臺中榮民總醫院嘉義暨灣橋分院
Chiayi & Wanqiao Branch, Taichung Veterans General Hospital

# AI人工智慧於社區照護的挑戰與展望
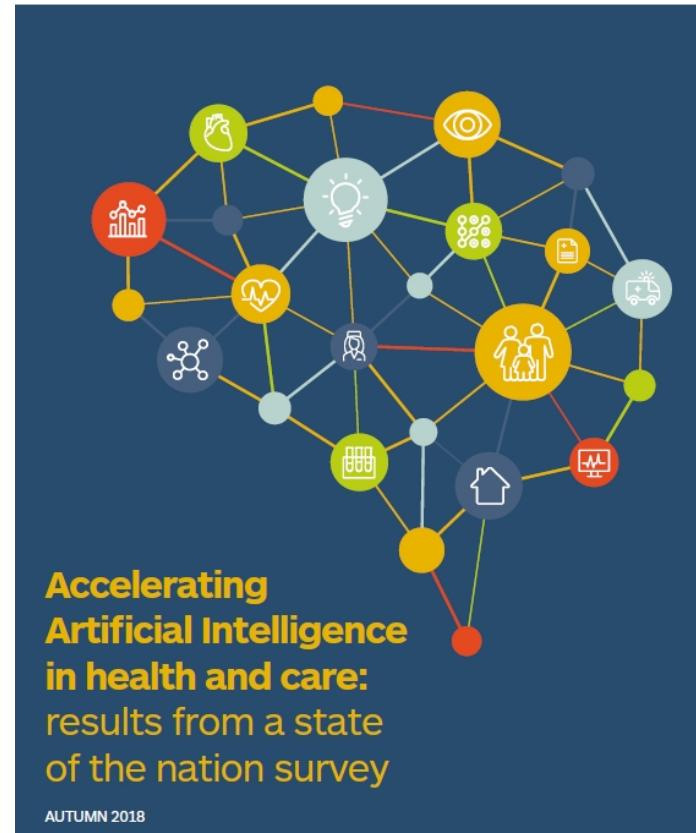
臺中榮民總醫院嘉義分院副院長　黃敏偉

2020.10.20
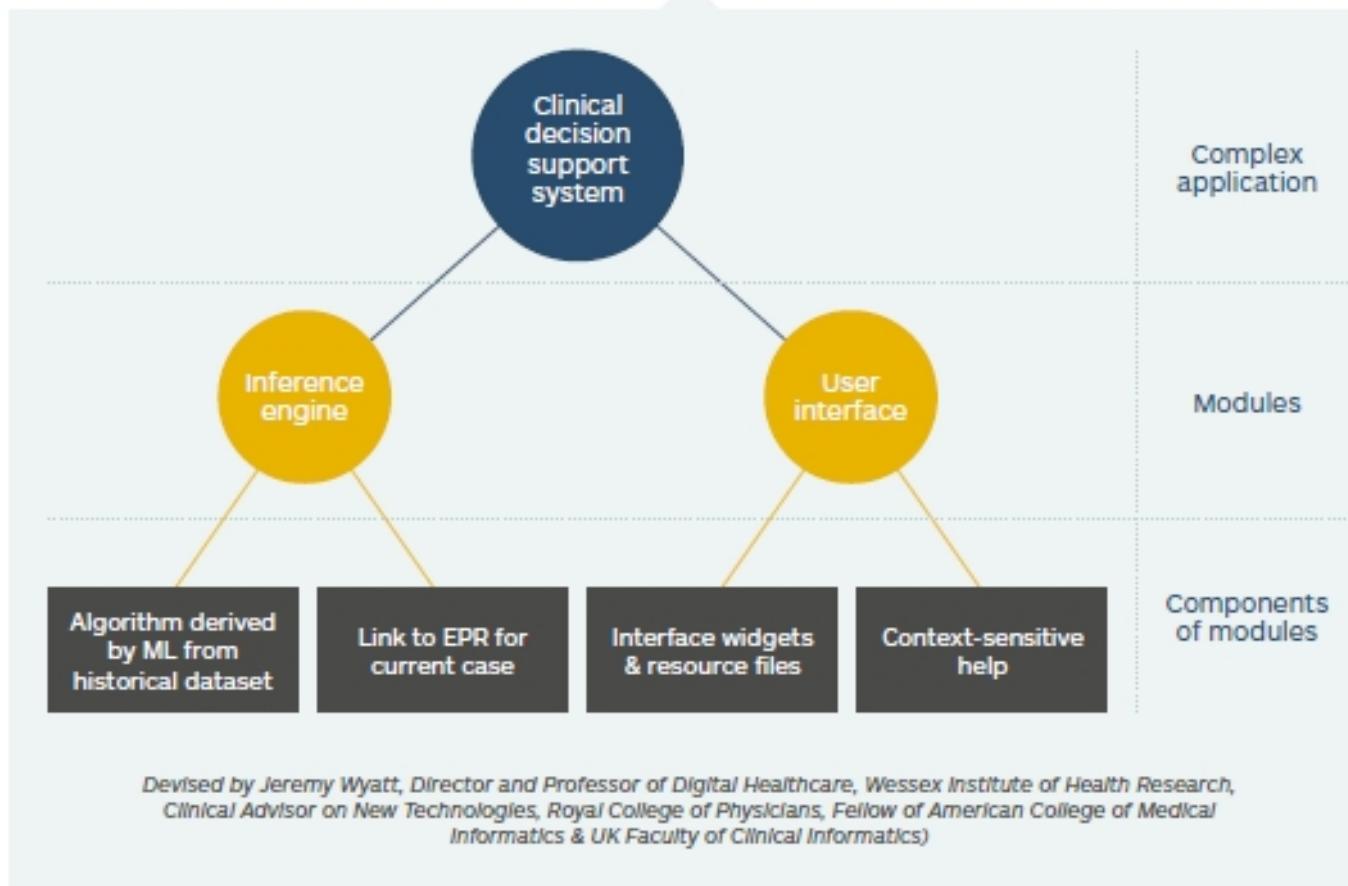
# Academic Health Science Networks (AHSNs)

- 學術健康科學網絡是英國NHS內的會員制組織。它們於2013年5月創建，旨在將醫療服務，學術界和業界成員聚集在一起。他們宣稱的目的是通過促進和鼓勵醫療保健創新的採用來改善患者的治療效果並為英國帶來經濟利益。

Example of how simple components form modules which then form a complex AI application

Machine-Learning(ML)  Electronic Patient Record (EPR)

| High complexity<br>AI applications | Middle complexity<br>AI modules or components | Low complexity<br>AI reasoning methods |
| --- | --- | --- |
| • Autonomous vehicle<br>• Machine translation tool<br>• Care companion robot<br>• Chat bot<br>• Surgical or pharmacy robot<br>• Mammogram interpretation system<br>• ECG interpreter<br>• Diagnostic decision support system<br>• Speech driven radiology report tool with SNOMED coded output | • Natural language to SNOMED code processing module<br>• Image processing module<br>• Text to speech module<br>• Knowledge based or expert system module<br>• Signal processing & classification module<br>• Recommender module | • Deep learning module<br>• Ensemble methods (e.g. Random Forest Models)<br>• Neural networks<br>• Object segmentation algorithm<br>• Signal processing algorithm / filter<br>• Generative adversarial networks<br>• Time series analysis<br>• Graphical models<br>• Decision trees, rule induction e.g. CART<br>• Clustering algorithm<br>• Classification algorithm<br>• Regression – linear, multiple, logistic<br>• Inference engine for rules or frames<br>• Argumentation, temporal or spatial reasoner e.g. QSIM<br>• Text generator using DCGs<br>• Case-based reasoning algorithm |

*Devised by Jeremy Wyatt, Director and Professor of Digital Healthcare, Wessex Institute of Health Research, Clinical Advisor on New Technologies, Royal College of Physicians, Fellow of American College of Medical Informatics & UK Faculty of Clinical Informatics)*

# Results of The National Survey About AI Technologies in Health and Care
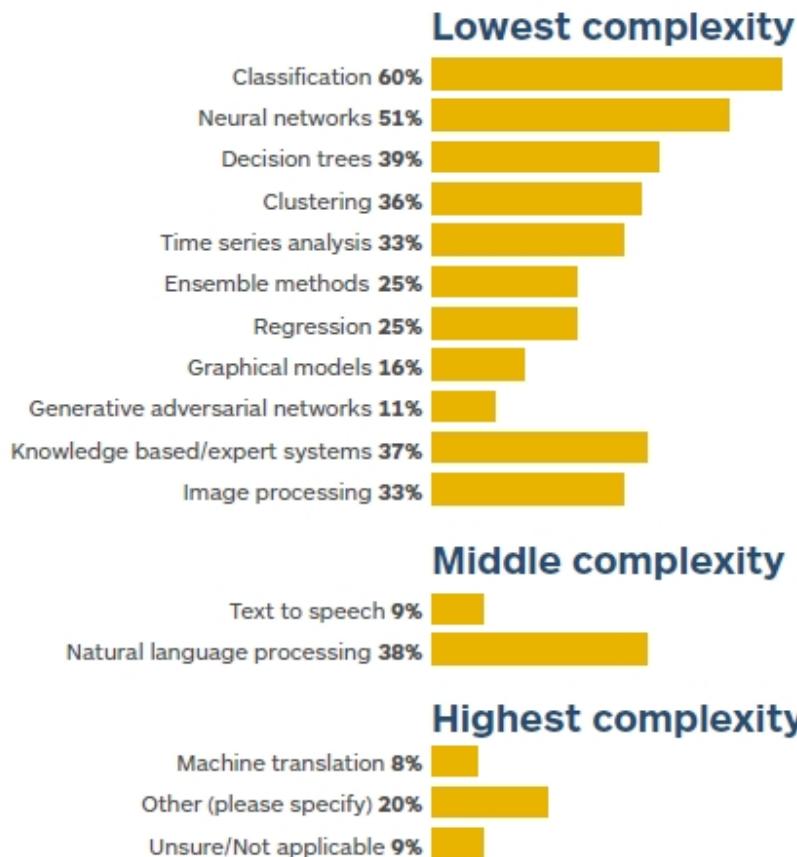
## Case studies delivering value now
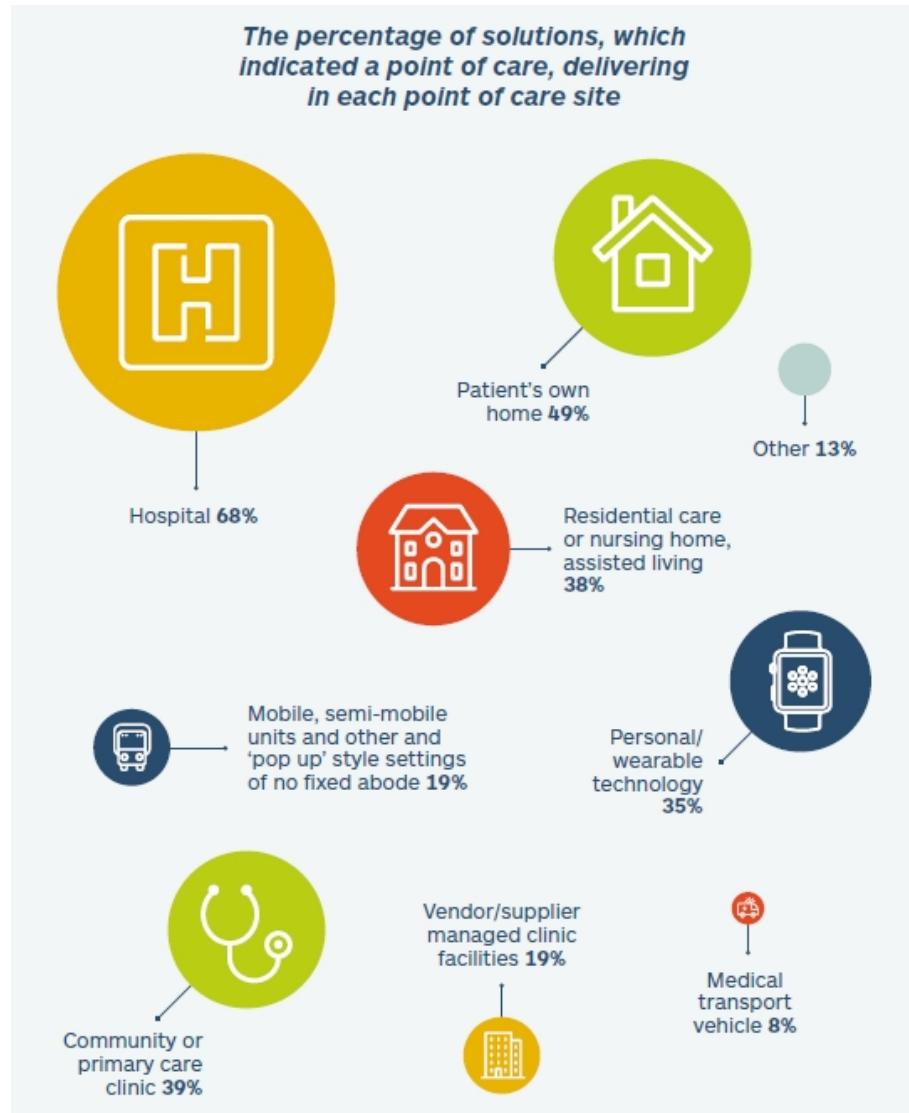
A range of case studies identified through the survey at various stages of maturity (from those at research stage through to examples with regulatory approval and/or publicly available) are listed in Appendix 1.

These solutions are delivering value to the health and care sector in the following areas:

- Unlocking value in data/analytics
- Leveraging skills and capacity
- Organisational processes
- Condition recognition.

### The percentage of solutions reporting using a method of AI

**Lowest complexity**

| Method | Percentage |
|---|---|
| Classification | 60% |
| Neural networks | 51% |
| Decision trees | 39% |
| Clustering | 36% |
| Time series analysis | 33% |
| Ensemble methods | 25% |
| Regression | 25% |
| Graphical models | 16% |
| Generative adversarial networks | 11% |
| Knowledge based/expert systems | 37% |
| Image processing | 33% |

**Middle complexity**

| Method | Percentage |
|---|---|
| Text to speech | 9% |
| Natural language processing | 38% |

**Highest complexity**

| Method | Percentage |
|---|---|
| Machine translation | 8% |
| Other (please specify) | 20% |
| Unsure/Not applicable | 9% |

The percentage of solutions, which indicated a point of care, delivering in each point of care site

Hospital **68%**

Patient's own home **49%**

Other **13%**

Residential care or nursing home, assisted living **38%**

Personal/wearable technology **35%**

Mobile, semi-mobile units and other and 'pop up' style settings of no fixed abode **19%**

Community or primary care clinic **39%**

Vendor/supplier managed clinic facilities **19%**

Medical transport vehicle **8%**

# Real World Analysis on Feasibility And Implementation

- Better allocation of resources by earlier detection of patterns and thus disease, with better targeted preventative strategies as a result
- Trust, privacy and ethics
- Workforce knowledge of AI
- Evidence of effectiveness and regulation
- Data quality, sharing and interoperability
- Funding and commercial models
- Towards a sustainable ecosystem

# 以被照顧者及照顧者為本之長照服務體系

**照管中心任務**

- ☐ 照管專員進行照顧需求評估
- ☐ 照顧計畫核定與服務資源連結
- ☐ 定期複評追蹤與品質監控

醫院 → 出院準備銜接

長照機構 → 返家準備

縣市照管中心

申請

社區

疑似失能/失智個案

ICF ← 身障者

**單項長照服務**

1. 照顧服務(居家服務、日間照護、家庭托顧)
2. 交通接送
3. 餐飲服務
4. 輔具購買、租借及居家無障礙環境改善
5. 居家護理
6. 居家及社區復健
7. 喘息服務
8. 長期照顧機構服務
9. 家庭照顧者支持服務
10. 失智症照顧服務
11. 原住民族地區社區整合型服務
12. 小規模多機能服務
13. 銜接社區整體照顧體系
14. 社區預防性照顧
15. 預防或延緩失能之服務
16. 銜接出院準備服務
17. 銜接居家醫療服務

身障者 → 身障長照服務

衰弱老人 → 預防延緩照護

失智者 → 失智共同照護

失能者 → 社區整體照顧(ABC)

單項長照服務

*註:International Classification of Functioning, Disability, and Health，簡稱ICF
(國際健康功能與身心障礙分類系統)

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# 長照2.0：建構連續性的社區整體照顧服務體系

預防照護

醫療照護

長期照顧

預防照護系統

醫療照護系統

長期照顧服務系統

健康促進 ⋯ 預防照護 ⋯ 急性期照護 ⋯ 急性後期照護 ⋯ 居家服務 ⋯ 社區服務 ⋯ 機構服務

透過照顧管理中心及在地社區服務協調整合中心
發展以人為本、家庭為單位、社區為導向、符合文化敏感及個人生命歷程之連續性照護服務體系

# 物聯網與醫療照護雲端科技的關聯性

# 醫療產業變遷四大觀察重點

民眾需求 → 公共政策 ↔ 產業結構 ← 科技

# 個人化E健康

- 世界主要國家用來降低醫療成本、改善醫療品質的方法。
- 將傳統以治療為導向的疾病管理，轉換為預防性、系統性的生活型態改變。
- 在任何時間、任何地點均可提供普及的、可靠的、具可近性的健康照護。
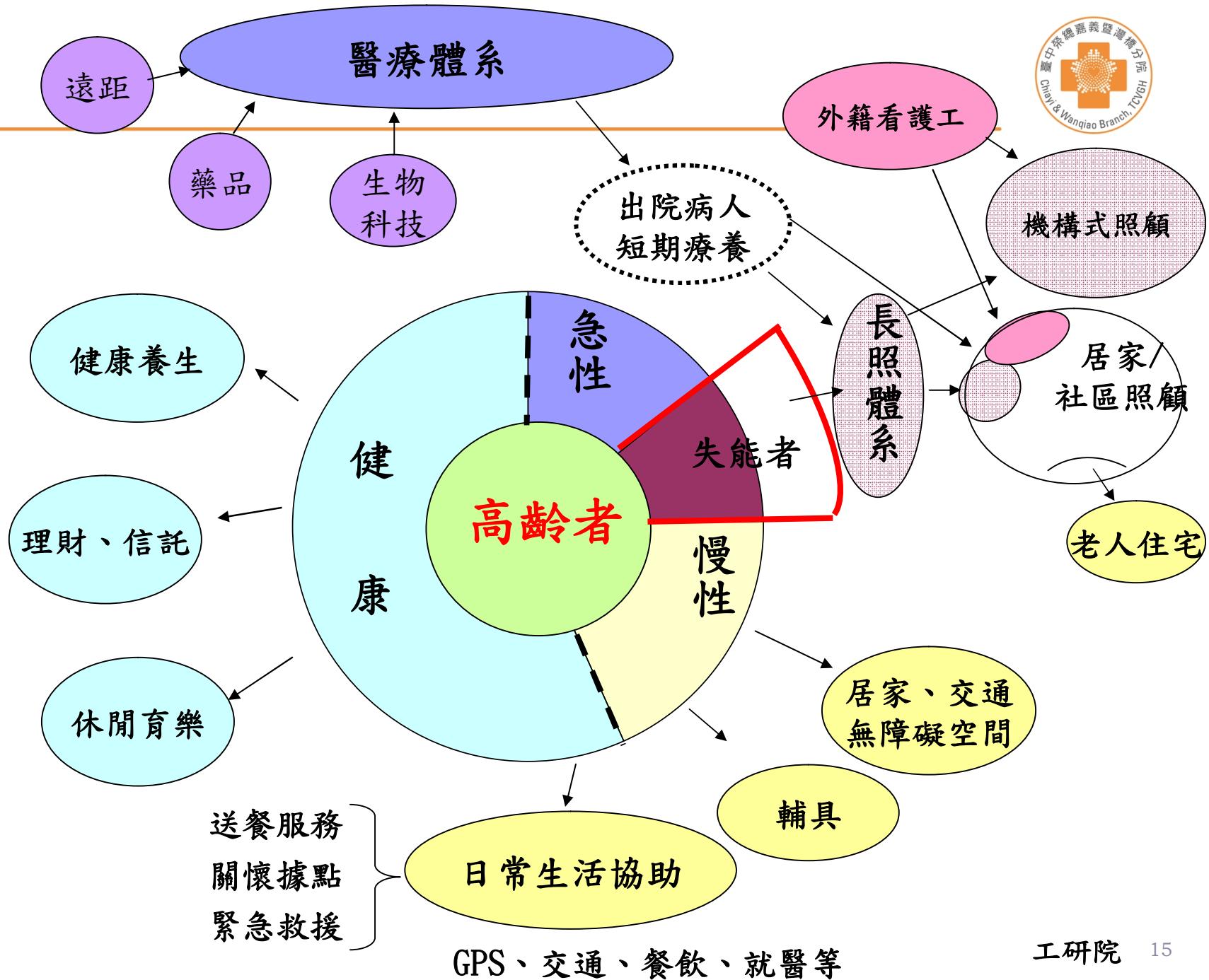
# 醫療照護科技

- 健康ICTs產業，如美國的Health-IT (2004-2013)、歐洲的 i2010 Initiative (2006-2010) 及 Seventh Framework Program me (F7) (2007-2013)、日本的U-Japan (2006-2010)、中國大陸的" 12-5" (2011-2015)。健康ICTs產業的發展趨勢朝向行動化(mobile)、個人化(personalization)、雲端化(cloud)、資料分析等方向發展。
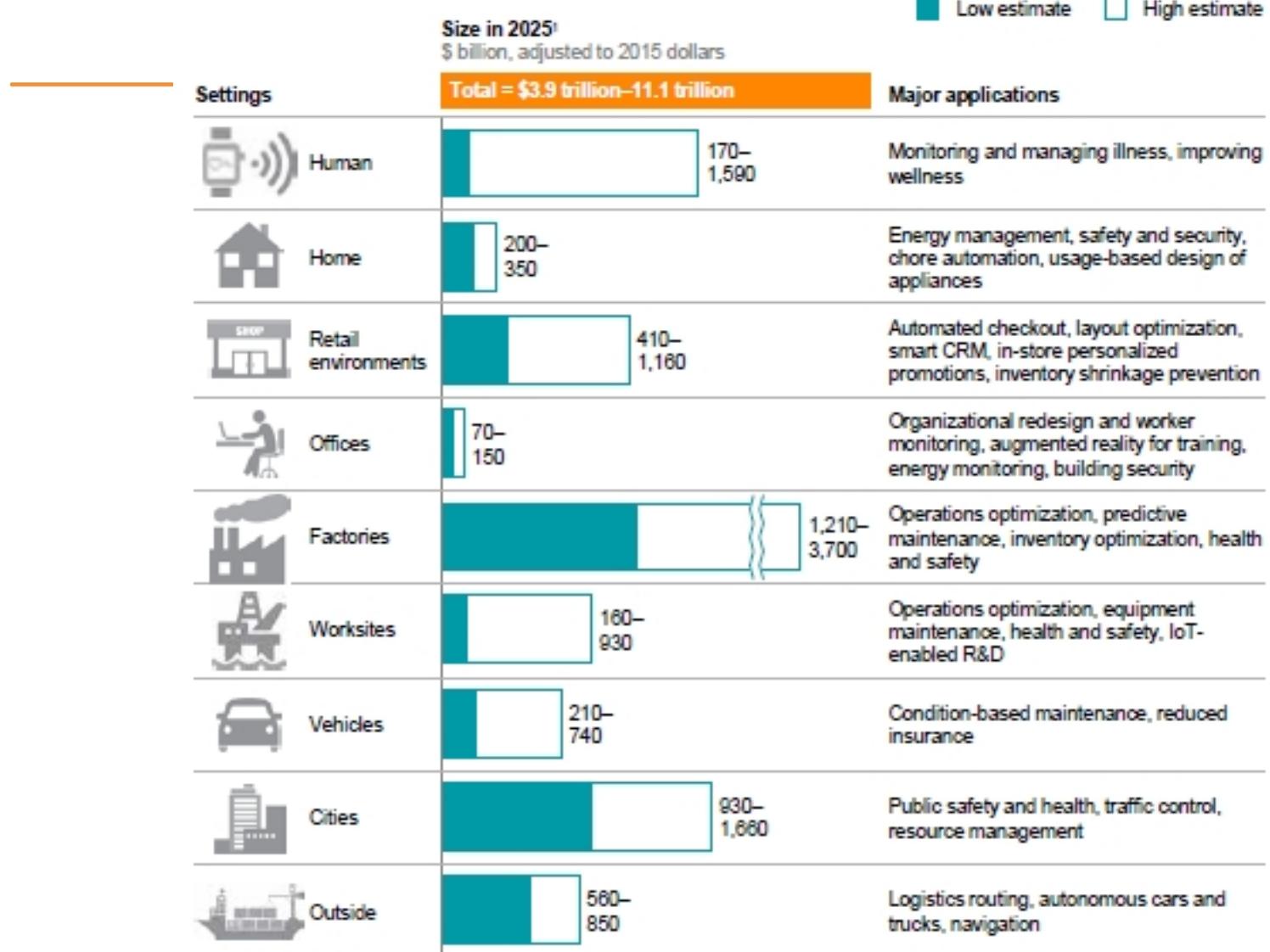


雲端健康管理流程圖(郭博昭 衛生福利部2013)

高齡者相關照護體系及產業示意圖

醫療體系

遠距

藥品

生物科技

外籍看護工

出院病人短期療養

機構式照顧

健康養生

急性

長照體系

居家/社區照顧

健康

高齡者

失能者

老人住宅

理財、信託

慢性

休閒育樂

居家、交通無障礙空間

輔具

送餐服務
關懷據點
緊急救援

日常生活協助

GPS、交通、餐飲、就醫等

**Potential economic impact of IoT in 2025, including consumer surplus, is $3.9 trillion to $11.1 trillion**

■ Low estimate  □ High estimate

**Size in 2025[1]**
$ billion, adjusted to 2015 dollars

| Settings | Total = $3.9 trillion–11.1 trillion | Major applications |
|----------|-------------------------------------|--------------------|
| Human | 170–1,590 | Monitoring and managing illness, improving wellness |
| Home | 200–350 | Energy management, safety and security, chore automation, usage-based design of appliances |
| Retail environments | 410–1,160 | Automated checkout, layout optimization, smart CRM, in-store personalized promotions, inventory shrinkage prevention |
| Offices | 70–150 | Organizational redesign and worker monitoring, augmented reality for training, energy monitoring, building security |
| Factories | 1,210–3,700 | Operations optimization, predictive maintenance, inventory optimization, health and safety |
| Worksites | 160–930 | Operations optimization, equipment maintenance, health and safety, IoT-enabled R&D |
| Vehicles | 210–740 | Condition-based maintenance, reduced insurance |
| Cities | 930–1,660 | Public safety and health, traffic control, resource management |
| Outside | 560–850 | Logistics routing, autonomous cars and trucks, navigation |

1 Includes sized applications only.
NOTE: Numbers may not sum due to rounding.

SOURCE: McKinsey Global Institute analysis

Quality-of-life impact is estimated using DALY and assumptions of impact by disease

🟩 Substantial benefit 🟨 Moderate benefit 🟥 Limited benefit

| | DALY Million | Treatment compliance | Early detection of complications | Real-time treatment management | Sample metrics tracked |
|---|---|---|---|---|---|
| Neuropsychiatric conditions | 13.3 | 🟩 | 🟨 | 🟥 | Medication use, activity, communication |
| Heart disease | 10.4 | 🟩 | 🟩 | 🟩 | Medication use, activity, blood pressure, heart rate, weight |
| Cancer | 8.3 | 🟨 | 🟩 | 🟩 | Weight, exercise, heart rate, body temperature, blood in urine |
| HIV/AIDS | 4.0 | 🟩 | 🟩 | 🟩 | Medication use, blood pressure, heart rate, body temperature |
| Sense organ diseases | 3.9 | 🟨 | 🟥 | 🟨 | Medication use (e.g., glaucoma) |
| Respiratory diseases | 3.9 | 🟩 | 🟨 | 🟩 | Medication use, respiratory rate, air quality, oximetry, pollen count |
| Diabetes | 1.6 | 🟩 | 🟩 | 🟩 | Medication use, exercise, weight, foot ulcers, HgbA1C, protein in urine, heart rate, blood pressure |
| Other chronic | 6.3 | 🟨 | 🟨 | 🟨 | Disease-dependent (e.g., mobility/flexibility for arthritis) |
| Non-chronic | 15.0 | 🟨 | 🟨 | 🟨 | Disease-dependent (e.g., wound humidity) |
| Total | 66.7 | | | | |

| Category | Revenue |
|---|---|
| HEALTH | $21.8B |
| IT SERVICES | $19.3B |
| BUSINESS PRODUCTS & SERVICES | $18.0B |
| ENERGY | $17.5B |
| FINANCIAL SERVICES | $17.2B |
| HUMAN RESOURCES | $12.3B |
| LOGISTICS & TRANSPORTATION | $11.1B |
| CONSUMER PRODUCTS & SERVICES | $10.7B |
| CONSTRUCTION | $10.3B |
| TELECOMMUNICATIONS | $9.4B |
| REAL ESTATE | $8.9B |
| RETAIL | $8.4B |
| MANUFACTURING | $7.5B |
| ADVERTISING & MARKETING | $7.4B |
| GOVERNMENT SERVICES | $6.5B |
| FOOD & BEVERAGE | $6.5B |
| SOFTWARE | $6.4B |
| INSURANCE | $4.5B |
| TRAVEL & HOSPITALITY | $3.6B |
| SECURITY | $3.3B |
| ENGINEERING | $1.3B |
| EDUCATION | $1.2B |
| COMPUTER HARDWARE | $1.2B |
| MEDIA | $1.1B |
| ENVIRONMENTAL SERVICES | $785M |
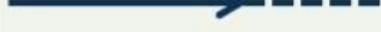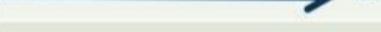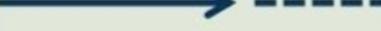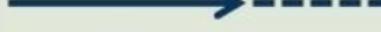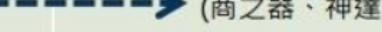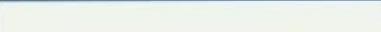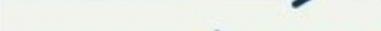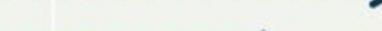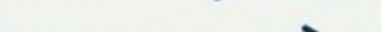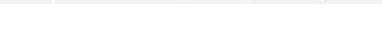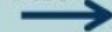
Inc. 5000於2015年全球5000大企業分析
(http://www.inc.com/inc5000)

| 用戶端 > | 設備端 > | 系統端 > | 營運端 > | 服務端 > |
|---|---|---|---|---|

**智慧健康**

**智慧醫療**

**智慧照護**

個人
居家照護服務
醫療就醫服務

機構服務
安養護機構
醫療機構

健康監測產品
宏碁、神達、Garmin、
正崴(代工)、鴻海(代工)

醫療監測設備
環瑞、佳世達、源星、
長庚醫材、明達等

生理監測設備
百略、泰博、華廣、優
盛、合世、福永等

系統整合
研華、精聯、神通、
神達、緯創等

軟體
商之器、凌華、資拓宏
宇等

服務營運平台
缺乏

資訊網路
中華電信、遠傳、台灣
大哥大

健康服務
缺乏

醫療照護服務(醫療機構)
亞東、馬偕、敏盛、耕莘、
秀傳、宏仁、北醫、萬芳、
三總、中榮等多家醫療院所

醫療照護服務(安養護機構)
健安護理之家、桃園寬福護
理之家、基隆安泰護理之家
、長庚養生村等
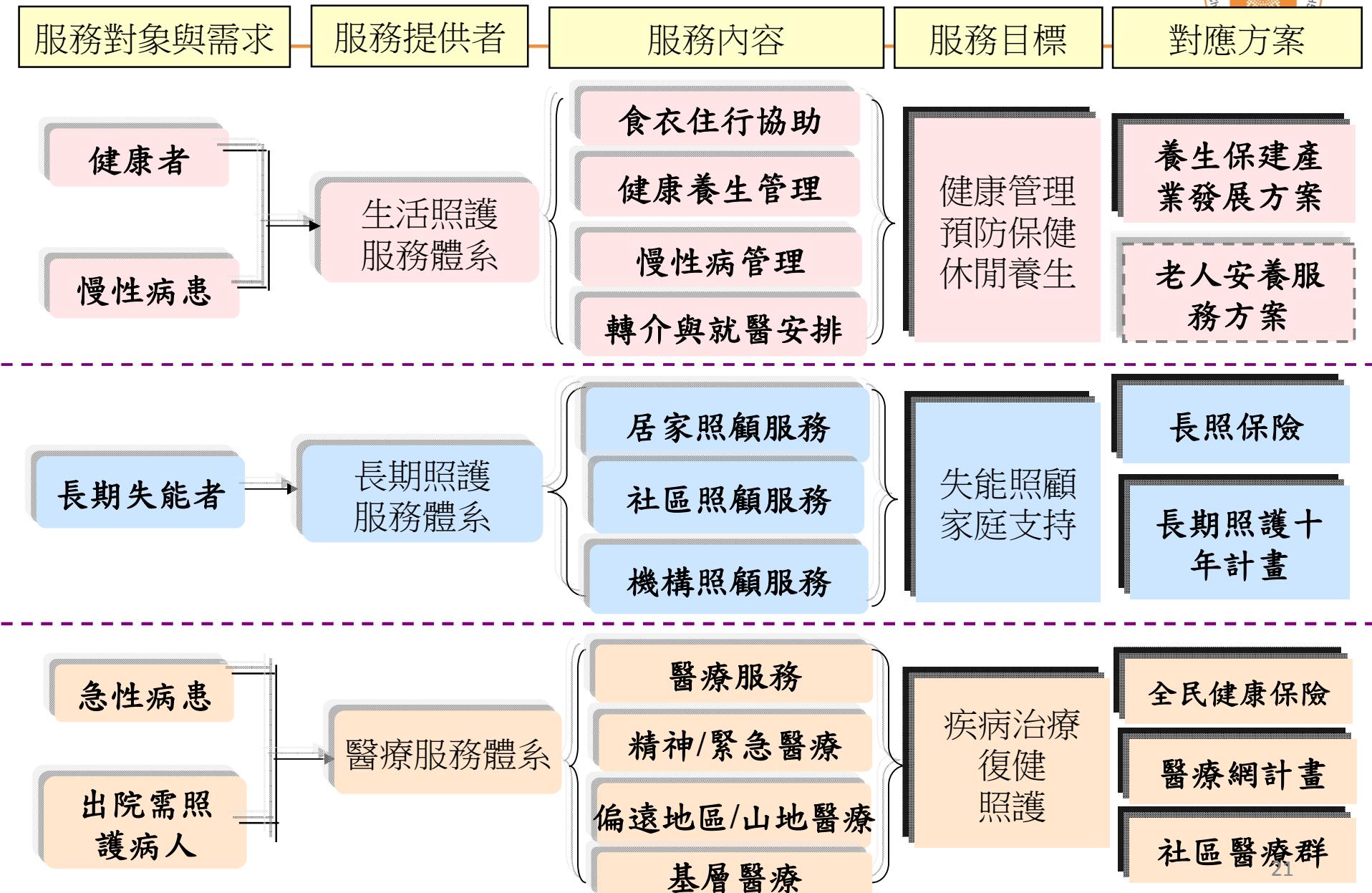
加速串聯跨領域合作，完善產業生態鏈（工研院IEK；
2015/11）

| | | 資訊化 | 智慧化 | 客製化 |
|---|---|---|---|---|
| 目標 | | • 自動偵測生理資訊<br>• 生理資訊數位化與透明化<br>• 即時生理資訊的管理 | • 整合多元感測訊號、運算處理、邏輯推理判斷、反應等功能<br>• 資料綜整與分析管理 | • 資料管理與分析，提供個人化建議<br>• 智慧連網檢測與分析<br>• 社群回饋與巨量分析 |

| 促進全民健康之智慧健康 | 穿戴設備 | (蓋德、台灣愛普生、Garmin...) |
|---|---|---|
| | 資訊平台 | (精聯、精誠、大同醫護...) |
| | 決策系統 | (工研院服科中心...) |
| | 服務模組 | (蓋德、哈佛健檢...) |
| 改善醫療效率之智慧醫療 | 醫療設備 | (佳世達、環瑞醫、長庚...) |
| | 軟體平台 | (商之器、神達...) |
| | 決策系統 | (商之器、神達...) |
| 提升居家品質之智慧照護 | 監測設備 | (泰博、百略...) |
| | 資訊平台 | (研華、精聯、神通、神達...) |
| | 決策系統 | (智能科技...) |
| | 服務模組 | (智能科技...) |

圖例：
→ ：國內已投入
⇢ ：近期國內待投入
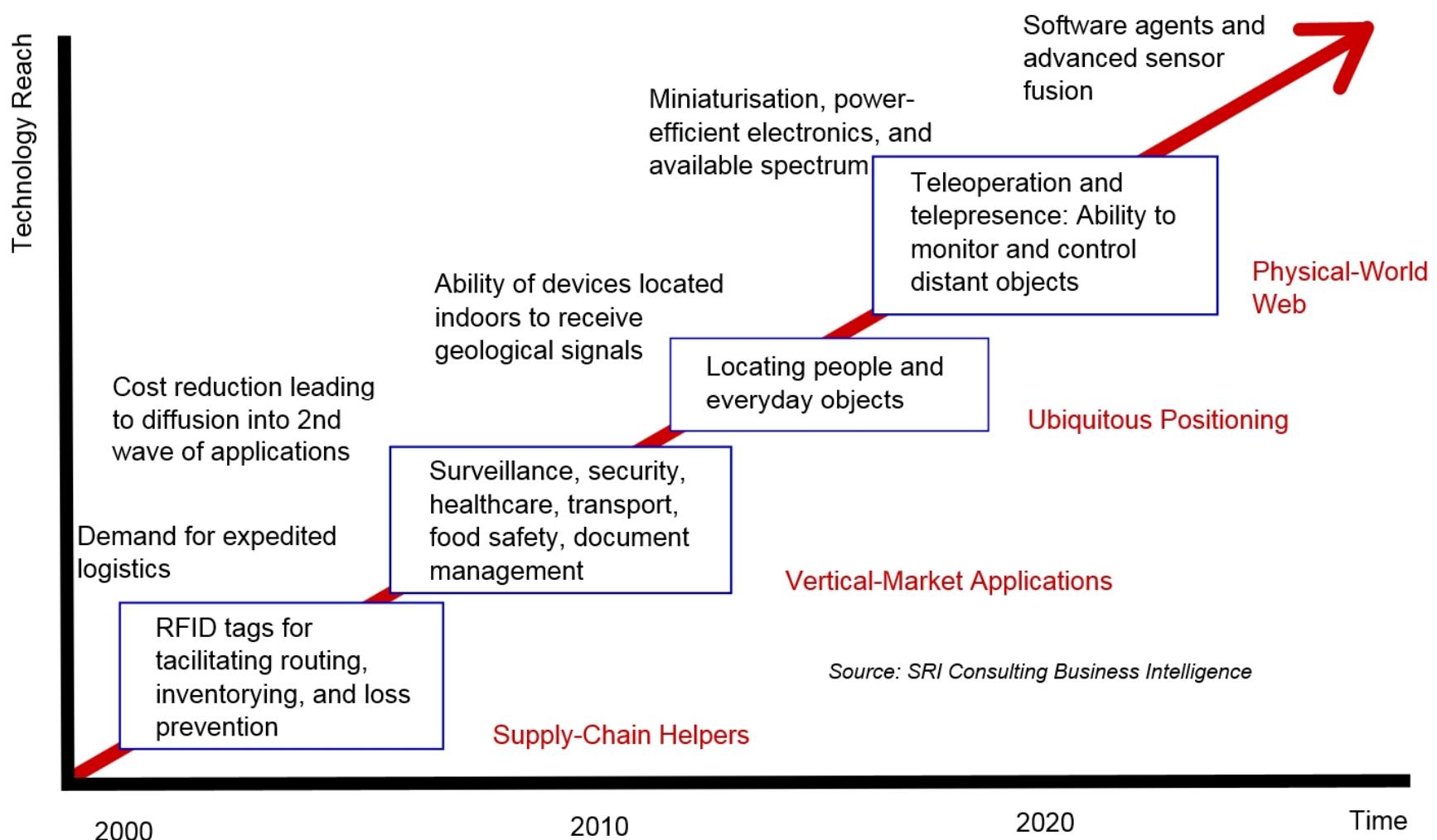
物聯網在智慧健康醫療照護次系統方案逐漸發展（工研院IEK；2015/11）

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# 醫療服務產業發展藍圖

| 服務對象與需求 | 服務提供者 | 服務內容 | 服務目標 | 對應方案 |
|---|---|---|---|---|

**健康者**
**慢性病患**
→ 生活照護服務體系 →
- 食衣住行協助
- 健康養生管理
- 慢性病管理
- 轉介與就醫安排
→ 健康管理 預防保健 休閒養生 →
- 養生保建產業發展方案
- 老人安養服務方案

**長期失能者** → 長期照護服務體系 →
- 居家照顧服務
- 社區照顧服務
- 機構照顧服務
→ 失能照顧 家庭支持 →
- 長照保險
- 長期照護十年計畫

**急性病患**
**出院需照護病人**
→ 醫療服務體系 →
- 醫療服務
- 精神/緊急醫療
- 偏遠地區/山地醫療
- 基層醫療
→ 疾病治療 復健 照護 →
- 全民健康保險
- 醫療網計畫
- 社區醫療群

21

# Technology roadmap: The Internet of Things

**Technology Reach**

Software agents and advanced sensor fusion

Miniaturisation, power-efficient electronics, and available spectrum

Teleoperation and telepresence: Ability to monitor and control distant objects

**Physical-World Web**

Ability of devices located indoors to receive geological signals

Locating people and everyday objects

**Ubiquitous Positioning**

Cost reduction leading to diffusion into 2nd wave of applications

Surveillance, security, healthcare, transport, food safety, document management

**Vertical-Market Applications**

Demand for expedited logistics

*Source: SRI Consulting Business Intelligence*

RFID tags for tacilitating routing, inventorying, and loss prevention

**Supply-Chain Helpers**

2000                     2010                     2020                     Time

# 人工智慧發展簡史

第一波
1950-1960
失敗

第二波
1980-1990
失敗

第三波
2010-Present

符號邏輯 ▶ 專家系統 ▶ 機器學習

把人的**思考邏輯**放進電腦

把人的**所有知識**放進電腦

把人的**所有看見**放進電腦

由領域專家寫下決策邏輯。

由領域專家寫下經驗規則。

由領域專家提供歷史資料，讓電腦自己歸納規則。

人類還沒辦法清楚理解自己的思考過程，如何告訴電腦？

太多難題人類無法解答、無法寫成規則、無法以程式碼表示。
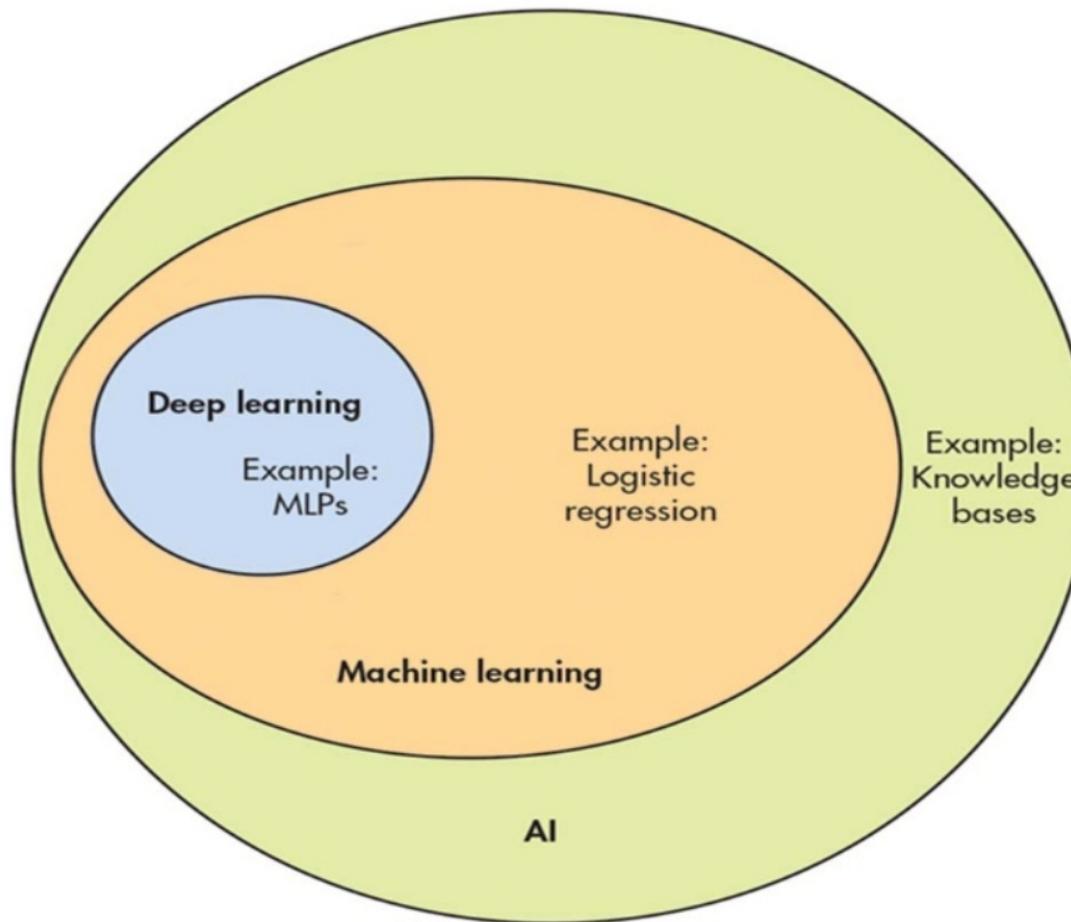
# Deep Learning, Machine Learning,and AI

# Predictive tasks for healthcare

Given a large corpus of training data of de-identified medical records, can we predict interesting aspects of the future for a patient not in the training set?

- *will patient be readmitted to hospital in next N days?*
- *what is the likely length of hospital stay for patient checking in?*
- *what are the most likely diagnoses for the patient right now?* **why?**
- *what medications should a doctor consider prescribing?*
- *what tests should be considered for this patient?*
- *which patients are at highest risk for X in next month?*

**and**

**Collaborating with several healthcare organizations, including UCSF, Stanford, and Univ. of Chicago. Have early promising results.**

# 可能改變健康照護的十大人工智慧應用



| 應用 | 到2026年每年可能節省的金額 | 獲採用的關鍵推動因素 |
|---|---|---|
| 機器人輔助手術 | $40B | 機器人解決方案的技術進步，應用在更多類型的手術 |
| 虛擬護理助理 | 20 | 醫療人力短缺的壓力日益沉重 |
| 行政工作流程 | 18 | 更容易與現有的技術基礎設施整合 |
| 詐欺偵測 | 17 | 必須處理日益複雜的服務和付款詐欺嘗試行動 |
| 減少劑量錯誤 | 16 | 醫療錯誤日益增多，導致實質懲罰 |
| 連結機器 | 14 | 連結機器與裝置激增 |
| 參與臨床測試 | 13 | 專利懸崖、數據過多、結果驅動的方法 |
| 初步診斷 | 5 | 互通性／資料架構以提升準確度 |
| 自動影像診斷 | 3 | 儲存容量、更信任人工智慧科技 |
| 網路安全 | 2 | 資料外洩增加、保護醫療資料的壓力 |

資料來源：埃森哲顧問公司

© HBR.ORG

陳昇瑋 / 人工智慧在台灣          https://www.hbrtaiwan.com/article_content_AR0008072.html

# Telemedicine遠距醫療

- 由於它為治療師提供了一個以深切人性方式關注和同情他人的平台
- 有助於將患者與現場護理人員聯繫起來。 患者不需要進行身體檢查，而是進行有意義的交談
- 可能意味著解決〝去找治療師〞這一普遍存在的污名

| Plateform | Purpose |
|---|---|
| Ginger | Patients can already schedule sessions with human coaches through smartphone apps |
| Cloud 9 | Hopes to make mental healthcare more accessible through its platform offering intervention and prevention support by connecting patients or those in crisis with mental healthcare professionals. |
| Talkspace | Connects users with over 200 licensed therapists through messaging |
| | |

Children's Hospital & Medical Center in Omaha, which services Nebraska, Iowa, Kansas, Missouri, and South Dakota in the United States

Children's Omaha serves over 250,000 children, the vast majority of whom living in rural areas with limited or nonexistent access to psychiatric care.

Using telepsychiatry, the health system has been able to reduce follow-up no show rates by 50 percent, eliminate the psychiatrist's 26-hour weekly windshield time, and have one psychiatrist provide care to over 600 patients in the program's first year.

# Virtual reality

| App | Purpose |
|---|---|
| Psious | Offers unique VR treatments for psychological conditions such as fear of flying, needles, various animals, public speaking, general anxiety, or agoraphobia. |
| Virtually Better | The pioneering VR company founded in 1996, offers among others an exposure therapy for people suffering from anxiety disorders, specific phobias, or post-traumatic stress syndrome |
| Bravemind | VR exposure therapy for soldiers to gradually immerse them into a virtual environment similar to the one where they got traumatized to help them process their feelings associated with their trauma. |
| Arachnophobia | Offers self-guided exposure therapy for people having an irrational fear of spiders |
| Limelight | Gives users the option of appearing in a business meeting, small classroom, or in a large hall as they give a speech. |

McKinsey&Company

MCKINSEY GLOBAL INSTITUTE

# THE INTERNET OF THINGS: MAPPING THE VALUE BEYOND THE HYPE

JUNE 2015

## EXECUTIVE SUMMARY

# Where is the value potential of the Internet of Things?

Interoperability required to capture 40% of total value
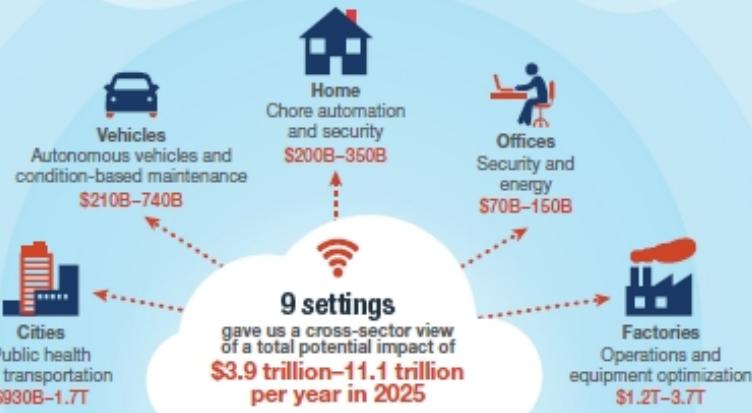
< 1% of data currently used, mostly for alarms or real-time control; more can be used for optimization and prediction

2X more value from B2B applications than consumer

Developing: 40%
Developed: 60%

**Vehicles**
Autonomous vehicles and condition-based maintenance
$210B–740B

**Home**
Chore automation and security
$200B–350B

**Offices**
Security and energy
$70B–150B

**Cities**
Public health and transportation
$930B–1.7T

**9 settings**
gave us a cross-sector view of a total potential impact of
**$3.9 trillion–11.1 trillion per year in 2025**

**Factories**
Operations and equipment optimization
$1.2T–3.7T

**Outside**
Logistics and navigation
$560B–850B

**Human**
Health and fitness
$170B–1.6T

**Worksites**
Operations optimization/ health and safety
$160B–930B

**Retail environments**
Automated checkout
$410B–1.2T

## Types of opportunities

**Transform business processes**
Predictive maintenance, better asset utilization, higher productivity

**Enable new business models**
For example, remote monitoring enables anything-as-a-service

**More value from IoT could be created in advanced economies, but the number of deployments could be higher in the developing world**

%

Advanced    Developing

| Settings | | Reasons for different levels of impact |
|---|---|---|
| Human | 89 / 11 | Health-care spending in advanced economies is twice that in developing economies |
| Home | 77 / 23 | Higher values in advanced economies outweighs higher number of emerging market households |
| Retail environments | 71 / 29 | Higher adoption and values in advanced economies, but large number of retail settings in developing markets |
| Offices | 75 / 25 | Higher costs and wages in advanced economies raises value of impact |
| Factories | 57 / 43 | Larger investments in automation in advanced economies but large number of factories in emerging markets |
| Worksites | 54 / 46 | Higher adoption in advanced economies outweighs larger number of developing economy deployments |
| Vehicles | 63 / 37 | Higher costs in advanced economies |
| Cities | 62 / 38 | More autonomous vehicles in advanced economies, but larger number of cities and populations in developing markets |
| Outside | 56 / 44 | Transportation/shipping spending higher in advanced economies |
| Total | 62 / 38 | |

NOTE: Numbers may not sum due to rounding.

SOURCE: McKinsey Global Institute analysis

**More than two-thirds of potential IoT value associated with B2B applications**
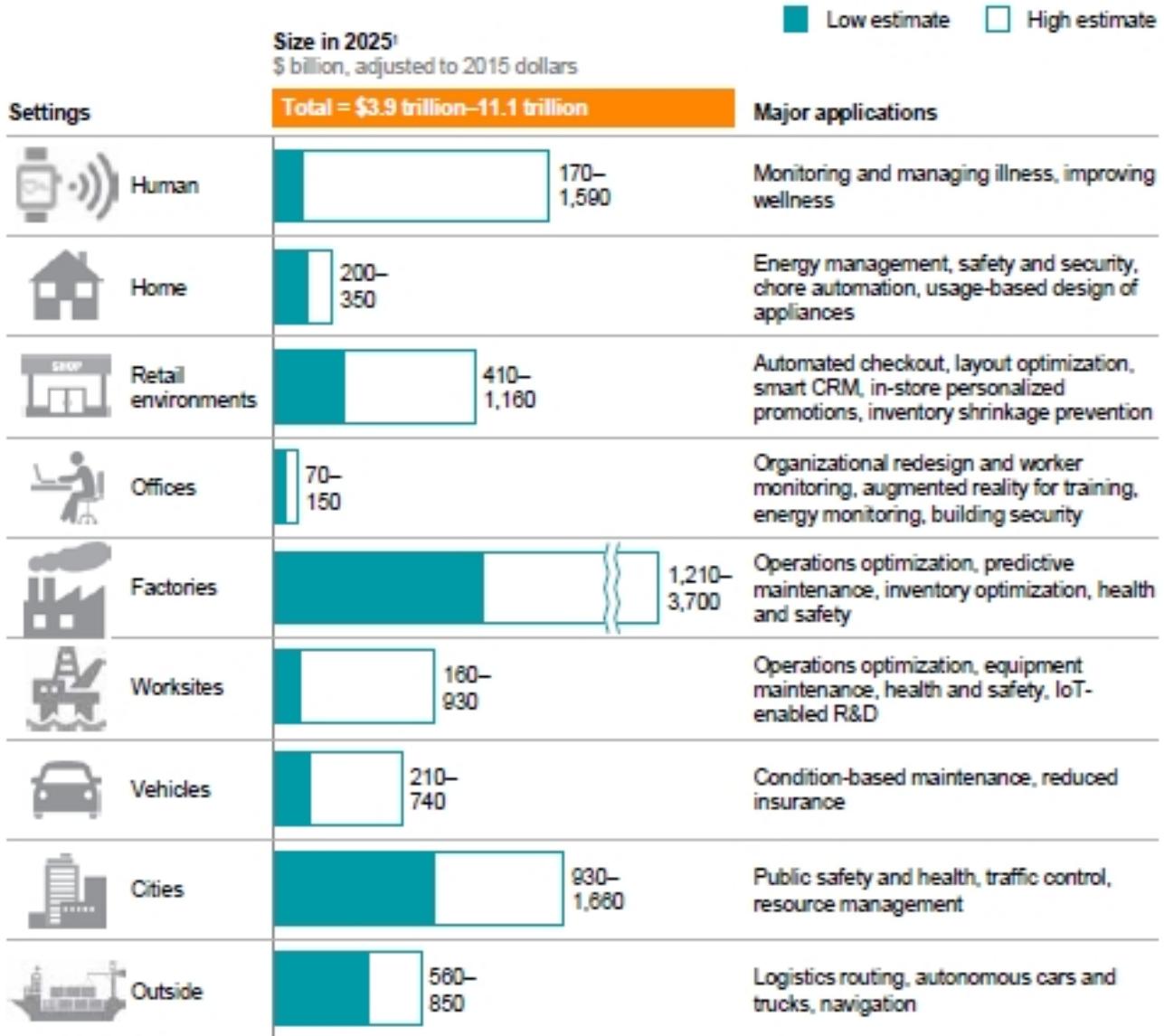
% of total IoT value potential by setting and different definitions of B2B

| | Business is user of IoT system | Business buys IoT system | Business owns the setting |
|---|---|---|---|
| **Overall % B2B** | 69 | 79 | 67 |
| Human | 0 | 50 | 0 |
| Home[1] | 6 | 2 | 0 |
| Retail environments | 62 | 85 | 100 |
| Offices | 100 | 100 | 100 |
| Factories | 98 | 100 | 100 |
| Worksites | 100 | 100 | 100 |
| Vehicles | 38 | 31 | 31 |
| Cities | 26 | 63 | 100 |
| Outside | 43 | 43 | 71 |

1  Applied from resident perspective.

**Potential economic impact of IoT in 2025, including consumer surplus, is $3.9 trillion to $11.1 trillion**

Legend: ■ Low estimate □ High estimate

**Size in 2025[1]**
$ billion, adjusted to 2015 dollars

| Settings | Total = $3.9 trillion–11.1 trillion | Major applications |
|---|---|---|
| Human | 170–1,590 | Monitoring and managing illness, improving wellness |
| Home | 200–350 | Energy management, safety and security, chore automation, usage-based design of appliances |
| Retail environments | 410–1,160 | Automated checkout, layout optimization, smart CRM, in-store personalized promotions, inventory shrinkage prevention |
| Offices | 70–150 | Organizational redesign and worker monitoring, augmented reality for training, energy monitoring, building security |
| Factories | 1,210–3,700 | Operations optimization, predictive maintenance, inventory optimization, health and safety |
| Worksites | 160–930 | Operations optimization, equipment maintenance, health and safety, IoT-enabled R&D |
| Vehicles | 210–740 | Condition-based maintenance, reduced insurance |
| Cities | 930–1,660 | Public safety and health, traffic control, resource management |
| Outside | 560–850 | Logistics routing, autonomous cars and trucks, navigation |

1 Includes sized applications only.
NOTE: Numbers may not sum due to rounding.

SOURCE: McKinsey Global Institute analysis

Quality-of-life impact is estimated using DALY and assumptions of impact by disease

- 🟩 Substantial benefit
- 🟨 Moderate benefit
- 🟥 Limited benefit

| | DALY Million | Treatment compliance | Early detection of complications | Real-time treatment management | Sample metrics tracked |
|---|---|---|---|---|---|
| Neuropsychiatric conditions | 13.3 | Substantial | Moderate | Limited | Medication use, activity, communication |
| Heart disease | 10.4 | Substantial | Substantial | Substantial | Medication use, activity, blood pressure, heart rate, weight |
| Cancer | 8.3 | Moderate | Substantial | Substantial | Weight, exercise, heart rate, body temperature, blood in urine |
| HIV/AIDS | 4.0 | Substantial | Substantial | Substantial | Medication use, blood pressure, heart rate, body temperature |
| Sense organ diseases | 3.9 | Moderate | Limited | Moderate | Medication use (e.g., glaucoma) |
| Respiratory diseases | 3.9 | Substantial | Moderate | Substantial | Medication use, respiratory rate, air quality, oximetry, pollen count |
| Diabetes | 1.6 | Substantial | Substantial | Substantial | Medication use, exercise, weight, foot ulcers, HgbA1C, protein in urine, heart rate, blood pressure |
| Other chronic | 6.3 | Moderate | Moderate | Moderate | Disease-dependent (e.g., mobility/flexibility for arthritis) |
| Non-chronic | 15.0 | Moderate | Moderate | Moderate | Disease-dependent (e.g., wound humidity) |
| Total | 66.7 | | | | |

This is a **list of countries by Internet of Things devices online** per 100 inhabitants as published by the OECD in 2015.[1]
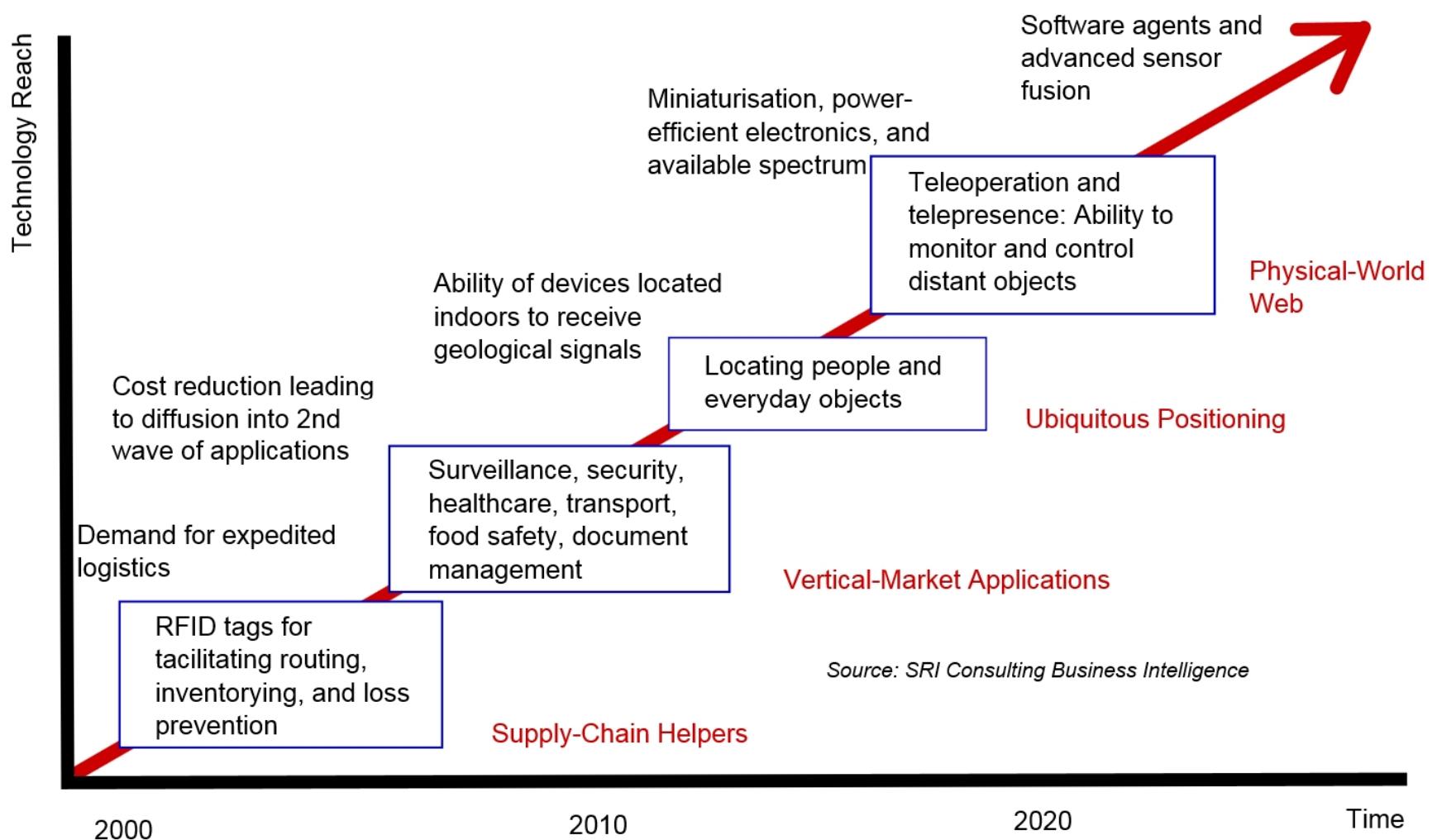
| Rank ⇕ | Country ⇕ | Devices online ⇕ | Relative size ⇕ |
|---|---|---|---|
| 1 | South Korea | 37.9 | |
| 2 | Denmark | 32.7 | |
| 3 | Switzerland | 29.0 | |
| 4 | United States | 24.9 | |
| 5 | Netherlands | 24.7 | |
| 6 | Germany | 22.4 | |
| 7 | Sweden | 21.9 | |
| 8 | Spain | 19.9 | |
| 9 | France | 17.6 | |
| 10 | Portugal | 16.2 | |
| 11 | Belgium | 15.6 | |
| 12 | United Kingdom | 13.0 | |
| 13 | Canada | 11.6 | |
| 14 | Italy | 10.2 | |
| 15 | Brazil | 9.2 | |
| 16 | Japan | 8.2 | |
| 17 | Australia | 7.9 | |
| 18 | Mexico | 6.8 | |
| 19 | Poland | 6.3 | |
| 20 | China | 6.2 | |
| 21 | Colombia | 6.1 | |
| 22 | Russia | 4.9 | |
| 23 | Turkey | 2.3 | |
| 24 | India | 0.6 | |

# IoT Analytics – *Quantifying the connected world*

Q1/2015

| Company | | Category | Overall rank[1] | | Scores [2] | [3] | [4] | [5] |
|---|---|---|---|---|---|---|---|---|
| | Ranking vs. Q4/14 | | | | 🔍 | 🐦 | 📰 | in |
| 1 intel | ⬆ +5 | Semiconductor | 72% | 🇺🇸 | 1k | 2.6k | 4k | 616 |
| 2 Microsoft | ⬆ +2 | Software | 69% | 🇺🇸 | 480 | 1.6k | 26k | 545 |
| 3 CISCO | ⬆ +2 | Hardware | 66% | 🇺🇸 | 1k | 1.4k | 5k | 719 |
| 4 Google | ⬇ -3 | Several | 59% | 🇺🇸 | 390 | 3.1k | 21k | 99 |
| 5 IBM | ⬇ -3 | Software | 55% | 🇺🇸 | 720 | 1.5k | 7k | 504 |
| 6 SAMSUNG | ⬆ +3 | Consumer prod. | 34% | 🇰🇷 | 590 | 1.6k | 5k | 29 |
| 7 Apple | ⬇ -4 | Consumer prod. | 31% | 🇺🇸 | 170 | 1.3k | 15k | 37 |
| 8 SAP | ➡ 0 | Software | 26% | 🇩🇪 | 320 | 0.4k | 5k | 260 |
| 9 Gartner | ⬇ -2 | Market research | 24% | 🇺🇸 | 390 | 1.2k | 3k | 40 |
| 10 ORACLE | ➡ 0 | Software | 22% | 🇺🇸 | 170 | 0.3k | 6k | 277 |
| 11 ARM | ⬆ +3 | Semiconductor | 20% | 🇬🇧 | 90 | 1.0k | 9k | 57 |
| 12 GE | ➡ 0 | Ind. equipment | 19% | 🇺🇸 | 70 | 0.4k | 3k | 319 |
| 13 accenture | ⬆ +11 | Consulting | 17% | 🇮🇪 | 170 | 0.4k | <1k | 249 |
| 14 amazon.com | ⬇ -3 | Software | 15% | 🇺🇸 | 110 | 0.4k | 7k | 67 |
| 15 HEWLETT PACKARD | ⬆ +3 | Software | 15% | 🇺🇸 | 90 | 0.1k | 7k | 151 |
| 16 ARDUINO | ⬇ -3 | Hardware | 15% | 🇮🇹 | 390 | 0.5k | <1k | - |
| 17 IDC | ⬇ -2 | Market research | 15% | 🇺🇸 | 210 | 0.4k | 5k | 30 |
| 18 BlackBerry | new | Software | 13% | 🇨🇦 | 210 | 0.3k | 4k | 25 |
| 19 PTC | ⬆ +10 | Software | 12% | 🇺🇸 | 110 | 0.6k | <1k | 123 |
| 20 verizon | ⬇ -2 | M2M | 11% | 🇺🇸 | 70 | 0.2k | 6k | 51 |

1. The highest ranking company in each aspect received a rating of 100%, with all other receiving a lower percentage in linear relation to the actual frequency. The overall result is the average of all four categories 2. Searches on Google in conjunction with IoT. 3. Tweets on Twitter in conjunction with IoT 4. Newspaper and blog mentions in conjunction with IoT 5. Number of employees that carry the tag "Internet of Things" on Linkedin. All numbers valid for Dec 2014 to Feb 2015. Sources: Google, Twitter, LinkedIn, Company websites, IoT Analytics

# Technology roadmap: The Internet of Things

Technology Reach →

**Software agents and advanced sensor fusion**

Miniaturisation, power-efficient electronics, and available spectrum

Teleoperation and telepresence: Ability to monitor and control distant objects

**Physical-World Web**

Ability of devices located indoors to receive geological signals

Locating people and everyday objects

**Ubiquitous Positioning**

Cost reduction leading to diffusion into 2nd wave of applications

Surveillance, security, healthcare, transport, food safety, document management

**Vertical-Market Applications**

Demand for expedited logistics

RFID tags for tacilitating routing, inventorying, and loss prevention

*Source: SRI Consulting Business Intelligence*

**Supply-Chain Helpers**

2000          2010          2020          Time

# 長照2.0服務體系之建構

## (二)成立社區整合型服務中心

衛生福利部
Ministry of Health and Welfare

農漁會 C
基金會
物理治療所/職能治療所
村里辦公處 C
衛生所 C
社區醫療群(醫師)
社區發展協會 C
日間托老據點
社區照顧關懷據點 C

診所
居家護理所 C
衛生所
社會福利團體 C
樂智據點 C
居家服務提供單位

A級-社區整合型服務中心
- 醫院/綜合醫院
- 小規模多機能/日間照顧中心
- 護理之家/衛生所
- 偏鄉長照據點

B級-複合型日間服務中心
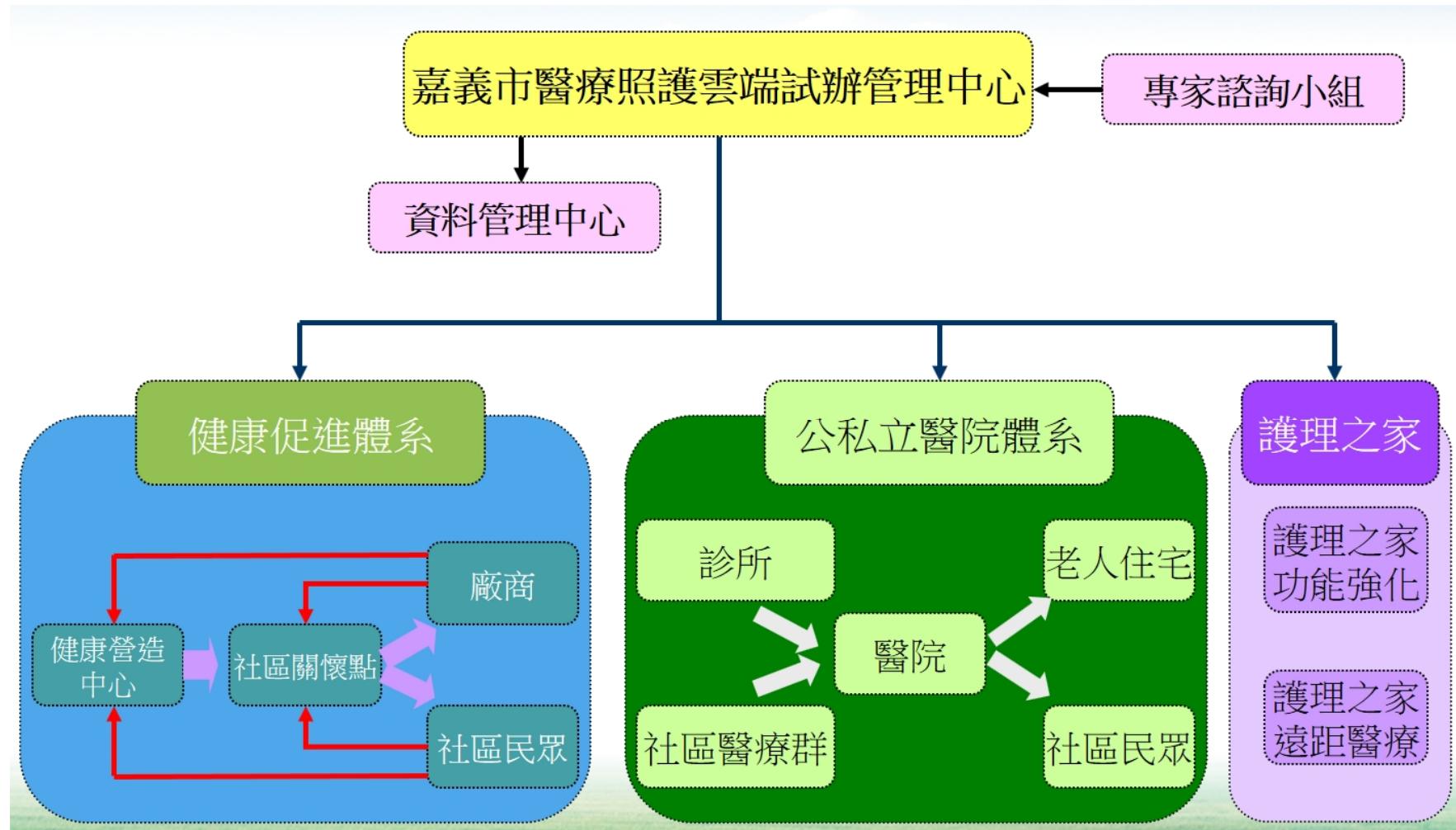
C級-巷弄長照站

# 政府長照2.0

**A級**
社區
整合型
服務中心

**B級**
複合型
日間
服務中心

**C級**
巷弄
長照站
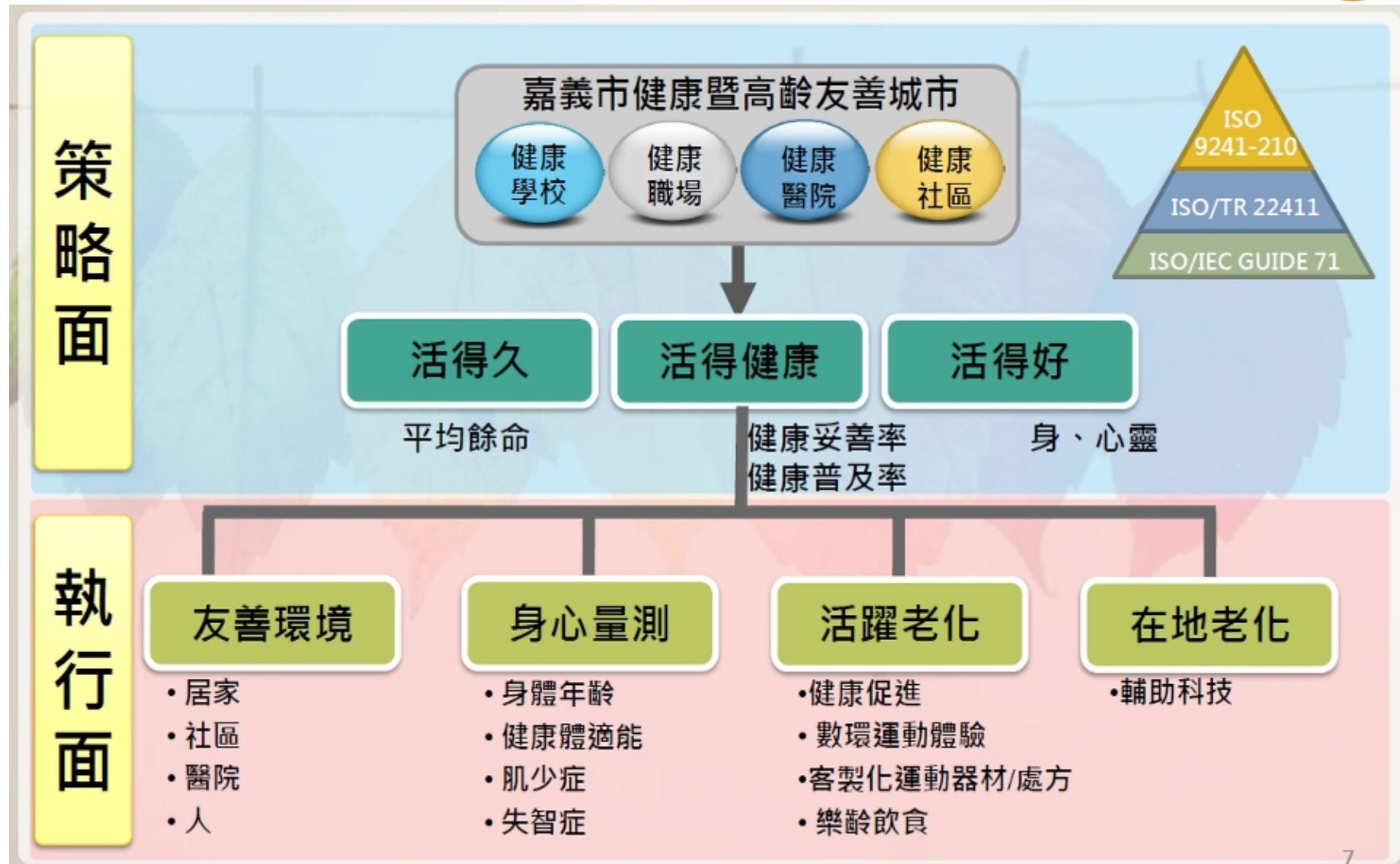
| | A級 | B級 | C級 |
|---|---|---|---|
| **場域** | ■ 醫院/綜合醫院<br>■ 小規模多機能/日照中心<br>■ 護理之家/衛生所<br>■ 偏鄉長照據點 | ■ 日間托老據點<br>■ 衛生所<br>■ 物理治療所/職能治療所<br>■ 診所/社區醫療群(醫師) | ■ 居家護理所/居家服務提供單位<br>■ 社區照顧關懷據點/農漁會/社區發展協會/村里辦公處/社會福利團體等<br>■ 衛生所/樂智據點 |
| **服務內容** | ■ 組成社區**健康照顧**團隊<br>－由護理師、社工、照管專員及照顧服務員組成；或由醫師、護理師、物理治療師、職能治療由師、營養師、社工及照顧服務員等人組成<br>■ **優化初級預防功能，提供B級與C級督導與技術支援；結合區域醫療資源，轉銜在宅臨終安寧照顧** | ■ **提供日間托老服務**<br><br>■ 服務包括：緩和失能服務、共餐服務、**體適能**、諮詢服務及輕度失能復健相關課程 | ■ 提供短時數看顧衰弱或輕度失能者照顧服務<br><br>■ 服務包括：社區預防保健、電話問安、關懷訪視、餐飲服務、**體適能**、自立支持服務等 |
| **目標** | ■ 每一鄉鎮市區至少設置一處為原則，並依區域人口數酌增設置<br>■ **規劃設置469處** | ■ 每一個國中學區設置1處<br>■ **規劃設置829處** | ■ 每3個村里設置1處<br>■ **規劃設置2,529處** |
| **對應** | ■ **醫事人員**<br>■ 體適能檢測服務建置<br>■ 衰弱、肌少症檢測服務 | ■ **醫事人員、運動專業人員**<br>■ 體適能檢測與健康促進<br>■ 體適能課程、復健訓練 | ■ **醫事人員、運動專業人員**<br>■ 協助體適能檢測服務<br>■ 簡易健康促進訓練 |

# 社區整體照顧模式的運作

生病時...

醫療

- 急性、亞急性、復健醫療服務

生活圈內之診所、醫院

交通車小區域定時巡迴接送

看病、住院

居家

在家接受服務

為了能健康地生活...

生活支援、預防

- 成立A-B-C服務據點
  - A級-社區整合型服務中心
  - B級-複合型日間服務中心
  - C級-巷弄長照站

必需照顧時...

照顧

- 例如：日間照顧、家庭托顧、社區及居家復健服務、樂智據點、身心障礙福利服務中心

長照管理中心

- 評估個案失能狀況

# 嘉義市醫療照護雲端系統

| 嘉義市健康醫療網SWOT分析及因應策略 | 團隊內部 | |
| --- | --- | --- |
| | 優勢(S)<br>s1.嘉義次都會區的核心都市，也為雲嘉南地區的消費中心<br>s2.醫療密度集中且服務方式均衡<br>s3.市內村里發展均衡 | 劣勢(W)<br>w1.地理位置位於南臺灣人口老化較明顯<br>W2.嘉義市民接受新科技的文化未　　成熟<br>W3.法令適宜性<br>W4.缺乏跨單位連結合作<br>W5.技術設備有空間成長<br>W6.人才網羅不易 |
| 團隊外部 機會(O)<br>　O1.社區健康及照護資源尚有空間<br>　O2.人口老化集中可開發聚集相關醫療服務<br>　O3. 本計畫與上位及相關計畫、政策之發展方向符合<br>　O4.周邊計畫將陸續發展<br>　O5.國際接軌 | SO策略內容(擴大、分享)<br>　1.推動健康促進城市<br>　2.發展高齡友善城市<br>　3.建置高科技健康醫療群聚<br>　4.發展特色化城市 | WO策略內容(補強、布樁)<br>　1.落實物聯網服務精神，建立平台，持續流程改善<br>　2.重塑以個案為中心的團隊文化<br>　3.精進產官學整合專業能力<br>　4.爭取中央經費，垂直及水平整合各相關產業，落實經營管理 |
| 威脅(T)<br>　T1.所屬地理位置為醫療戰區<br>　T2.國健署及地方政府政策<br>　T3.消費者期待高 | ST策略內容(差異、創新)<br>　1.提供在地老化及健康老化理念<br>　2.塑造差異化服務<br>　3.發展整合平台<br>　4.破壞式創新及漸進　性創新兼顧 | WT策略內容(學習、連結)<br>　1.落實人才培訓<br>　2.建立顧客關係夥伴<br>　3.發展垂直整合之策略聯盟 |
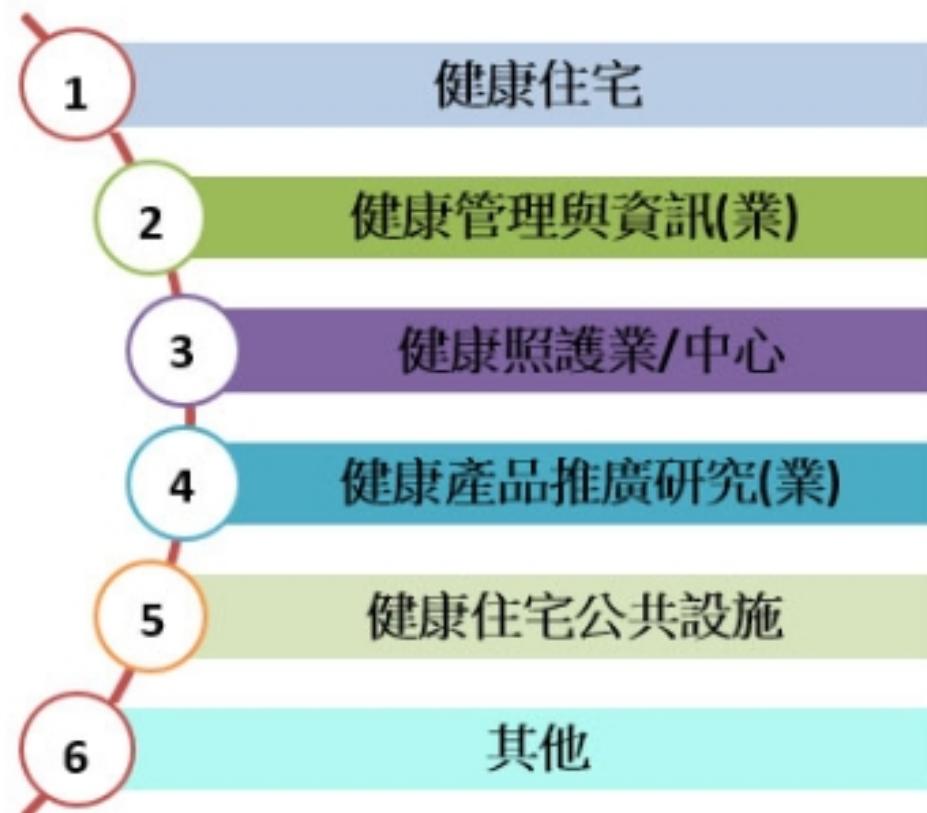
# 嘉義市智慧健康城宣導活動

# 嘉義市「健康防老園區」

老而健康，老而有用



健康防老園區計畫範圍
(湖子內段湖美小段)

| | |
|---|---|
| 1 | 健康住宅 |
| 2 | 健康管理與資訊(業) |
| 3 | 健康照護業/中心 |
| 4 | 健康產品推廣研究(業) |
| 5 | 健康住宅公共設施 |
| 6 | 其他 |

健康營造

健康管理

全人健康

體能檢測

整合健康促進服務

運動指導

優質生活

營養照護

完美體態

# 長照服務項目

| 臺中榮總嘉義分院<br>長照服務項目 | 嘉義市政府<br>自辦項目 |
|---|---|
| 日間照顧 | 醫師訪視服務 |
| 居家服務 | |
| 居家及社區復健 | 緊急救援服務 |
| 社區預防性照顧 | |
| 營養餐飲服務－社區共餐 | 藥師用藥安全訪視 |
| 居家護理 | |
| 居家安寧 | 失智症患者預防走失手鍊 |
| 長期照顧機構服務 | |
| 機構喘息服務 | 身心障礙臨時暨短期照顧服務 |
| 銜接出院準備服務 | |
| 銜接居家醫療 | |

失智協尋ing

在宅福終

醫療團隊
到你家

輪椅趴趴 GO

仿家屋

出院宅極便

到宅坐月子

在　嘉　真　好

# 長照延續性服務-2.0

**85年-95年**

嘉義分院：
1.88年成立護理之家 50床
2.92年公務床轉型護理之家170床

灣橋分院：
1.95年公務床轉型護理之家75床

**96年-104年（長照1.0）**

長照1.0執行業務：
1. 居家喘息服務
2. 居家護理
3. 機構喘息
4. 長期照顧機構服務—護理之家
5. 居家復健

**105-106年（長照2.0）未來執行**

長照2.0已執行業務

1. 居家喘息服務
2. 居家護理
3. 機構喘息
4. 長期照顧機構服務—護理之家
5. 居家復健
6. 居家醫療
7. 出院準備服務
8. 社區關懷據點（18處）提供預防性照顧、保健服務
9. 社區健康營造（嘉義縣水上、 竹崎鄉）
10. 輔具中心（嘉義縣社會局委託灣橋分院）

長照2.0未來執行業務

1. 嘉義分院日間照護（20床）
2. 灣橋分院日間照護（16床）
3. 居家服務（提供洗澡、陪伴、備餐等服務）
4. 共餐服務
5. 送餐服務
6. 交通接送
7. 居家送藥

# 長照延續性服務-2.0

# 醫院端出院準備銜接長照2.0流程

出院準備護理師針對有長照服務需求個案轉介至嘉義市照顧管理中心

↓

個案出院前3天，前往評估其失能等級(照管中心專員或出院準備護理師)

居家環境評估

↓

照專針對案家需要的服務進行規劃

仿家屋進行個別化訓練

↓
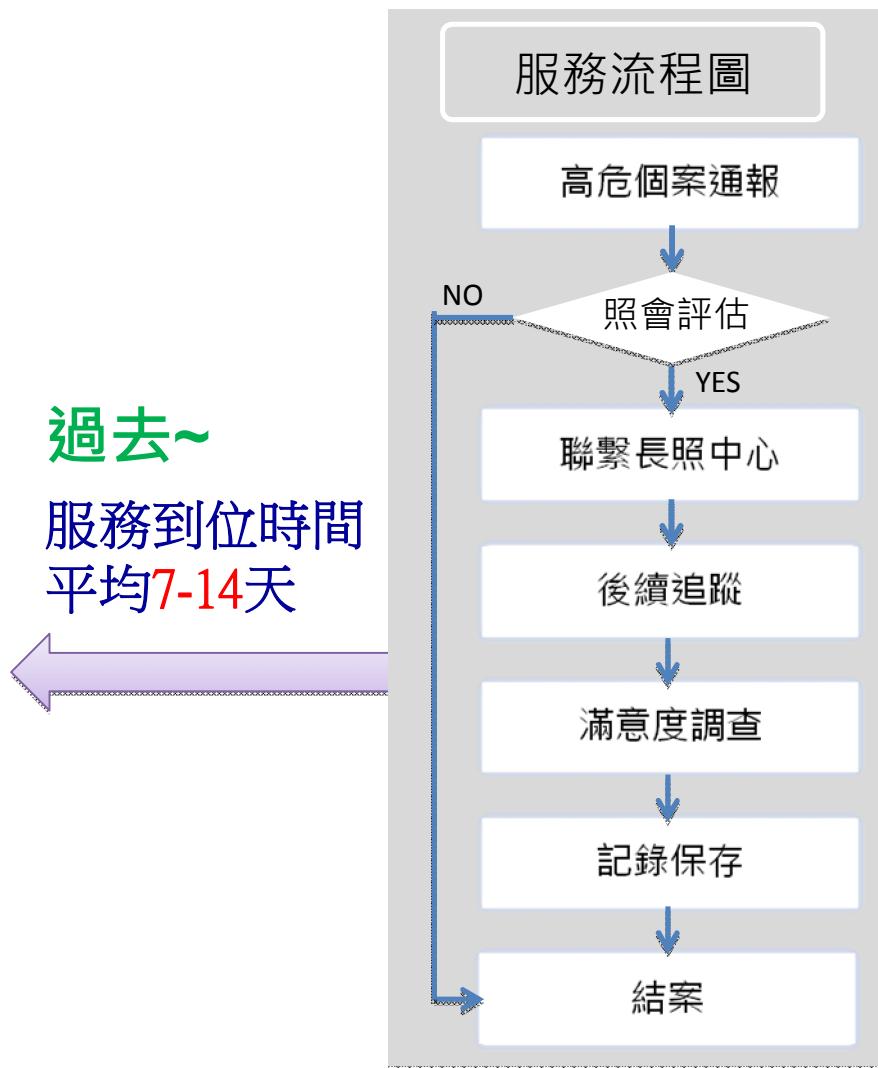
照專與提供長照服務之單位聯繫，由服務單位派居家照服員至案家服務

(出院宅急便)
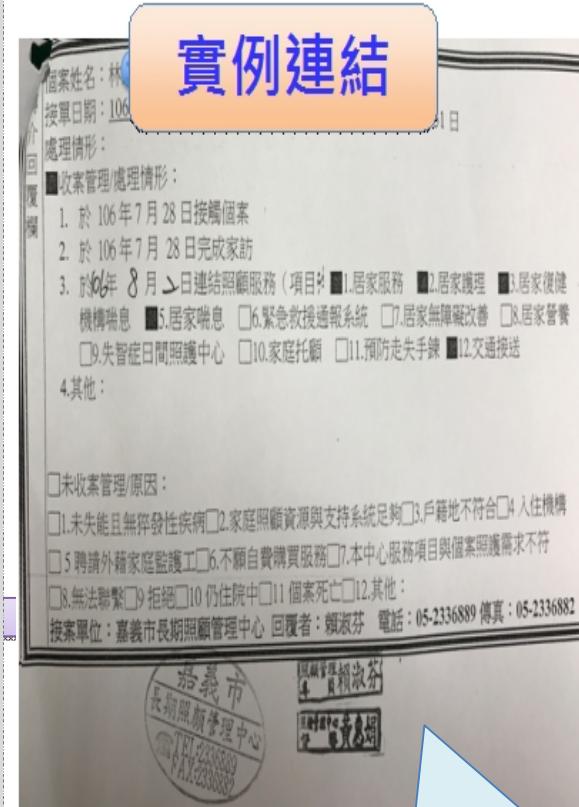
# 出院準備銜接長照2.0友善醫院

**出院前三天完成評估**

**執行方式：與照管中心合作**

服務流程圖

- 高危個案通報
- 照會評估
  - NO
  - YES
- 聯繫長照中心
- 後續追蹤
- 滿意度調查
- 記錄保存
- 結案

**實例連結**



**過去~**

服務到位時間
平均7-14天

**現在~**

平均1-3天
連結服務

**8/1出院，8/2服務介入**

| 健康 | 亞健康 | 疾病或失能 |
|---|---|---|
| 個人衛生觀念及個人自我形象的建立推廣 | 代謝異常管理 | 疾病管理與治療 |
| 健康識能, 合適的運動態度及行為 | 傳染病育預防 | 延緩失能 |
| 代謝異常及營養均衡概念 | 跌倒預防 | 復能及復健 |
| 體適能評估 | 衰弱預防 | 特殊科別疾病管理 |
| 社交互動的練習 | 壓力調適及抒壓管道 | 心理疾病治療 |
| 個人知能提升 | 認知功能評估 | 失智預防與治療 |

# 智慧科技居家應用

## 健康住宅

## 健康管理

智慧雲端健康管理

智慧家居

健康促進

衛生福利部社家署

| 需求 | 居家式 | 社區式 | 住宿式 | 供給 |
|---|---|---|---|---|
| 健康 | 食衣住行<br>育樂醫等<br>生活支持服務 | 樂齡學習中心<br>長青學苑<br>社區大學 | 樂齡安居住宅 | 自由市場 |
| 亞健康 | 居家服務<br>居家復健 | 社區照顧關懷據點<br><br>日間托老中心 | 安養中心<br><br>養護中心 | |
| 失能 | 居家護理<br>居家安寧 | 日間照顧中心<br><br>多元照顧中心 | 護理之家<br><br>長照機構 | 規範性市場 |

銀髮產業
社會企業
非營利組織
政府

57 衛生福利部社家署
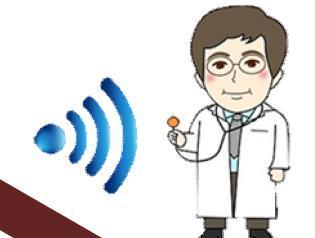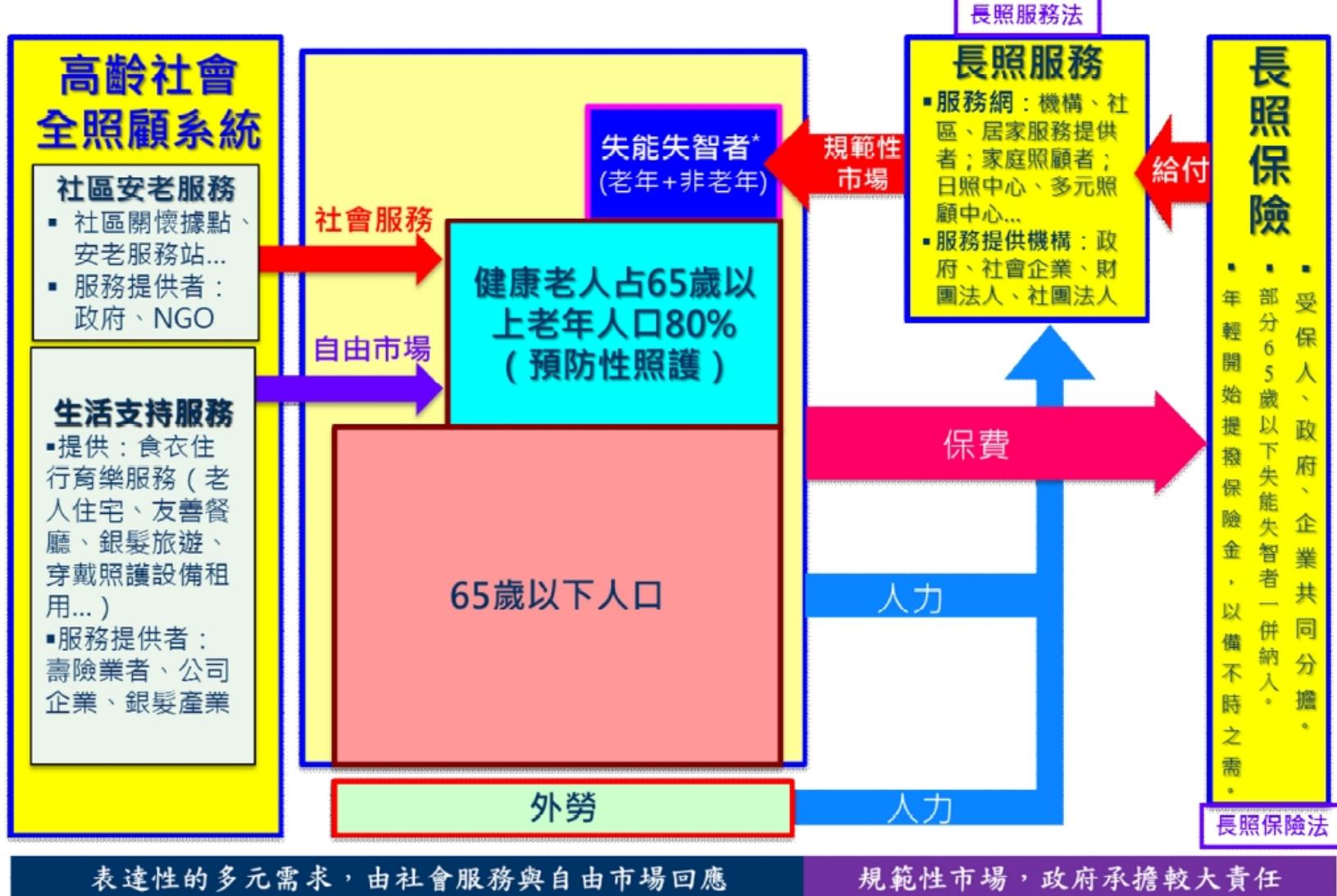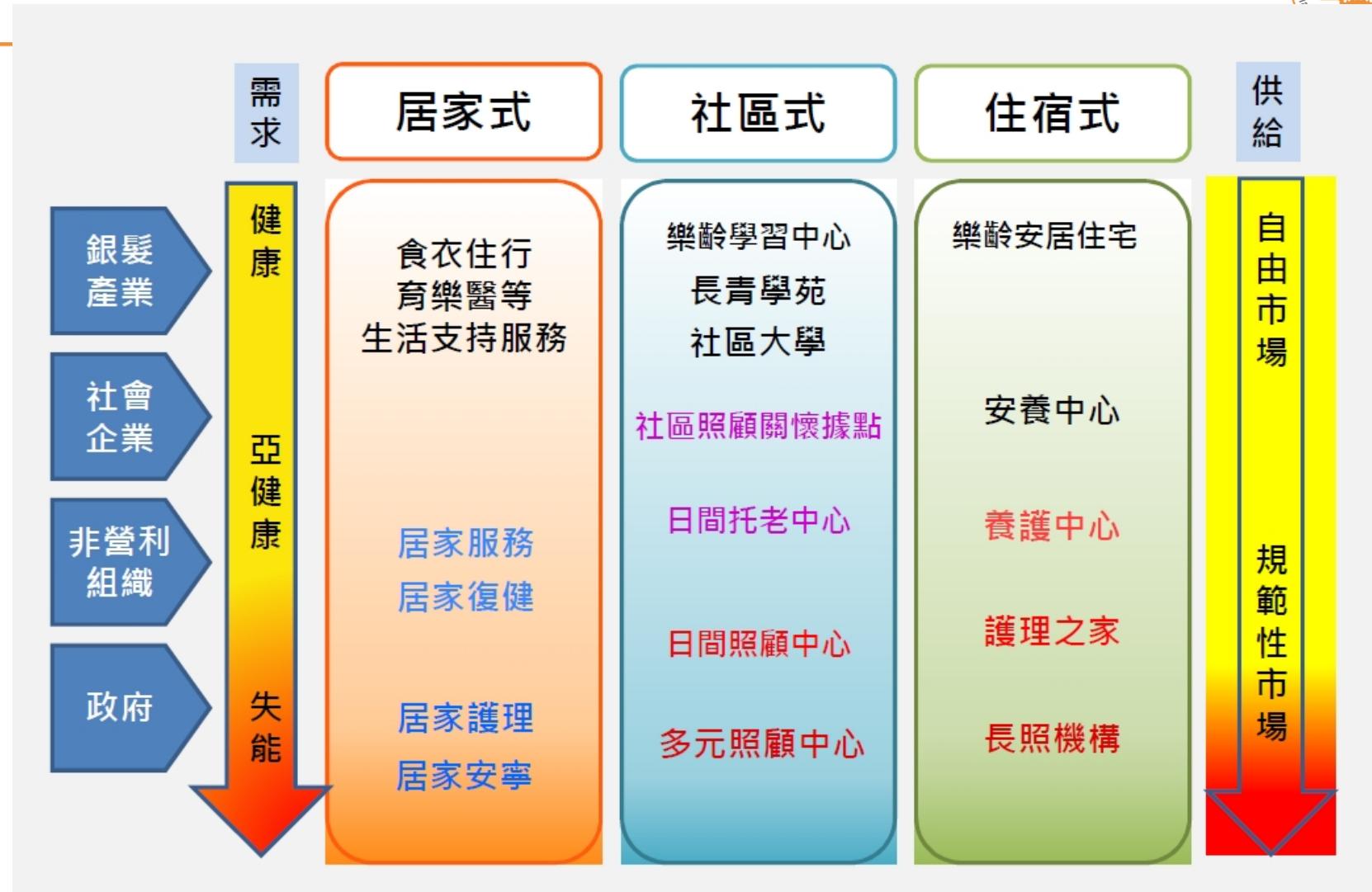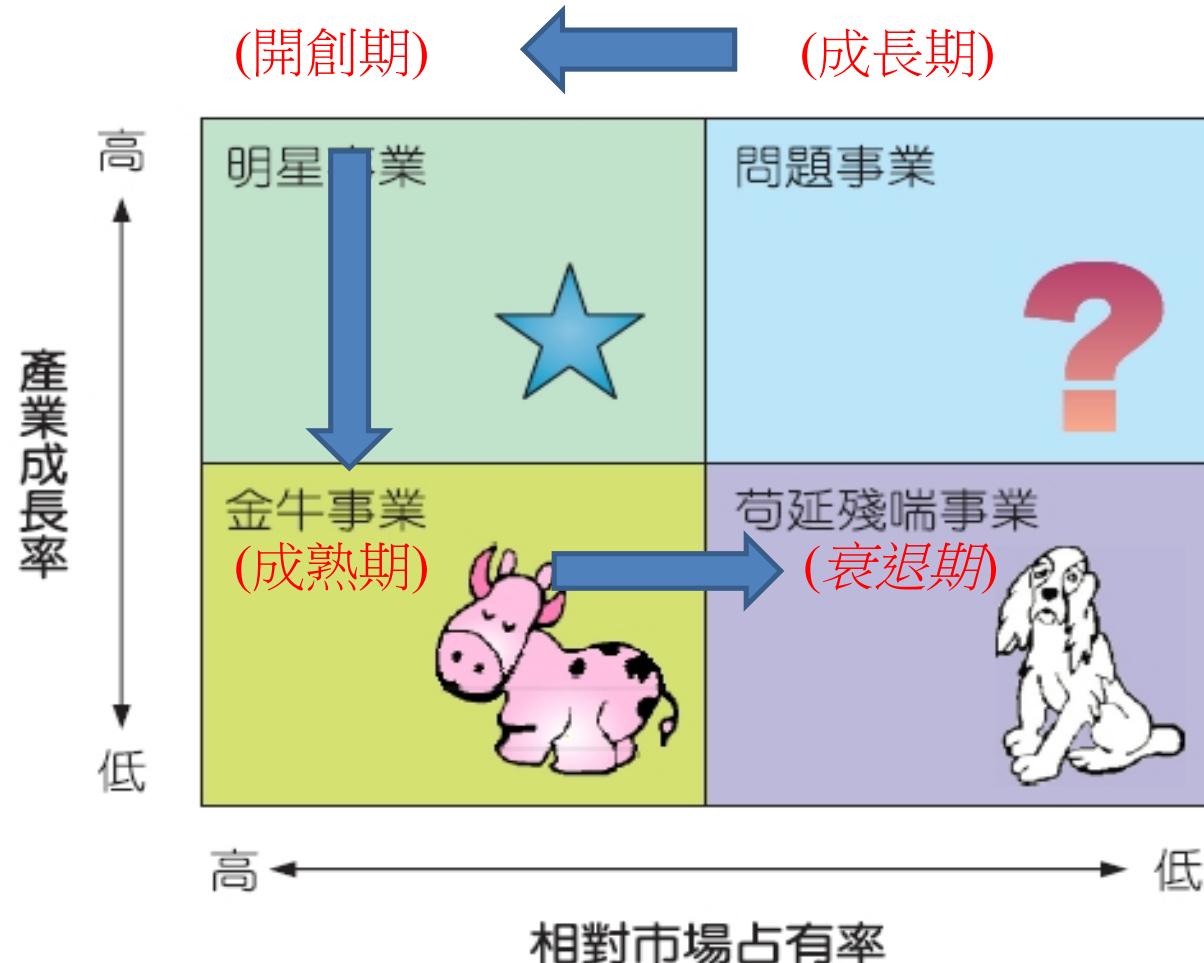
BCG矩陣

# 策略規劃

- 發展分析、溝通與執行選定策略的過程
- 學者Barry：「策略規劃就是組織決定其未來所要發展的目標，以及如何達成目標的一個決策過程。」

理想 樣子

要如何到達？

目前樣子　　我們將往哪裡走？

我們現在在哪裡？

**what to do? what not to do?**

取捨,聚焦。

# Thank You Very Much

Time for Two Wheels

Time for Love

Time to Marvel

Time for Love

Time for Nature

Time to Marvel