



Smart Living × IoT Online Workshop, Global Affairs Office, Yuan Ze University

From gerontechnology research to daily applications

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Aging boom, baby bust – How can technology help?

- Taiwan became an aged society in 2018, and is expected to become a super aged society by 2025.
- ➔ Advanced technologies/products for the future? Implement existing technological products in daily applications **NOW**.
- Life expectancy at age 65: Male 18.59 / female 22.23 @ 2019
- ➔ Long term care? Technology should also be used to enhance the physical and cognitive wellness of healthy older adults to prolong their independent, healthy life expectancy.
- Total fertility rate by World Population Review 2020
 - ◆ Taiwan: 1.218 (199/199)
- Taiwan had 177,767 births and 176,296 deaths, or almost zero natural population growth in 2019
- ➔ Technology for older adults? Use technology to support caregivers, to reduce their care burden and improve quality of care, and to provide the economic drive to society and industry

3G's for the aged society: Gerontology, Geriatrics, Gerontechnology

- First International Congress on Gerontechnology, 1991
- International Society for Gerontechnology (ISG), 1997



“**Design** technology and environment for **independent living** and **social participation** of older persons in good health, comfort and safety”

- Scope of *Gerontechnology*: Health, Housing, Mobility, Communication, Leisure, Work



Gerontechnology is only valuable if we can bring research to daily applications

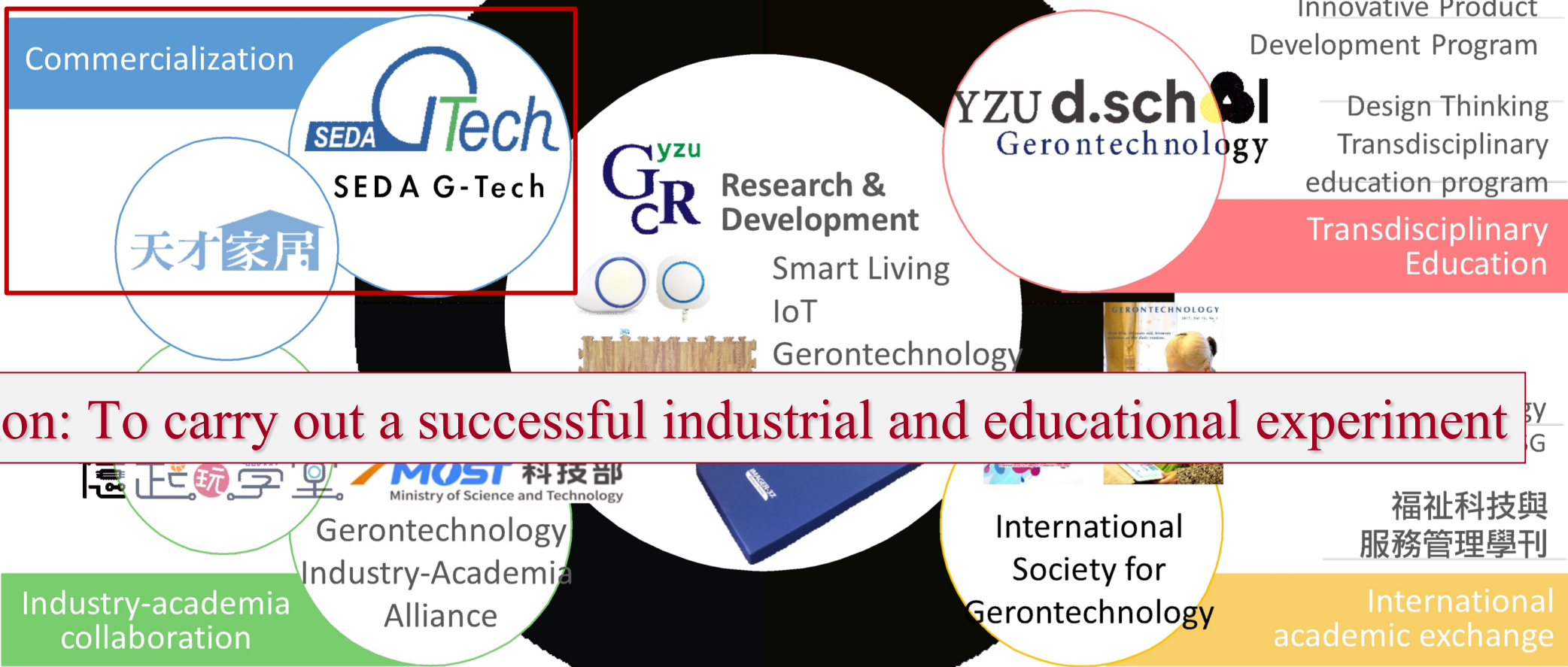
A design approach to gerontechnology:

Creativity → Prototypes → Products → Sales

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GRC

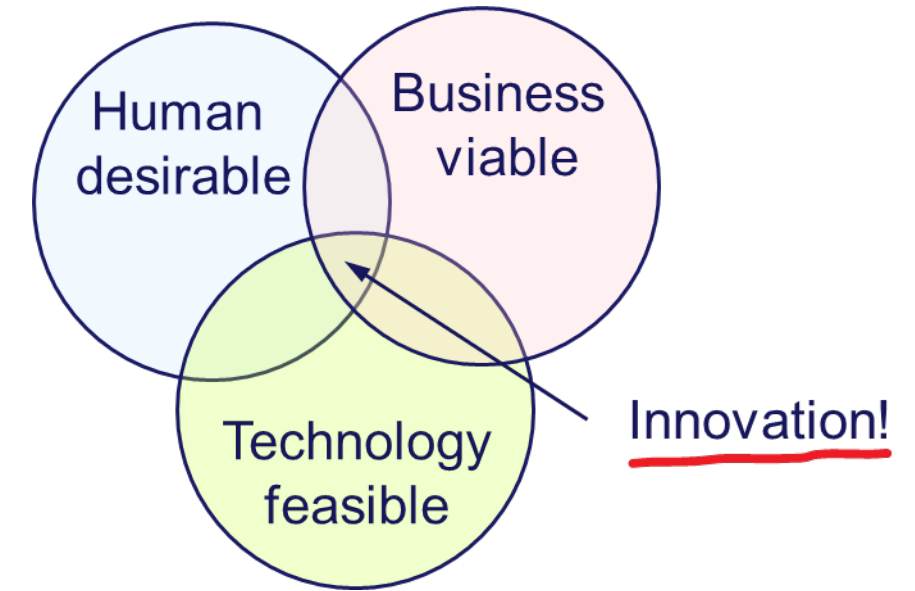
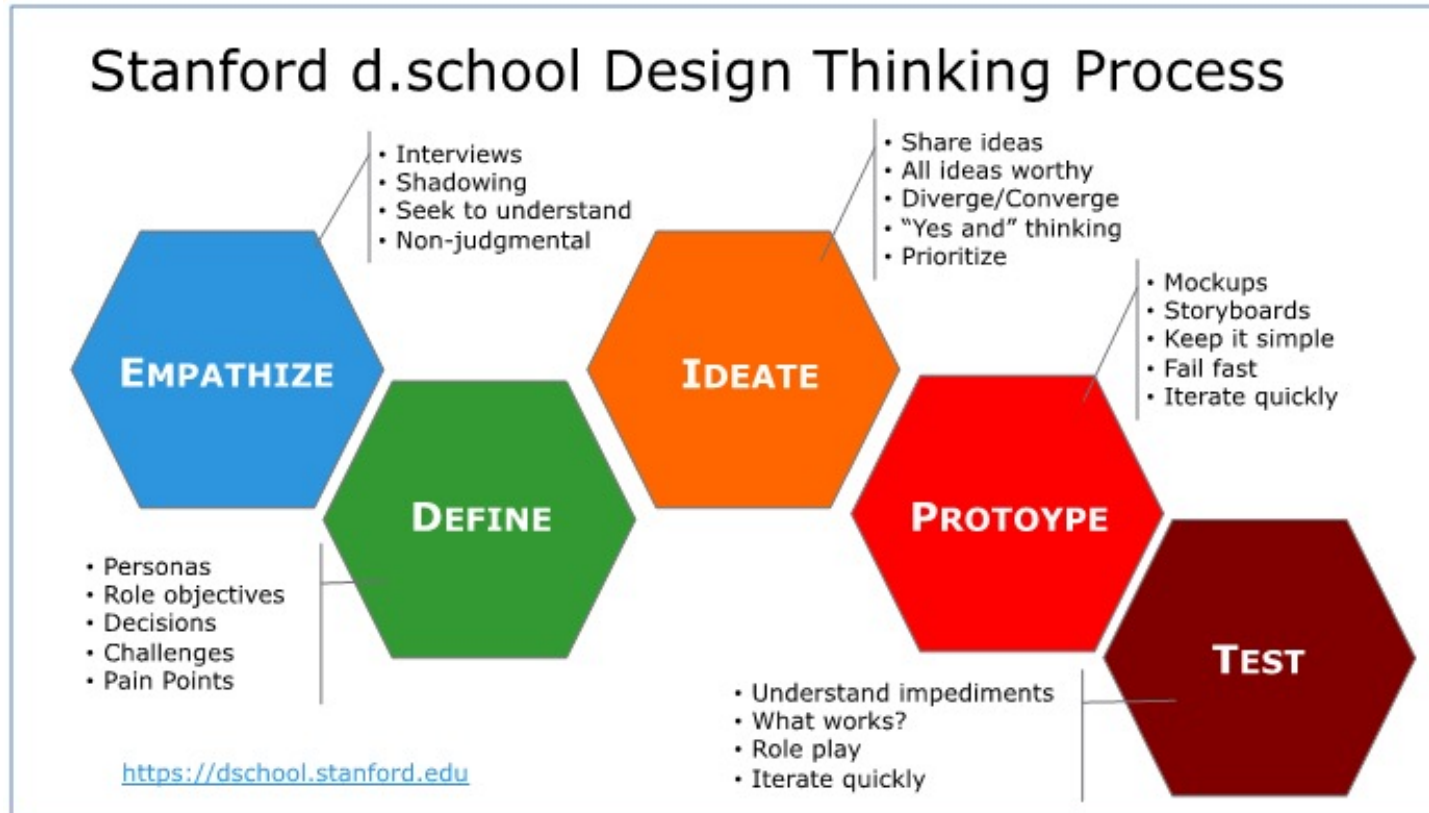
Gerontechnology Research Center Yuan Ze University
老人福祉科技研究中心 元智大學
Est. 2003



Mission: To carry out a successful industrial and educational experiment

Bringing gerontechnology research to daily applications: More DESIGN THINKING!

Think like a boss... (not like a professor...)



IDEO (<http://www.ideo.com>)
CEO Tim Brown

Ambient intelligence:
Everyday environments that are sensitive
and responsive to the presence of human



Robots that look after grandma?

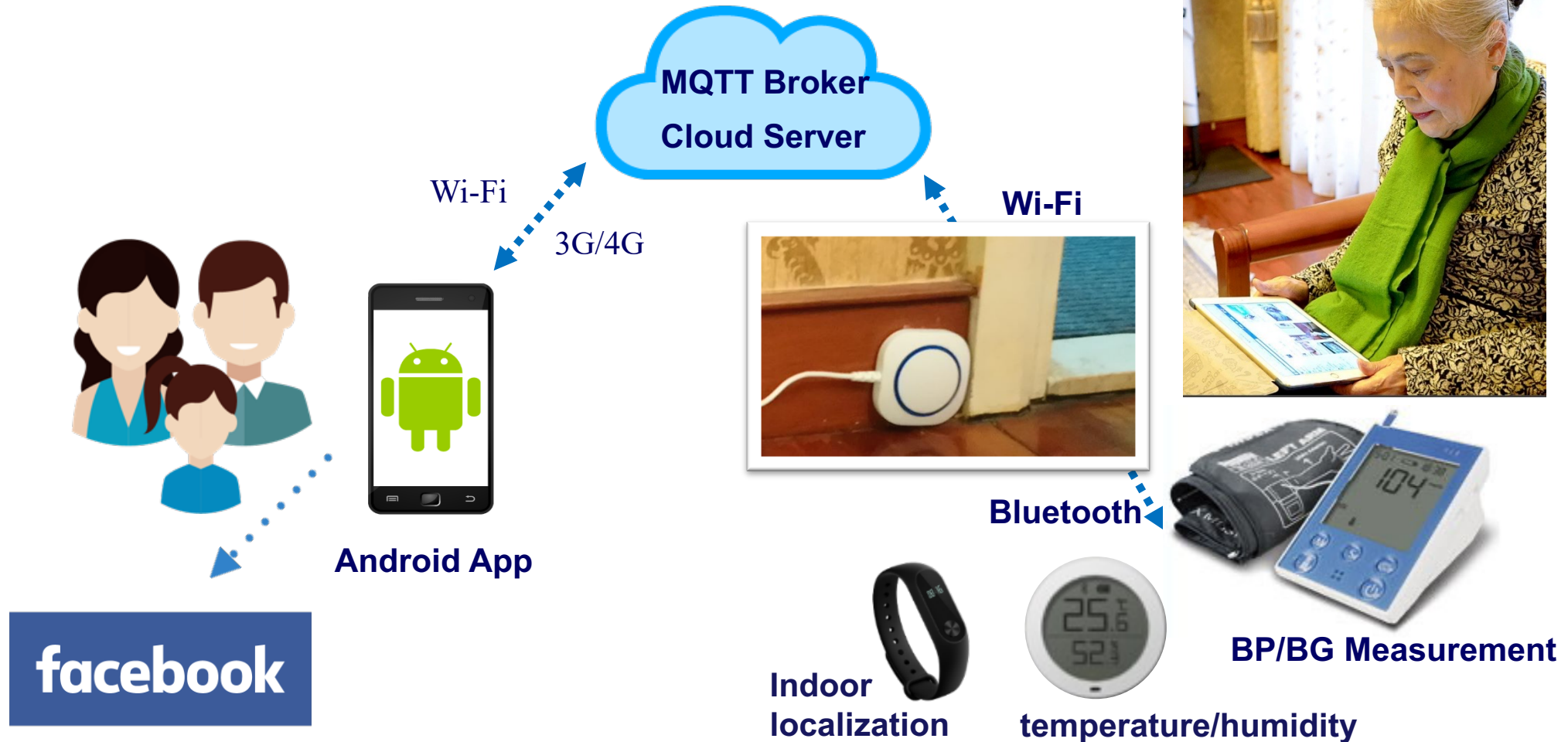
A gerontechnology point of view

- The whole IoT environment with sensors, actuators, and cloud servers is the robot?!
 - Build ambient intelligence to support older adults and caregivers.
 - The “robot” itself is just a user interface with the ambient intelligence for older adults and caregivers.
1. Monitoring of vital signs / behavior patterns, and platforms for health management
 2. Technology interventions for enhancing physical and cognitive ability
 3. Technology assistance for everyday lives for older adults and caregivers
 4. Platforms for social communication and participation of the older adults

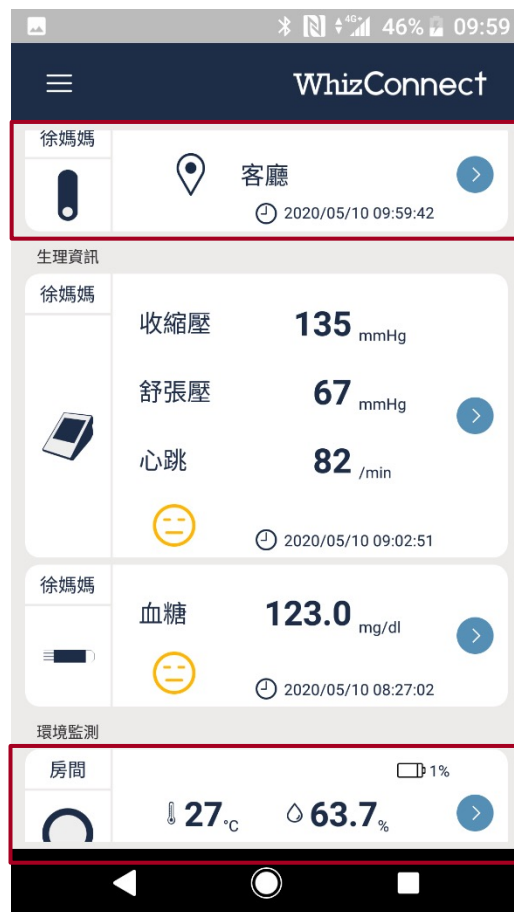
Industrial robots usually replace human activity, by contrast, service robots extend it.

A simple telehealth system based on *WhizConnect*

Connect older adults
with family members



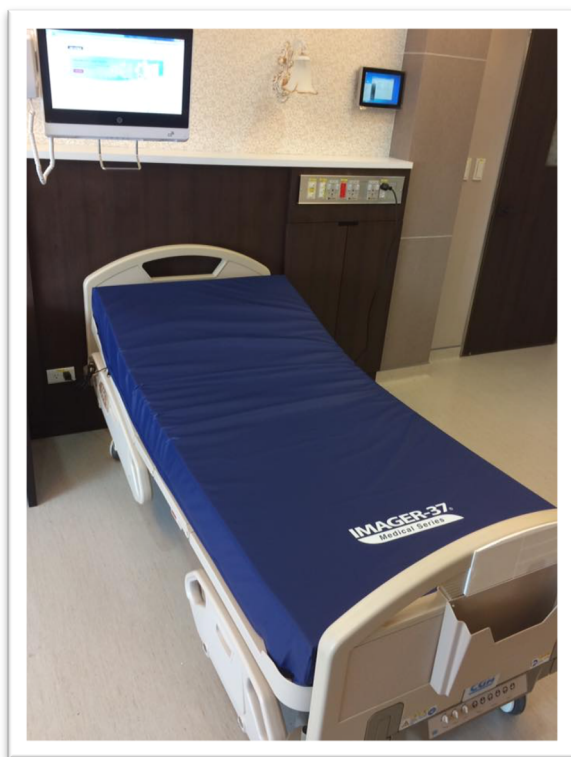
The son is the trigger to enable the behavior



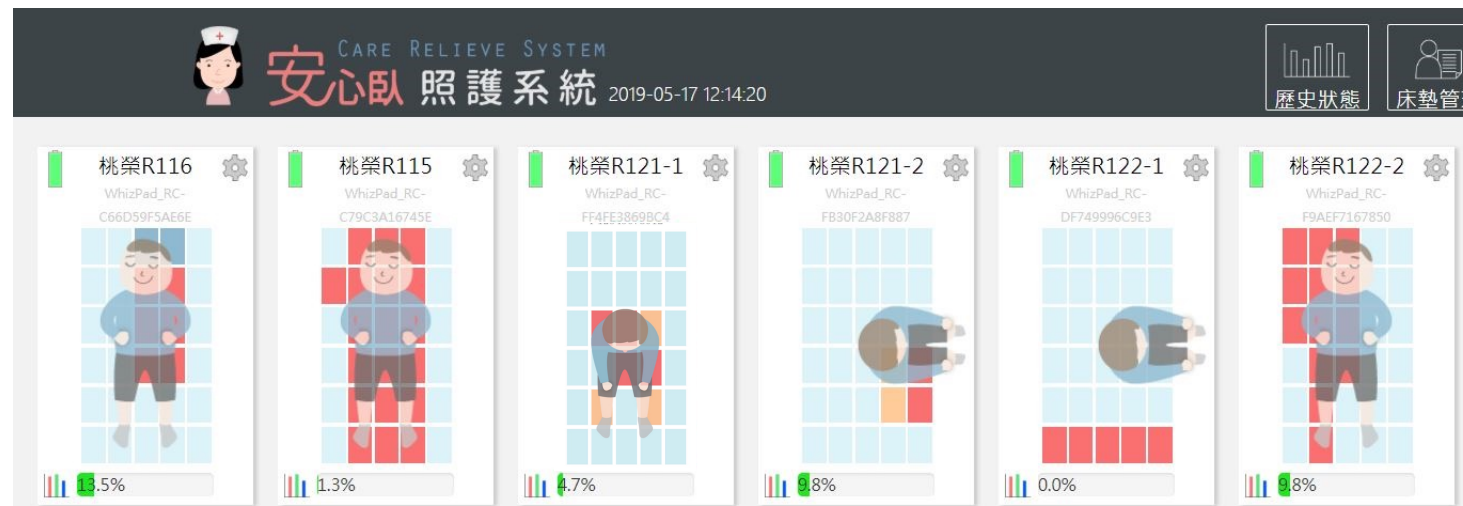
Supporting the caregivers: Care, interaction, connection, in addition to health monitoring

Implementing Machine Learning – starting from the bed

- **WhizPad** is an extremely comfortable mattress made by pressure-relieve material for the prevention of pressure ulcers.



Taipei Veteran Hospital

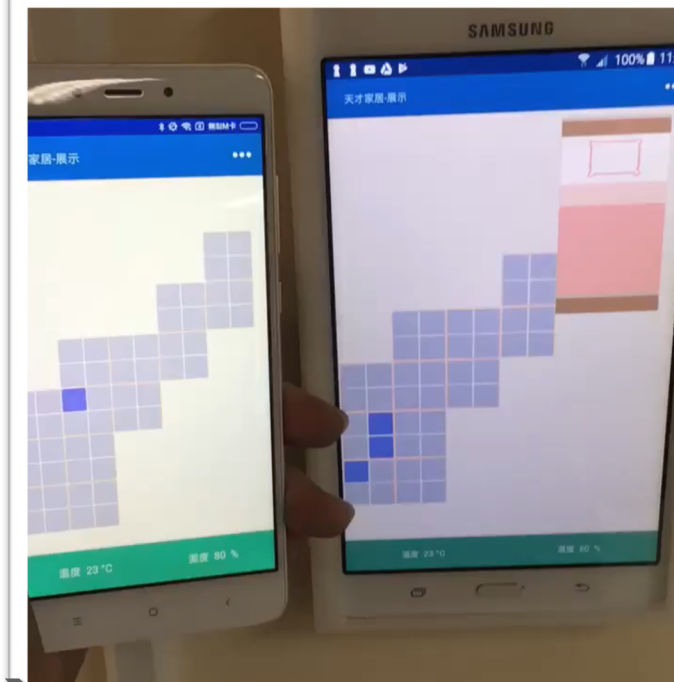


- Machine Learning to capture the intention of the patient leaving the bed to **prevent hospital falls**.
- Motion sensing with 30 sensing areas, ML classification of lying/sitting/left edge/right edge
- **Edge AI**: Neural Network model deployed on chip
- Three-stage leave bed alert: sit-up, sitting at the side, leave bed.
- **Cloud AI**: Living pattern recognition, sleep quality

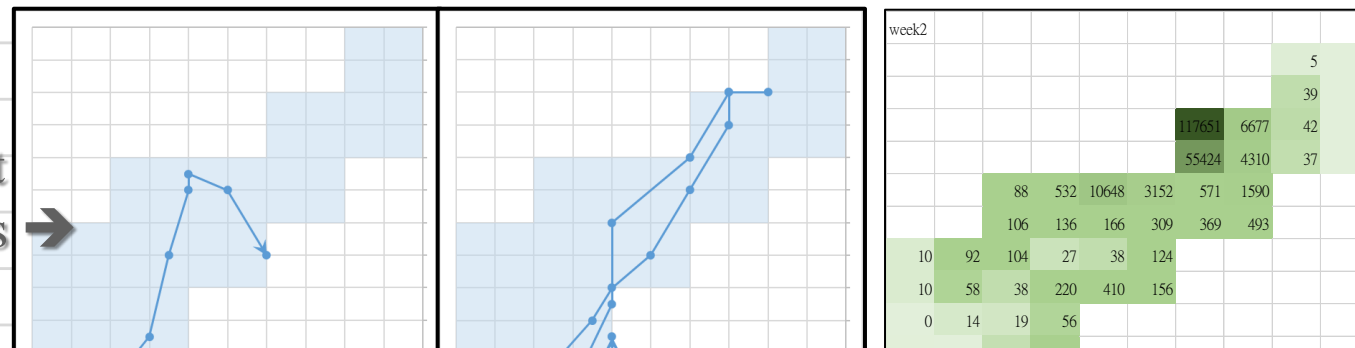
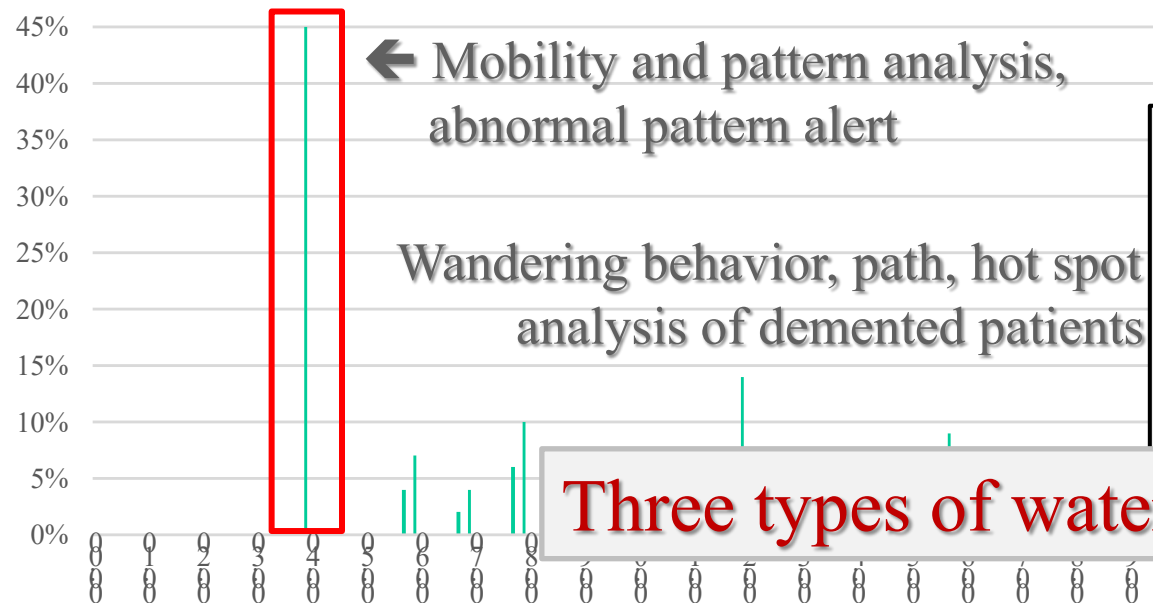
Motion sensing *Whiz*Carpet for fall detection



← Easy and flexible set up;
soft surface reduces risk
of fracture when falling



Real time position display,
fall detection and alert ➔

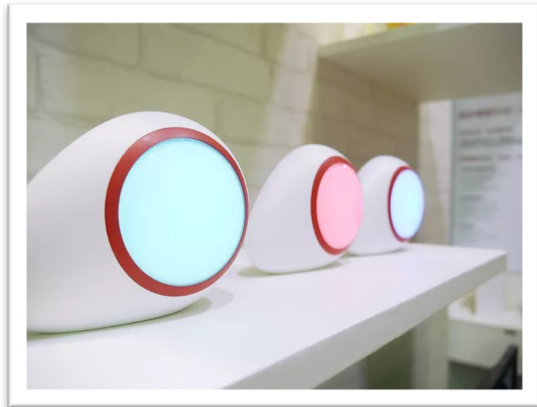


Three types of water to handle: bathroom, floor cleaning, urine

WhizTouch: IoT call button for bedridden older adults



- Big button; mobile phone as receiver; green light to confirm the call
- But...



IoT care products at home?

- Internet usage is low for older adults (31.1% / 8.6% @ 2018). **High monthly fee for Internet service** is not acceptable.
- Connecting the IoT product to home Wi-Fi AP has been a major **usability issue**; **Wi-Fi coverage** is often poor in bedroom

Narrow Band IoT: the last mile

- Sim card connects directly to mobile phone base station
- Plug and play, used anywhere without setup

Technology interventions for enhancing physical and cognitive ability

- Non-pharmacological intervention for preventing cognitive decline in older adults
- **Physical activity (PA)** is known to improve cognitive function at older age.
- In a meta analysis of 41 studies, **combined PA + CA (cognitive activity)** intervention showed significantly larger gains in **cognition** relative to the control group (Gheysen et. al, 2018).

	Cognitive	ADL	BPSD
Cognitive training	+	+	+
Cognitive rehabilitation	+	+	+
Cognitive stimulation therapy	+	+	+
Snoezelen/multisensory	+	+	+
Reality orientation	+	+	+
Reminiscence therapy	+	—	+
Validation therapy	+	—	+
Physical activity	+	+	+
Light therapy	+	—	+
Music therapy	+	—	+
Aromatherapy	—	—	+
Animal-assisted therapy	—	—	+

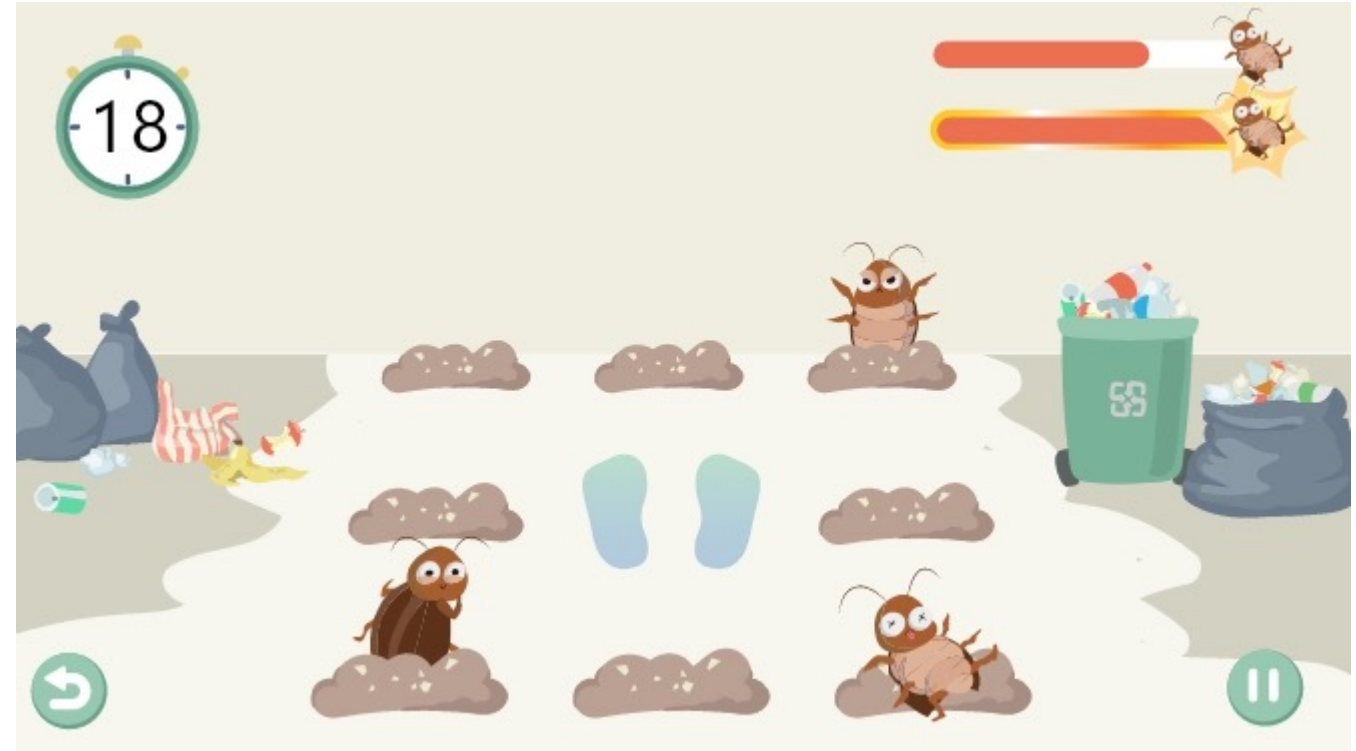
Takeda et al. (2012)

Exercise is good, but...

Physical activity + cognitive activity
+ fun technology

WhizToys
One Toy, Many Games

Mother Hsu's new problem



- Play comes first: Serious game design
- Bring the “gerontechnology gym” to the older adults to create peer encouragement.

No screens – guiding physical and cognitive activities with lights and sounds



Blaze Pod



Treax pads



Moto Tiles



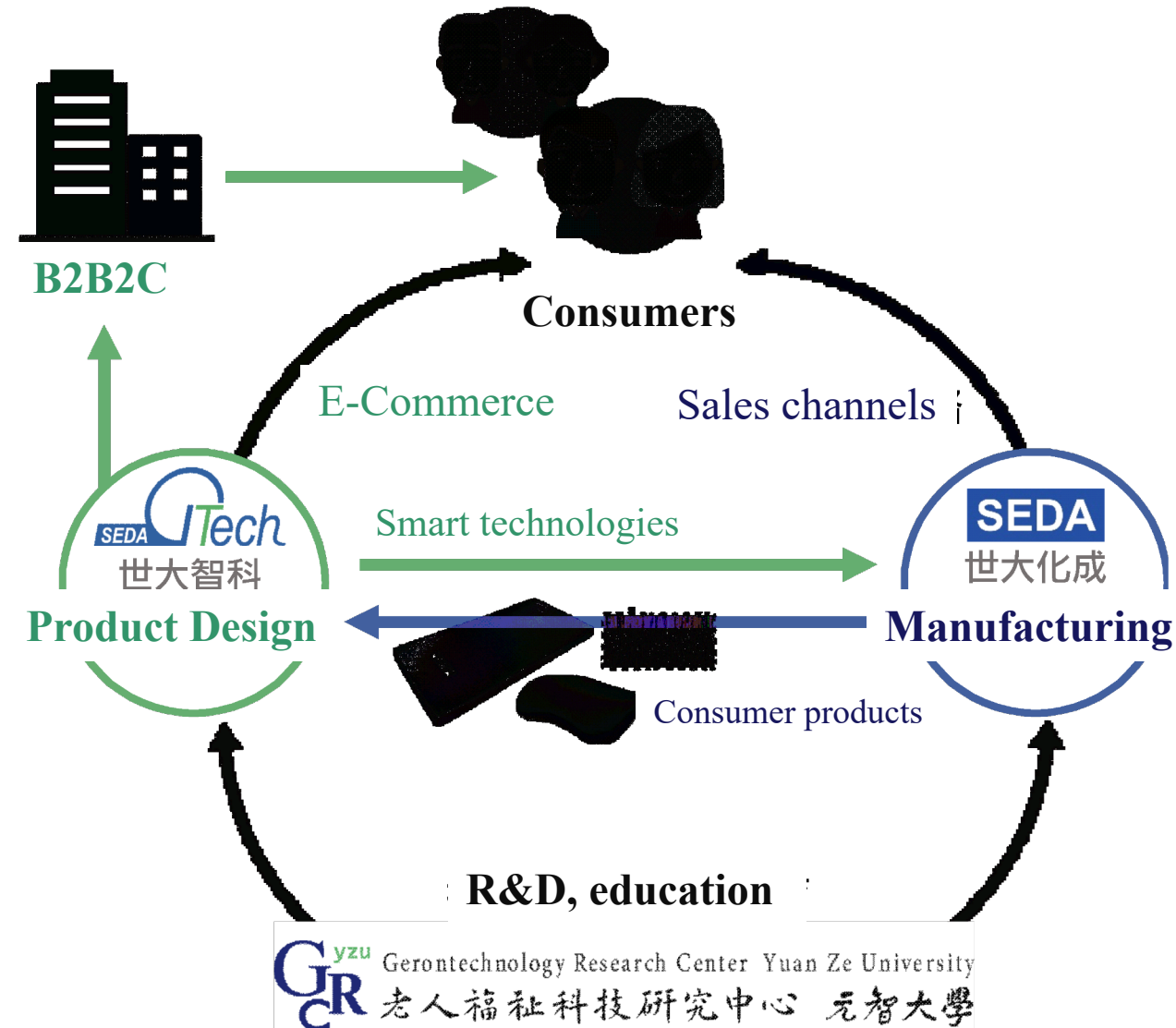
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SODA



- Start-up company founded in April 2016, at the age of 53...
- 8 co-founders are students graduated from the research center



The future world needs transdisciplinary talents



YZU d.sch 
Gerontechnology

Transdisciplinary learning

Real world problems and experience

“Design” is our common language!

Design starts with a problem. Design ends with a solution.

DESIGN IS A PROBLEM SOLVING PROCESS

Thank you

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