

# 以人因工程為基礎之人機互動 設計

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# Recent news

- Cisco survey reveals close to three-fourths ( $\frac{3}{4}$ ) of IoT projects are failing
  - Cisco's Technology News Site, 2017
- Cisco study finds how “human factors” influence successful IoT implementation
  - IoT News, 2017
- Elon Musk drafts in humans after robots slow down Tesla Model 3 production
  - “Humans are underrated,” says CEO after company failed to hit weekly production target in first quarter of 2018
    - The Guardian, Apr. 16, 2018
- Tesla car that crashed and killed driver was running on Autopilot, firm says
  - Company says driver took no action despite system's warnings
    - The Guardian, Mar. 31, 2018
- Self-Driving Uber Car Kills Pedestrian in Arizona, Where Robots Roam
  - The New York Times, Mar. 19, 2018



# 問題點

科技導向，未充分考慮使用脈絡與使用者需求

如何了解使用脈絡與使用者需求

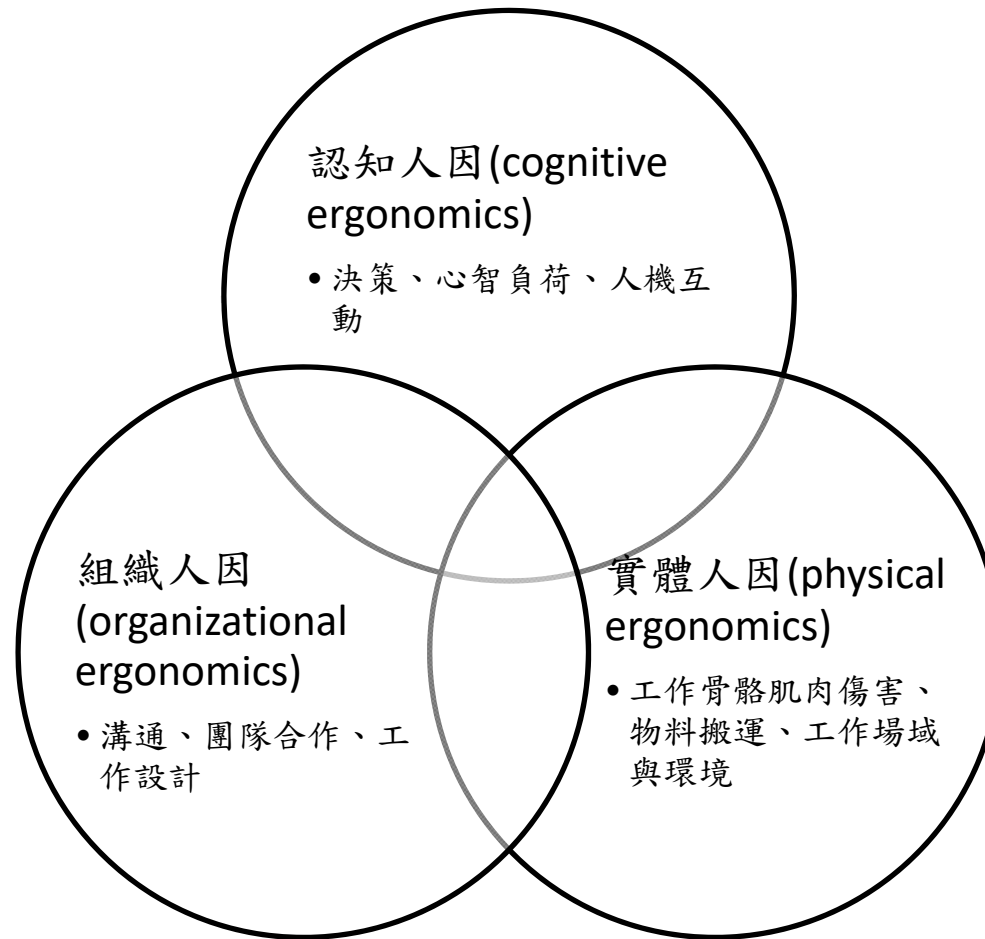
如何提出有效的解決方法

# 名詞解析

- 人因學
- 人因工程學
- 人體工學
- 人類工效学
- 人間工学
- Ergonomics
- Human Factors



# 人因三大領域



# 人因大事記

1984

- 科技部建立人因工程與設計子學門(工業工程與管理學門)

1993

- 人因工程學會(Ergonomics Society of Taiwan, EST)成立

1995

- EST成為國際人因學會(International Ergonomics Association, IEA)會員

2012

- 王明揚教授獲選為IEA理事長

2018

- 人因工程學會成立25週年(年會：三月16~18，清華大學)

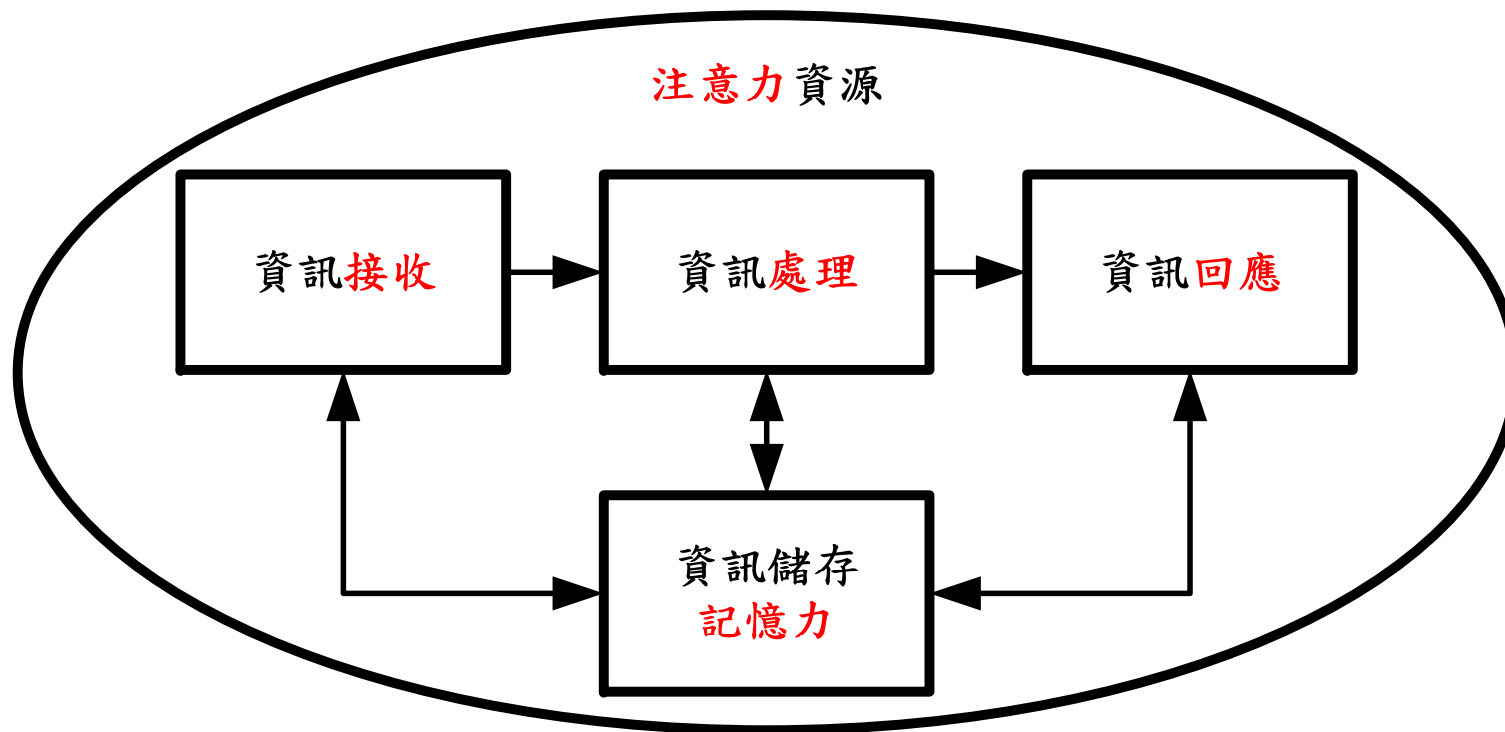


# Ergonomics/Human Factors

- Human factors discovers and applies information about
  - **human (人)** behavior, abilities, limitations, and other characteristics
  - to the **design (設計)** of tools, machines, systems, tasks, jobs, and environments
  - for productive, safe, comfortable, and effective human use.
  - Sanders and McCormick (1993) *Human Factors in Engineering and Design* (7<sup>th</sup>. Eds.)
- Ergonomics (or human factors) is the scientific discipline concerned with
  - the understanding of **interactions (互動)** among **humans (人)** and other elements of a system,
- and the profession that applies theory, principles, data and methods to **design (設計)**
  - in order to optimize human well-being and overall system performance
  - International Ergonomics Association (IEA)  
<http://www.iea.cc/ergonomics/>

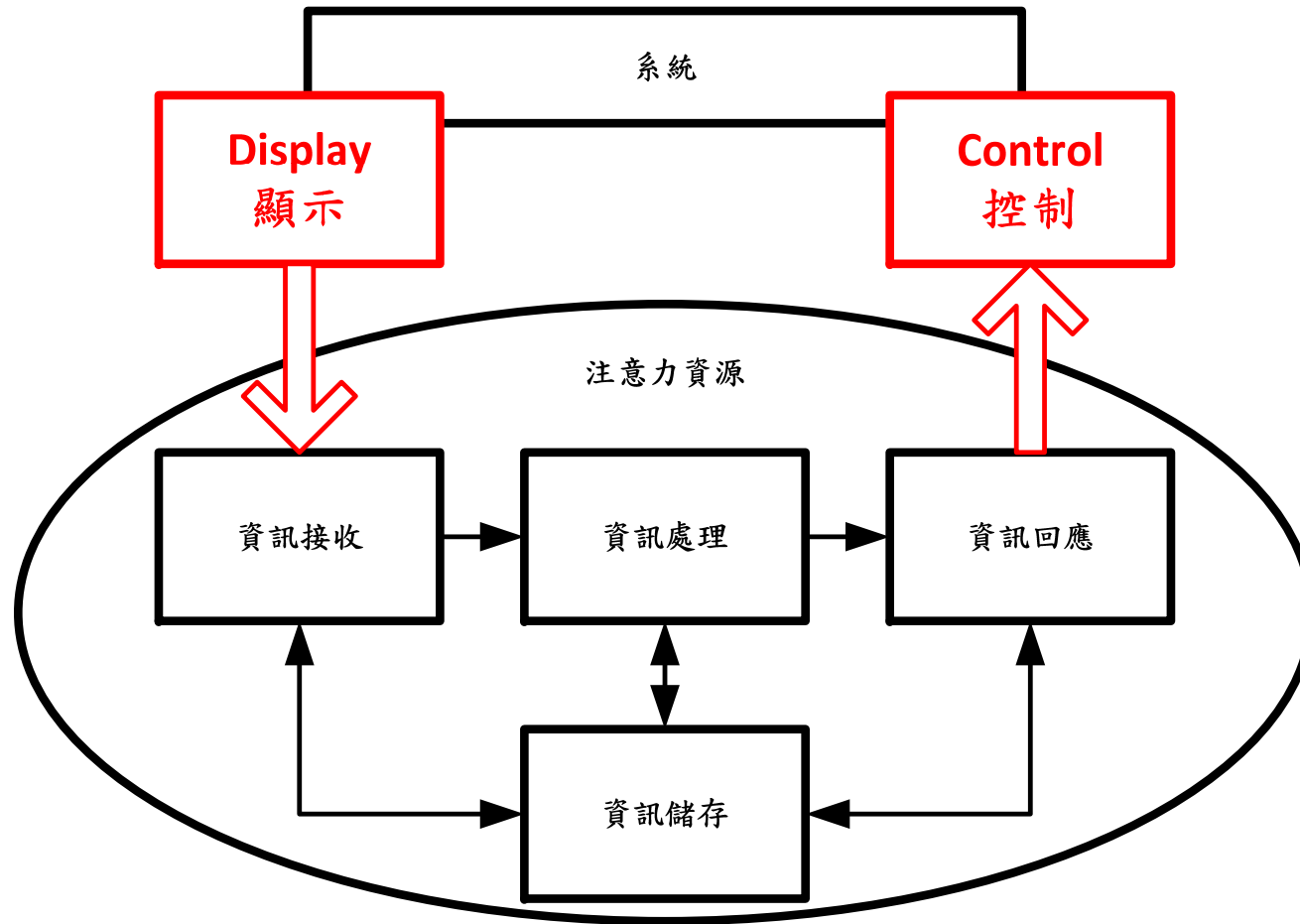


# 人(human)的認知能力與限制



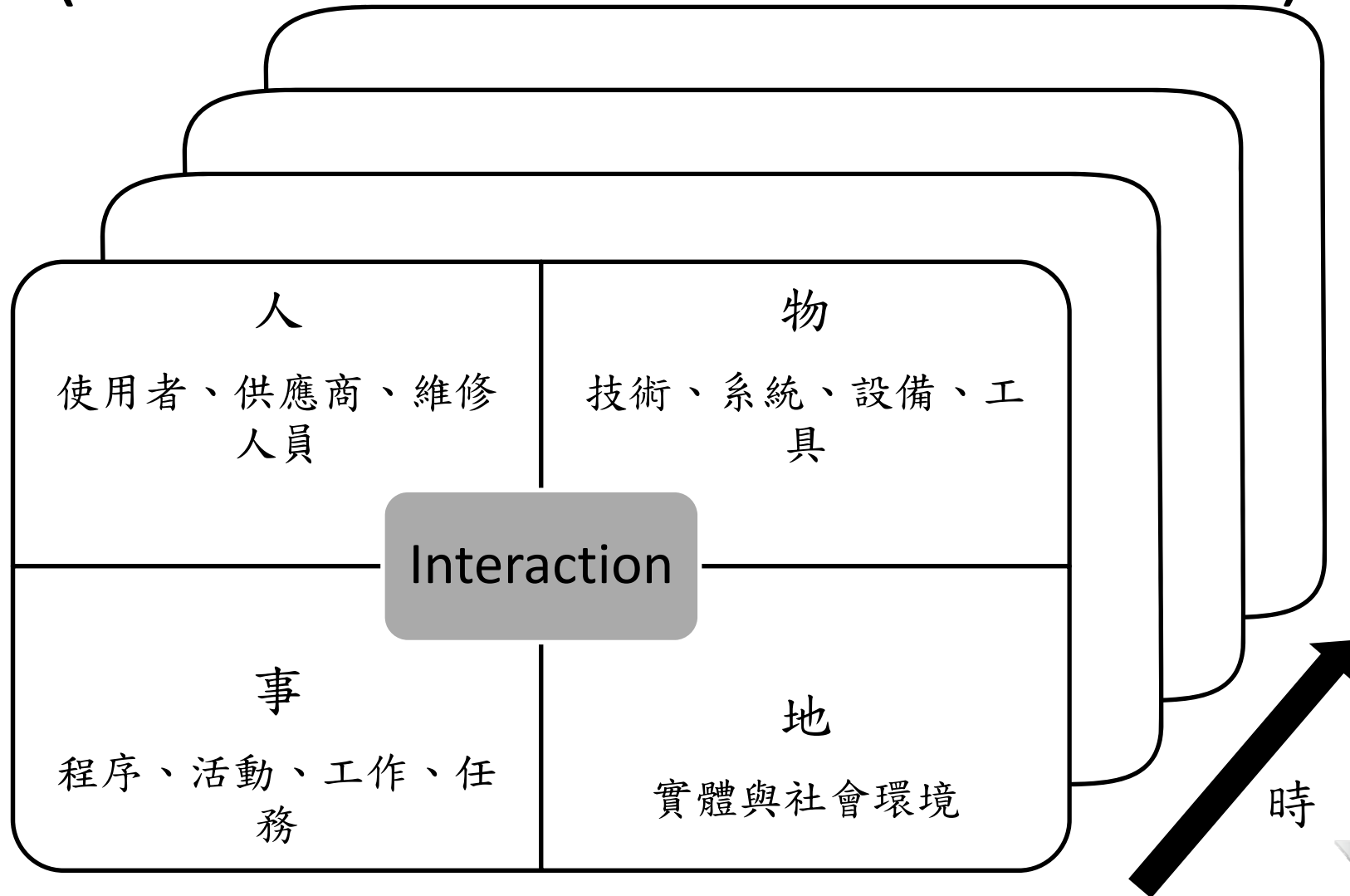


# 使用者介面設計



# 互動脈絡架構

(Framework of interaction context)



# 人因工程解決方案

以物就人

- 設計

以人就物

- 訓練
- 招聘

# 以人就物

## 人員訓練

- 學用落差
- 配合度
- 正確度

## 人員招聘

- 合格標準
- 衡量方式
- 合格人數

# 設計 Design

- Designs by Jacques Carelman
- 案例：屏東火車站(2017/5/26)
- Tactile maps designed by Inuit

# 日常案例：電梯按鈕

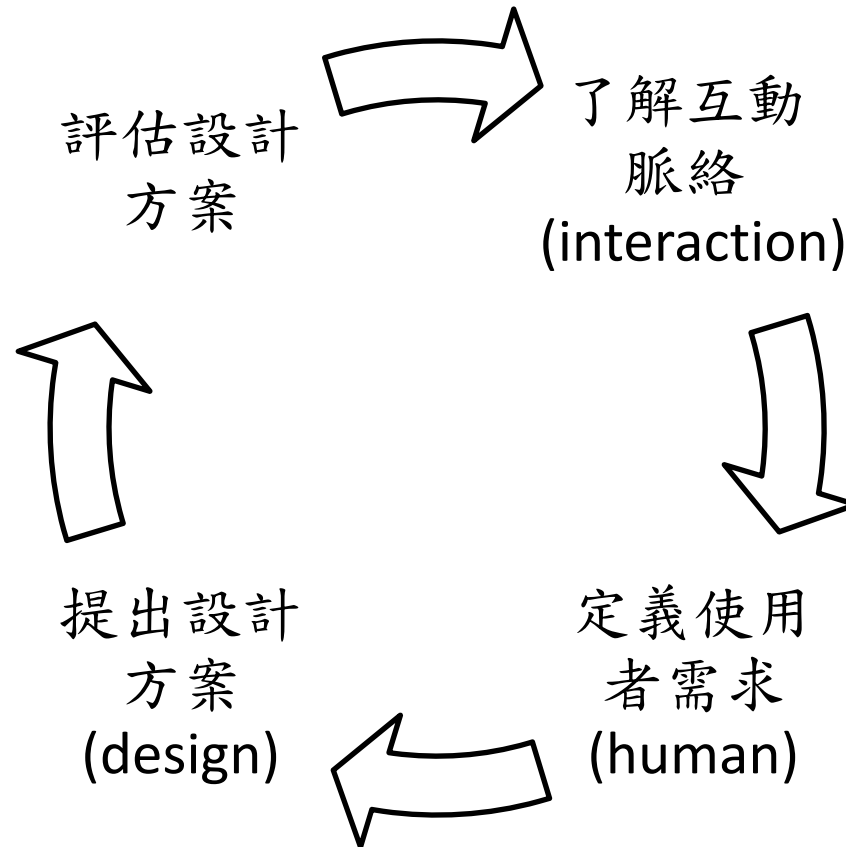


# 醫療案例：復健牽引機



Liang, S. -F. M., Rau, C. -L., Tsai, P. -F., and Chen, W. -S. (2014).  
Validation of a task demand measures for predicting mental workloads of physical therapists.  
*International Journal of Industrial Ergonomics*, 44, 5, 747-752.

# 設計循環 ISO 9241-210 (2010)



**Human-centered, not technology-driven**





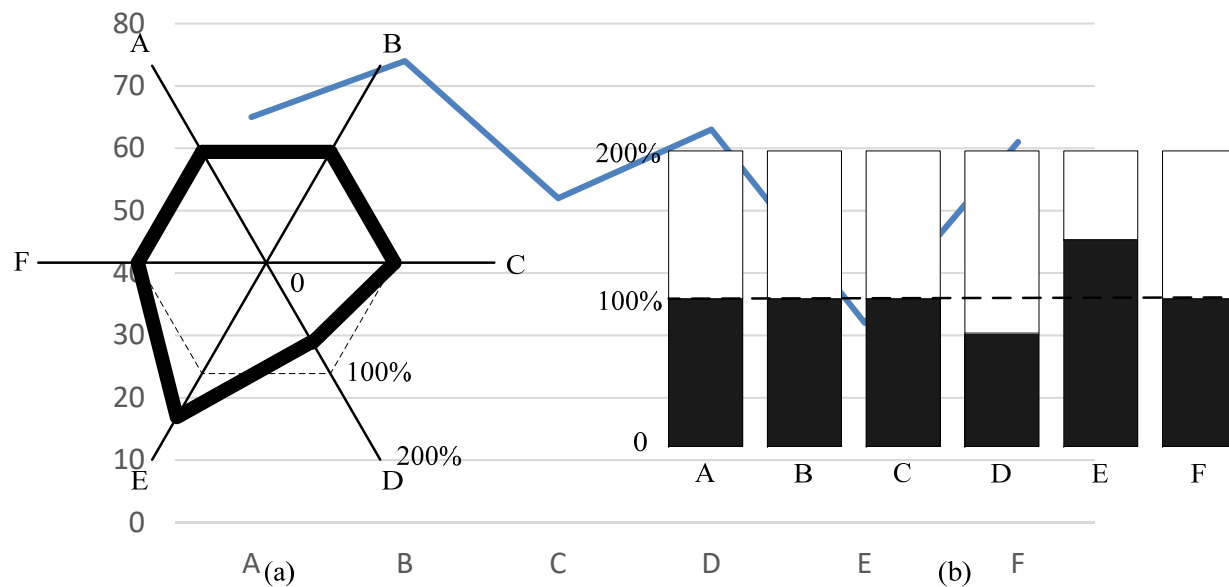
# 評估：使用性 (Usability)

## ISO 9241-210 (2010)

- The extent to which a system, product or service can be used by specified users to achieve specified goals with effectiveness (效果), efficiency (效率) and satisfaction (滿意度) in a specified context of use
  - Adapted from ISO 9241-11:1998

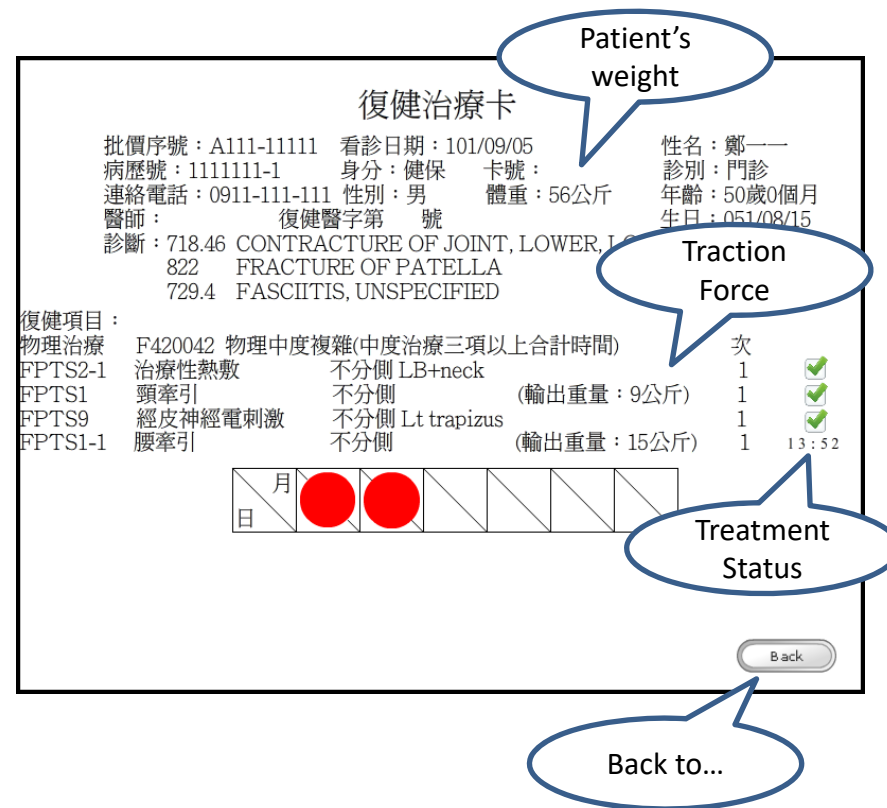
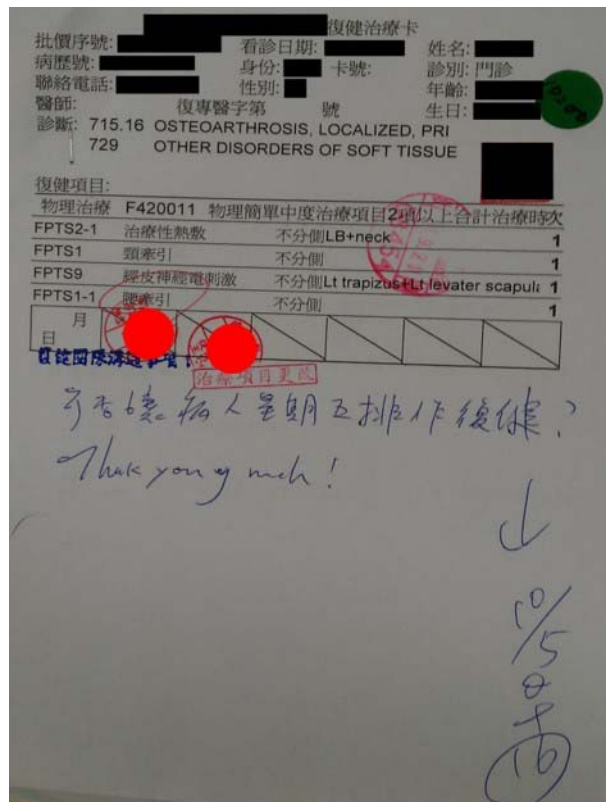
# 設計方案舉例一： Configural display (組態顯示)

| A  | B  | C  | D  | E  | F  |
|----|----|----|----|----|----|
| 65 | 74 | 52 | 63 | 32 | 61 |



梁曉帆 (2017). 運用人因及風險觀點檢視化療藥品靜脈注射給藥作業.  
醫療品質雜誌(*Journal of Healthcare Quality*), 11(3), 17-23.

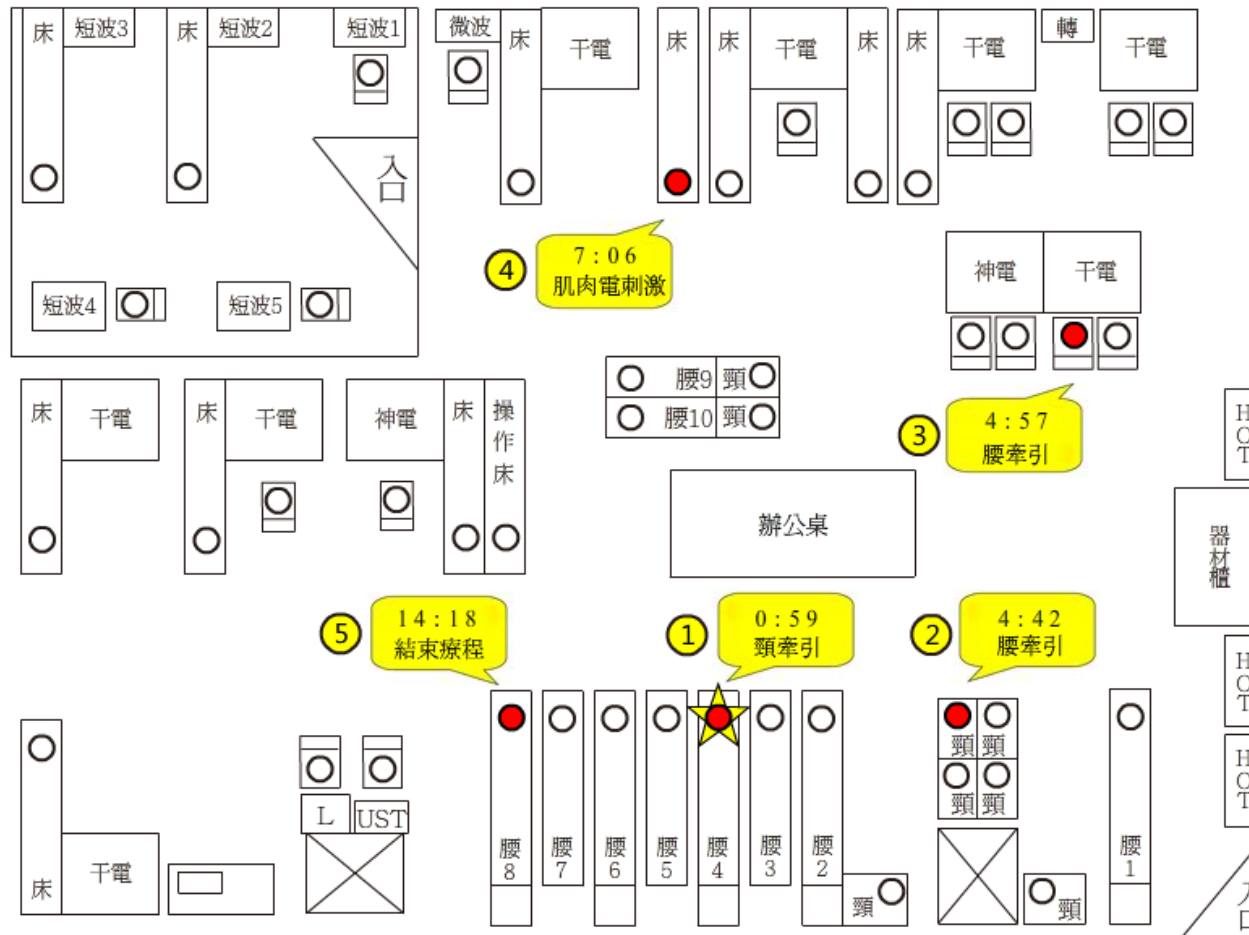
# 設計方案舉例二：復健治療



Liang, S. -F. M., Cheng, L. -W., Tsai, P. -F. J., and Rau, C. -L. (2014).  
 Designing user interfaces of a handheld device for physical therapists.  
 Proceedings of the 4<sup>th</sup> International Conference on Healthcare Systems Ergonomics and Patient Safety, 6 pages.



# 設計方案舉例二：復健治療



Liang, S. -F. M., Cheng, L. -W., Tsai, P. -F. J., and Rau, C. -L. (2014).  
Designing user interfaces of a handheld device for physical therapists.  
*Proceedings of the 4<sup>th</sup> International Conference on Healthcare Systems Ergonomics and Patient Safety*, 6 pages.

# 總結

了解人的能力與限制

以「人、事、時、地、物」之使用脈絡架構分析互動，了解使用者的需求

人本設計，非科技導向



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