Carry out a successful industrial and educational experiment in gerontechnology

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Some demographics of Taiwan

- Taiwan became an aged society in 2018, and is expected to become a super aged society by 2025.
- Age 65+: 3.52M (14.90%) @2019/06
- The average life expectancy in Taiwan hit a new high of 80.7 years in 2018, with men and women averaging a record 77.5 years and 84.0 years, respectively.
- Life expectancy at age 65: men 18.44, women 22.12 @ 2018
- Aging index: 112.64 (2018/12)
- Average age of first time mother: 30.9 @2019 (Italy 31.1 @2017)
- Age of first time mother 35+: 22.3%
- Taiwan had 115,395 births and 117,935 deaths from January to August — 2,540 more deaths than births, or negative natural population growth — with nothing to suggest a reversal in this trend before the end of the year. (Taipei Times, Sep. 26, 2019)

<table>
<thead>
<tr>
<th></th>
<th>Hong Kong</th>
<th>Taiwan</th>
<th>Macao</th>
<th>Singapore</th>
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</thead>
<tbody>
<tr>
<td>2017</td>
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<tr>
<td>Crude birth rate</td>
<td>8.90 (208)</td>
<td>8.30 (219/224)</td>
<td>8.60 (216)</td>
<td>8.60 (216)</td>
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<tr>
<td>Fertility rate</td>
<td>1.19 (221)</td>
<td>1.13 (222/224)</td>
<td>0.95 (223)</td>
<td>0.83 (224)</td>
</tr>
</tbody>
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CIA: The World Factbook
It is only natural to consider applying technologies...

to provide positive solutions in maximizing the efficiency and effectiveness of manpower and resource for the care of older adults.
Medical devices? Assistive devices? Gerontechnology!

• Proud to be a designer!

• 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
From telehealth to an AIoT bedroom -- The route of R&D

Telehealth
- Ubiquitous Care – The “UCare Flagship Project” funded by the Ministry of Economics, Taiwan, from 2006-2011
- 40+ projects by hospitals, nursing homes, IT companies
- Very few projects actually sustained after the funding ended

Robots do not belong to the homes?!

Smart living / IoT / Gerontechnology

Service robots
- Intelligent robotic wheelchair
  Gold medals, 2011 intelligent robot competition / 2012 innovative mechanism design competition

- Telepresence robot (2013)
AI, rainbow in the sky?
Daily living pattern obtained from WhizPad

64.58%

55.55%

59.72%

42.36%

46.52%

47.22%

43.05%
Accumulating the norm for in-bed activities

- 1 week
- In-bed 51.09%

- 2 weeks
- In-bed 45.88%
Use 70% as threshold to define “normal activities”

Normally, the older adult
1. Gets up no earlier than 05:50
2. Gets up no later than 07:30
3. Not in bed during the day
4. Goes to bed no earlier than 19:00
5. Goes to be no later than 20:40

1. In-bed longer (64.58%)
2. Got up later than normal at 07:50
3. Back to bed multiple times during the day
4. Went be bed earlier at 17:30
5. Left bed multiple times during the night

AI: Learning ➔ Prediction
Gerontotechnology is transdisciplinary in nature

Transdisciplinary learning
Real world problems and experience

• 18 hours, 1 credit design workshop
• 12 credit undergraduate program
• 2-year master degree program

Students from various backgrounds

“DESIGN” IS OUR COMMON LANGUAGE...
### “Zenbo for older adults?” 3+1 weeks design workshop

**Domain knowledge with a purpose**

**Design Thinking practice**

**Design tool: Zenbo App Builder**

**Prototype demonstration to intended users**

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Topic</th>
<th>Instructor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/25</td>
<td>1:10pm-4:00pm</td>
<td>課程介紹/老人福祉科技概論</td>
<td>徐業良/林煒卿</td>
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<tr>
<td></td>
<td>4:00pm-5:00pm</td>
<td>小組討論</td>
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<tr>
<td>11/01</td>
<td>1:10pm-2:00pm</td>
<td>Zenbo介紹與展示</td>
<td>華榮榮</td>
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<tr>
<td></td>
<td>2:10pm-6:00pm</td>
<td>設計思考與使用者經驗設計</td>
<td>張成秀</td>
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<tr>
<td></td>
<td>6:10pm-7:00pm</td>
<td>小組討論</td>
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<td></td>
<td></td>
<td>課間作業:設計思考同理心練習</td>
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<tr>
<td>11/15</td>
<td>1:10pm-4:00pm</td>
<td>遊戲化設計(gamification design)</td>
<td>陳姿文</td>
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<tr>
<td></td>
<td>4:10pm-6:00pm</td>
<td>失智症生活照護與非藥物治療</td>
<td>彭瑞蘭</td>
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<tr>
<td></td>
<td></td>
<td>課間作業:Zenbo與長者互動使用情境設計</td>
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<tr>
<td>11/22</td>
<td>1:10pm-4:00pm</td>
<td>期末評價</td>
<td>任課老師及業師</td>
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<tr>
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<td>期末評價在新北市衛生局「失智照護智慧資源專區」辦理 除本計畫教師外，另由新北市衛生局邀請長者及專業照護者擔任評審業師</td>
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Serious game design based on WhizToys – One semester design course

- Sensor, IoT, Apps… / Game and UI design
- Reviewed, played, and critiqued by target users

WhizToys
One Toy, Many Games
Participating in the International Society for Gerontechnology

- 2011/08 Associate Editor, *Gerontechnology*
- 2012/06 Bid for the 9th World Conference of Gerontechnology
- 2012/06 Executive Board, International Society of Gerontechnology
- 2014/06 The 9th World Conference of Gerontechnology at Taipei
- 2014/06 – present IT Director, International Society for Gerontechnology
- President, Chinese Society of Gerontechnology and Service Management, 2013/01 – 2017/12
- President, International Society of Gerontechnology, Sinophone Chapter, 2014/06 – present
- 2016/09 Editor-in-Chief, *Gerontechnology*
Promoting gerontechnology through the many speeches

1. 健康樂活科技的應用與發展, 第三屆後現代整合學及通識教育研討會, 2019/10/19
2. Fun technology—智慧科技在長者健康適能與認知促進的創新應用, 中華安全行動照護協會2019高峰論壇, 2019/10/05
3. 智慧科技在機構照顧的應用, 台北仁濟院課程, 2019/08/29
4. 窄帶物聯網—居家智慧照護最後一哩 Narrow Band IoT— The Last Mile for Smart Homecare Systems, Smart IoT Taiwan Expo & Summit – Smart Healthcare, 2019/08/23
6. 科技可以幫徐媽媽做些甚麼 — 老人福祉科技的設計與創新, 中國時報「安心終老論壇」, 2019/08/19
7. Purpose Learning—建立特色領域d.school, 跨領域國際碩士學位學程規畫小組會議專題演講, 2019/08/01
9. 通用設計概念與設計思考/智慧科技輔具設計, 108年度桃竹苗區結合創客基地辦理職務再設計主題講座, 2019/07/27
10. 職務再設計創意思考微型工作坊, 彰化縣政府勞工處專業訓練, 2019/07/11
11. 人工智慧/物聯網在糖尿病整合照護應用, 中華民國糖尿病衛教學會2019年會專題演講, 2019/07/07
12. 智慧科技在長者健康適能活動的創新應用, 台灣健康促進暨衛生教育學會第3期長期照顧健康管理師認證班, 2019/06/30
13. 智慧科技輔具設計思考, 勞動部勞動力發展署專題演講, 2019/05/28
14. 職務再設計創意思考微型工作坊, 彰化縣政府勞工處專業訓練, 2019/07/11
15. 人工智慧/物聯網在糖尿病整合照護應用, 中華民國糖尿病衛教學會2019年會專題演講, 2019/07/07
16. 智慧科技在長者健康適能活動的創新應用, 台灣健康促進暨衛生教育學會第3期長期照顧健康管理師認證班, 2019/06/30
17. 智慧科技輔具設計思考, 勞動部勞動力發展署專題演講, 2019/05/28
18. 老人福祉科技的設計思維, 2019台灣復健工程暨輔具科技學會年度研討會專題演講, 2019/05/18
19. 服務型機器人在長者居家照護的應用與創新, 元智大學機械工程學系書報討論演講, 2019/05/17
20. We are designers -- 智慧科技於長者照護的應用, 清華大學音樂、科技與健康研究中心專題演講, 2019/04/30
21. 智慧科技於長者照護的應用, 台灣長期照護專業協會第十七屆長期照護學術研討會專題演講, 2019/04/27
22. 智慧科技在長者健康適能活動的創新應用, 台灣健康促進暨衛生教育學會, 2019/04/14
23. 服務型機器人在長者照護的發展與應用—設計思考觀點, 工研院產業學院, 2019/04/12
24. We are designers -- 運動及認知訓練智慧科技產品設計, 資策會「馨生活健康科技服務推動聯盟」成立大會暨交流研討會, 2019/03/21
25. 樂齡科技—從科技研發到生活應用, 香港專業教育學院健康科技研討會主題演講, 2019/03/15
26. 人力工程設計考量和通用設計, 中彰投區職務再設計創意工作坊, 2019/02/23
27. Gerontechnology: From research to daily applications, Keynote speech in "Community, welfare, technology for society in the 21st century" Nara Women's University, Social Cooperation Center, 2019/01/25
ISG’s 12th World Conference of Gerontechnology (ISG 2020)
May 18-20, 2020, Trondheim, Norway

“Measures to achieve better quality of life and active healthy aging”

Call for abstracts, due Friday, November 15, 2019
Gerontechnology is only valuable if we can bring research to daily applications

- How much? Where can I buy this?
- Work with the industry or do it myself?

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

Creativity ➔ Prototype

➤ Product ➔ Sales

- Too greedy to experience everything…
- Struggle between my role as a professor and as a boss…
Writing papers has another meaning...

- We recruited 254 participants who were at risk of bedsores from the ICU of Far Eastern Memorial Hospital, with 127 in the control group and 127 in the intervention group.

- In addition to the standard nursing care, participants in the intervention group used the motion-sensing mattress, which can detect the bed activities during their hospitalization.

- 13 (10.2%) participants in the control group developed bedsores while only 2 (1.6%) in the intervention group developed bedsores, showing a significant reduction of 8.6% (P=0.003).

- After adjusted for some confounding variables, we found that the likelihood of development of bedsore in the intervention group was reduced by 90% (OR=0.10, 95% CI: 0.02, 0.51, P=0.005) compared with that in the control group.

- The average timing to develop bedsore in participants using the motion-sensing mattress was 7.5 days and was postponed by 2.3 times than that in participants who received standard nursing care which was 3.3 days.
徐業良，王為寬，劉育強，張凱維，戴其宇，林翰俊，李杰儒，黃宗正，李福祥，甘凱文，鄭智銘，謝佩均

19. Applying for patents so that the companies are serious about us...
Carry out a successful industrial and educational experiment in gerontechnology

The gerontechnology industry is not there, yet…

• A professor can keep telling people what to do…… or show people how this can be done!

The future world needs transdisciplinary talents

• Are we really doing the right research which “will be useful in the future?”
• Are we educating students the right way?

I have the best job in the world!

Do the things I like, the way I like. Feel like contributing to the world, and make a living too!

Thank you

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