We are designers --
Bringing gerontechnology to daily nursing practice

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Proud to be a designer

• PhD 1992, Stanford University, Mechanical Engineering, DESIGN DIVISION
• Teaching and doing design at Yuan Ze University for 27 years
• Design for people…
• Medical devices, assistive technology…
• Gerontechnology!
3G’s for the aged society: Gerontology, Geriatrics, Gerontechnology

- First International Congress on Gerontechnology, 1991
- International Society for Gerontechnology, 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
Mission: To carry out a successful industrial and educational experiment

Gerontechnology Research Center Yuan Ze University

Est. 2003

Commercialization

Research & Development

Industry-academia collaboration

New Taipei City

Industry-Academia Alliance

SEDA G-Tech

Smart Living

IoT

Gerontechnology

Innovative Product Development Program

Design Thinking Transdisciplinary education program

Transdisciplinary Education

International Society for Gerontechnology

International academic exchange

Gerontechnology Official Journal of the ISG

福祉科技與服務管理學刊

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Are you using telehealth systems to care the older adults?

Wearable devices or, Leap beads 智慧佛珠?

Smart home, smart wheelchair, smart anything?
Why are caregivers not using technological products?

Designers vs. Technologists

年長消費者以熟齡女性為主力，...影響我們共同未來最深的科技業，則是年輕男性的天下

「銀光經濟」The Longevity Economy, Joseph F. Coughlin, MIT AgeLab
Which walking stick do you think the older ladies like better?

Which walking stick do you like better?

Smart Standard Walking Stick (Auto-Fall-Alarm/Radio/MP3)

- Selection Switch: LED/ LED+ Flashing' Off * Activate/Deactivate Alarm (Hold-Press 3 sec)
- Speakers (Alarm)
- Soft-Grip Handle Handy Wrist Cord
- Mirror SD Card Slot
- Volume Key: Up
- Scan Key: Forward
- Selections Key: * On/Off (Pressing) * Radio/MP3 (Hold-Press)
- Scan Key: Backward
- Volume Key: Down

4 Pivoting Angle LED Lights
Charging Point (SV USB)
Flashing Lights
10 Step Adjustable Height: 68 - 90 cm
Locking Collar
High Strength Aluminium Shaft
Soft Pivoting Head Self Standing Base

Net Weight: 520g

**Persuasive technology:** How technology is designed to change behaviors of the users

- A new behavior was created in 2007
- User Centered Design: Need≠Motivation

More fun than functions…

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![Fogg Behavior Model](image)

- High Motivation
- Low Ability
- High Ability
- Low Ability

**Action Line**

- Triggers succeed here
- Triggers fail here

\[ B = \text{mat} \]

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If telehealth systems connect older adults with family members, the son is the trigger… Care, interaction, connection, in addition to health monitoring.
Banqiao Veterans Home
We are designers!
UX: User Experience Design

Find that Trigger—Caregivers are the best designers!

iPad Project by Anchor in UK

- iPads were introduced to all of Anchor’s care homes (63) in two years, to be used in activity sessions for residents with dementia.
- Use of iPads with residents: 42% using the iPad less than a few times a week, 44% a few times a week and 13% more than a few times a week.
- Playing music or songs (94%), playing film clips (60%), games (58%), drawing and art (48%), use of Skype (45%).
- iPads were helping to enhance activities and further enrich residents’ lives by providing an extra dimension to an activity.
政策引導：經由專業市場篩選智慧健康科技產品？！

香港行政長官林鄭月娥2017年10月發表首份施政報告，宣布為積極推動樂齡科技，改善長者生活，減輕護老者和護理人員的負擔和壓力，預留10億港元成立基金，資助安老服務單位試用及購買科技產品。(2017/10/11)

政務司司長張建宗出席第二屆「樂齡科技博覽暨高峰會」開幕儀式時表示，特區政府在2017年施政報告中設立的10億元「樂齡及康復創科應用基金」，將於12月3日起接受相關院舍及機構申請，預計超過1,260間服務單位將受惠。 (2018/11/22)
The high-tech buzzwords: What is “Internet of Things”, or IoT, anyway?

• Connect everything through the Internet (Bill Gates, 1996)

• So the devices at home start to have some Artificial Intelligence (AI)…

• And the cloud starts to collect some Big Data of the on-off bed behavior of the older adult…

• Publish / subscribe / topic ➔

  IoT is like a Line (or WhatsApp) group

• M2M (Machine to Machine) communication
Bed is the core of living and care for residents in hospitals and nursing homes

- **WhizPad** is an extremely comfortable mattress capable of motion sensing

- Pressure-relieve material for prevention of bedsore

- Four sensing areas, private cloud, IoT

- Three-stage leave bed alert (sit-up, sitting at the side, leave bed) for hospital fall prevention.

- Web and App UI
Second generation WhizPad: 30 sensing areas, “Machine Learning”

- Learning samples from 40 testers in 8 weight groups
- Classification of 6 postures
  - Lying down/left/right
  - Sitting up/left side/right side
- Prediction accuracy: 96.7%

- Edge AI: algorithm on chip
- Management UI
  - 3-stage leave bed alert
  - Long pressure area alert
- Using 2 AAA batteries
- Amazon Web Service (AWS) for data storage and Cloud AI: living pattern, sleep quality…
Motion sensing **WhizCarpet**: Fall detection and mobility monitoring

- Easy and flexible set up; soft surface reduces risk of fracture when falling
- Real time position display, fall detection and alert
- Mobility and pattern analysis, abnormal pattern alert
- Wandering behavior, path, hot spot analysis of demented patients

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2018/06/21 甘泉伯伯活動頻率及模式
Bluetooth IoT gateway *WhizConnect*: AIoT bedroom integrating Bluetooth products

- **Environmental data**
- **Vital signs**
- **Long term health and living pattern**
- **Real time status and event alerts**
**WhizTouch: IoT light / caregiver pager**

- Big button; mobile phone as receiver; green light to confirm the call
- Our only B2C product used at home

**Problems with using IoT care products at home**

- High monthly fee for Internet service is not acceptable, if the older adult is not using Internet for other purposes.
- 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 for bringing IoT care products to homes**

- Sim card connects directly to NB-IoT base station; used anywhere without setup
- Low transmission cost (as low as 10TWD per month)
WhizSeries IT structure: Edge AI and Cloud AI

- B2B2C business model
Non-pharmacological intervention to Alzheimer patients

- Non-pharmacological intervention often needs technology support
- Physical activity (PA) programs for older adults could integrate challenging cognitive exercises to improve cognitive health.
- In an 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)
- Combined PA + CA programs should be promoted as a modality for preventing as well as treating cognitive decline in older adults.

<table>
<thead>
<tr>
<th>Non-pharmacological intervention to Alzheimer patients</th>
<th>Cognitive</th>
<th>ADL</th>
<th>BPSD</th>
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<tbody>
<tr>
<td>Cognitive training</td>
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<td>Cognitive rehabilitation</td>
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<td>Cognitive stimulation therapy</td>
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<td>Snoezelen/multisensory</td>
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<td>Physical activity</td>
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<td>Light therapy</td>
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<td>Animal-assisted therapy</td>
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Takeda et al. (2012)
Designing serious games for people with dementia

• Serious games use technology to combine multimedia, entertainment, and experience (Laamarti et al., 2014), to design “games that do not have entertainment, enjoyment, or fun as their primary purpose” (Michael et al., 2006)

• Recommendations for serious games for people with dementia [Dietlein et. al, 2018] :
   Interventions should be supervised to support people with dementia to help them understand the instructions and the technology of the games
   Serious games should be well adapted to the target population and their individual impairments, capacities, and interests
   Interventions should be played in groups in order to guarantee enjoyment and commitment to the games and to foster social behavior and interaction
What are the values brought by technologies?

• Combining physical exercise, cognitive training, and multi-sensory stimulation
Generate and record data that are helpful to elderly care

- Timed up and go (TUG) 3 meters
- Time (sec), step length (cm), cadence (steps /min), difference in left and right steps (%)
- Facial recognition, game results stored in the cloud
Caregivers can choose and design games suitable for older adults.

Chasing game

麻将配对
“Pillow Fight”, 3rd Place in Stanford Center on Longevity Design Challenge

• Intergeneration game: Changed video game controllers to familiar household items - pillows, enabling older adults and children to play together by punching the pillow.

• Other 7 global finalists: Stanford University (1st place), UC Berkeley (1st place), New York University, Virginia Tech University, San Francisco State University, Stieglitz State Academy of Art and Design (Russia), Shih Chien University (Taiwan)

GRC Deputy Director Prof. CK Lim and students presenting “Pillow Fight” at Stanford, 04/16/2019
Bringing gerontechnology research to daily living

- Gerontechnology research is only valuable if the research can become products!
- Start-up company founded in 2016
- 8 co-founders are students graduated from the research center

Creativity ➔ Prototype ➔ Product ➔ Sales

- Struggle between being a professor and a boss…
From research to product: More Design Thinking!

- Empathy: User centered, persona…
- Define the right problem
- Think like a boss…
The future world needs transdisciplinary talent

"Design" is our common language!
Design starts with a problem. Design ends with a solution.

DESIGN IS A PROBLEM SOLVING PROCESS.

Thank you

Transdisciplinary learning
Real world problem and experience

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