limited Market Size
16. Poor Segmentation
17. Rental Risks
18. Gerontechnology Products are too Expensive for Elderly
19. Exhausting Procurement Procedures
20. Refusal to Accept Products with New Technology
21. Insufficient Collaboration between Universities and Research Institutions
22. Insufficient Collaboration between Research Organisations and the Private Sector
23. Insufficient Collaboration between the Private Sector and NGOs
24. Insufficient Medical-Social Collaboration



# 背景及目的

# Government

One Billion Fund

◆ 行政長官在 **2017** 年施政報告宣布

◆ 設立 **10** 億元的樂齡及康復創科應用基金

◆ 資助安老及康復服務單位購置、租借和試用科技產品

◆ 以改善服務使用者的生活，並減輕護理人員及照顧者的負擔和壓力

◆ 樂齡及康復創科應用基金於 **2018** 年 **12** 月推出

Encourage use of new  
gerontechnology in  
institutions



(SWD, 2018)



樂齡科技平台  
GERONTECHNOLOGY  
PLATFORM

撥款資助

協創機構



# Collaboration Partners



基督教靈實協會  
CHRISTIAN SERVICE



THE HONG KONG  
POLYTECHNIC UNIVERSITY  
香港理工大學



Logistics and Supply Chain MultiTech R&D Centre  
物流及供應鏈多元技術研發中心



Marsh



OUR HONG KONG  
FOUNDATION  
團結香港基金



HKU Med  
LKS Faculty of Medicine  
School of Nursing  
香港大學護理學院

# Collaboration between Therapist & Rehab Engineer

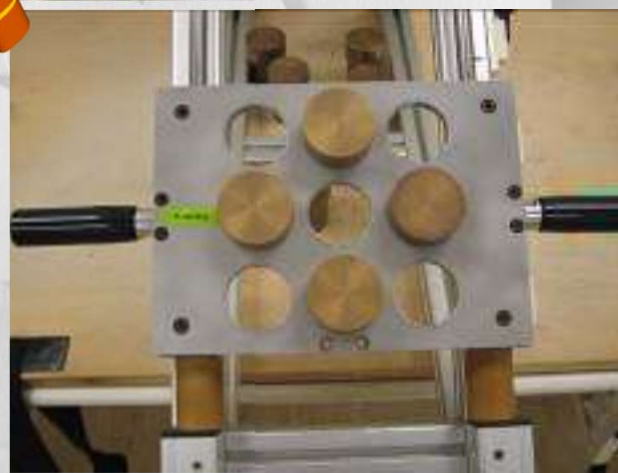


Design of training tools

90s



# Collaboration between Therapist & Rehab Engineer



Design of training tools  
90s

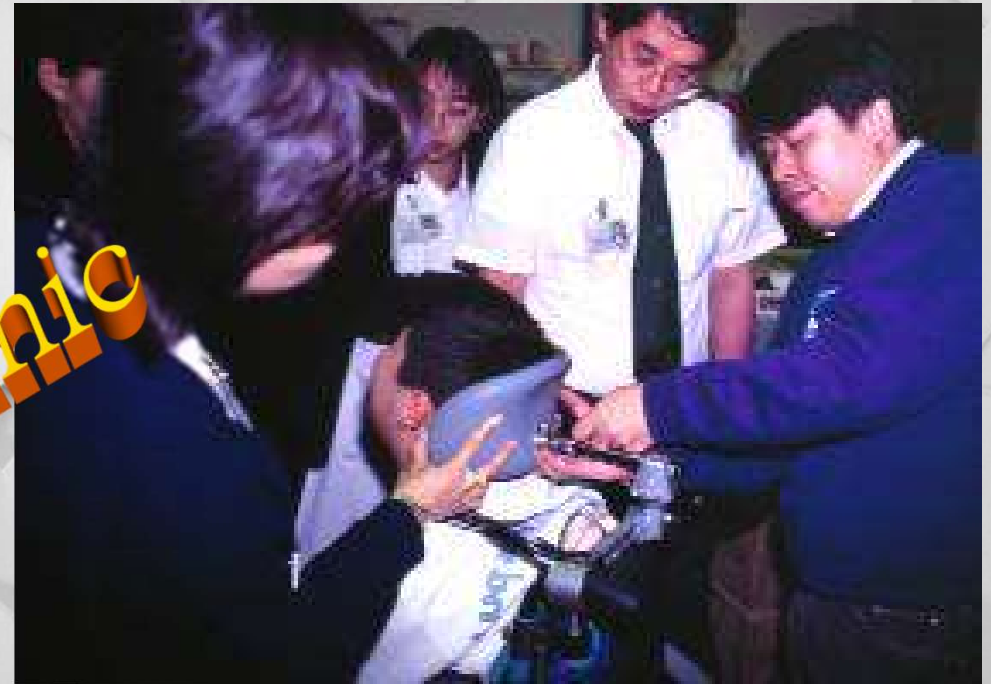
# Collaboration between Therapist & Rehab Engineer

Multi-disciplinary  
Collaboration



90s

## Seating Clinic





# Collaboration between Therapist & Rehab Engineer

## Cathay Pacific Wheelchair Bank

Reuse  
90s



Group photo at the launch of the Cathay Pacific Wheelchair Bank  
國泰航空兒童輪椅庫成立當日合照

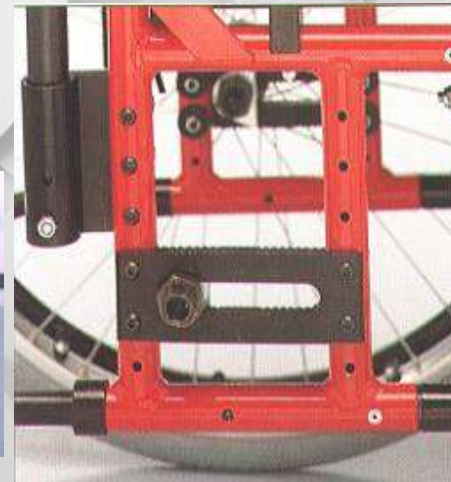
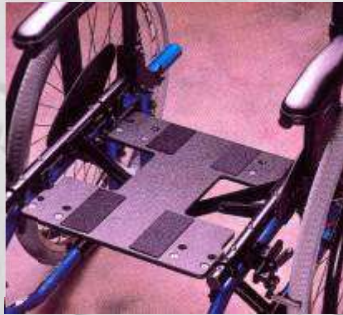
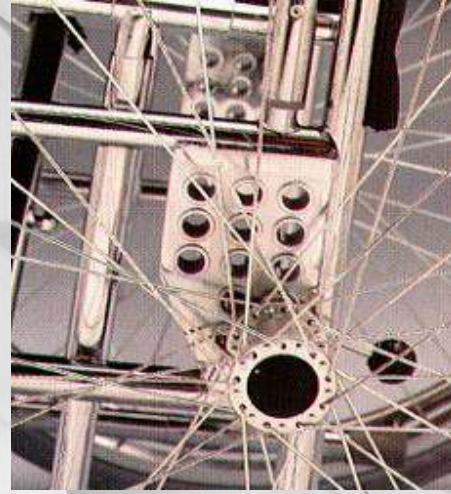
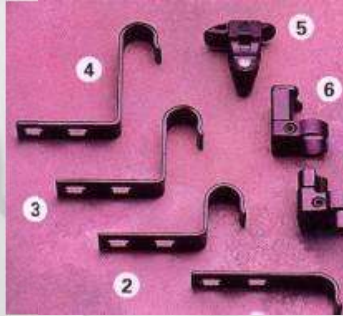
Bank concept for  
children with  
neuromuscular  
diseases

**Carroll Pacific Wheelchair Bank**

# Wheelchair and Accessories

Improve  
efficiency and  
effectiveness

90s



# Collaboration between Therapist & Rehab Engineer



Seating Clinic for SCI  
00s

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- 樂齡科技博覽暨高峰會2023產品介紹網頁 <https://gies.hk/zh-hk/expo/exhibition-products?category=10>



*Thank You*