

工業技術研究院

Industrial Technology
Research Institute

科技化照護的未來發展與願景

Health ICT Future & Vision

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工研院服科中心健康組



Outline

- When ICT meets Healthcare
- How ICT transform Healthcare
- What is the development trend of Health ICT
- Future Health ICT development
- Technology Adopting Evaluation
- Conclusion



WHEN ICT MEETS HEALTHCARE



When ICT meets Healthcare

Through A Health System

- Equitable
- Affordable
- Efficient
- **Technologically appropriate**
- Environmentally adaptable
- Consumer friendly

With Emphasis On

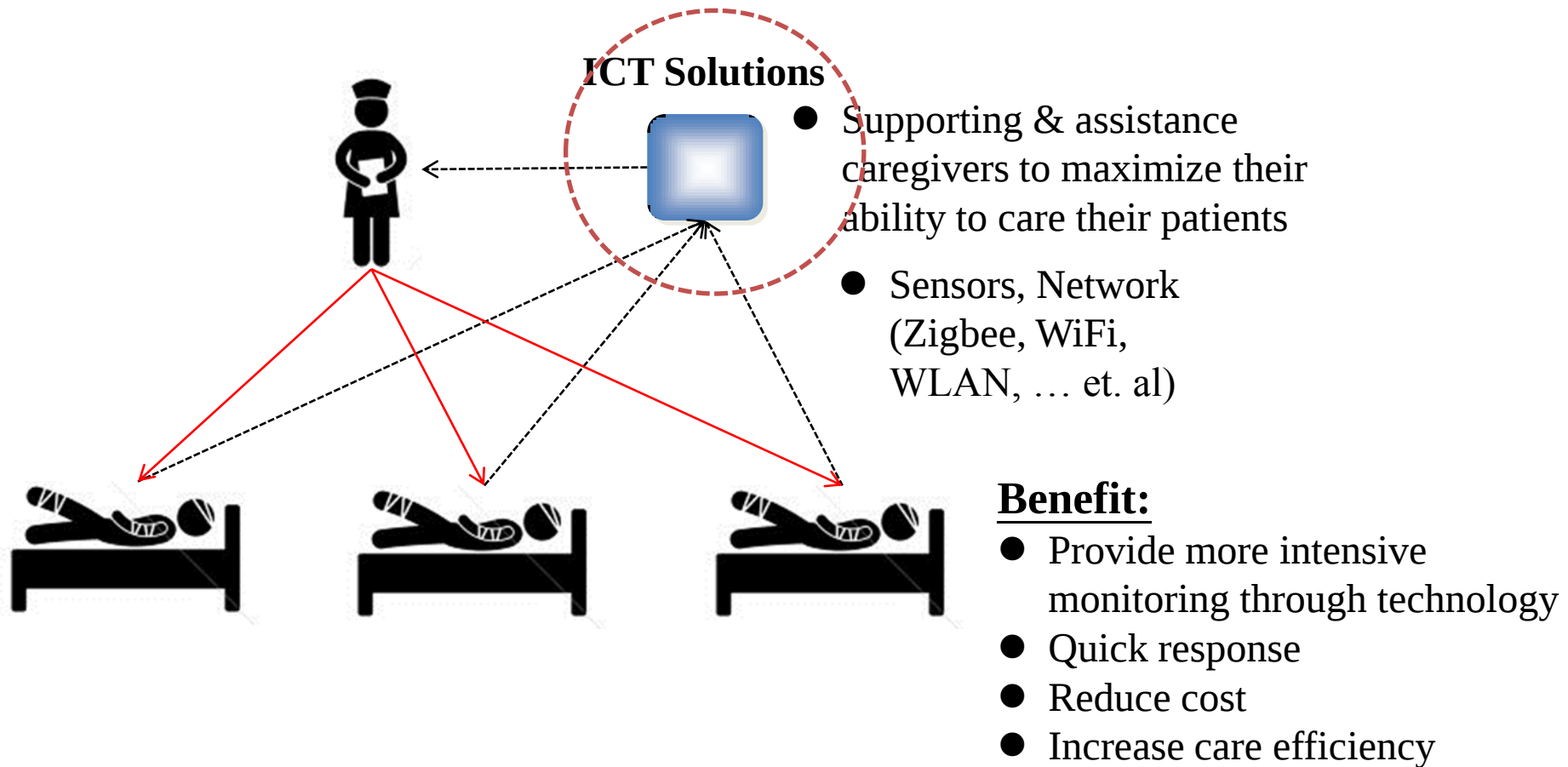
- Quality
- Innovation
- Health promotion
- Respect for human dignity
- Community participation

Towards

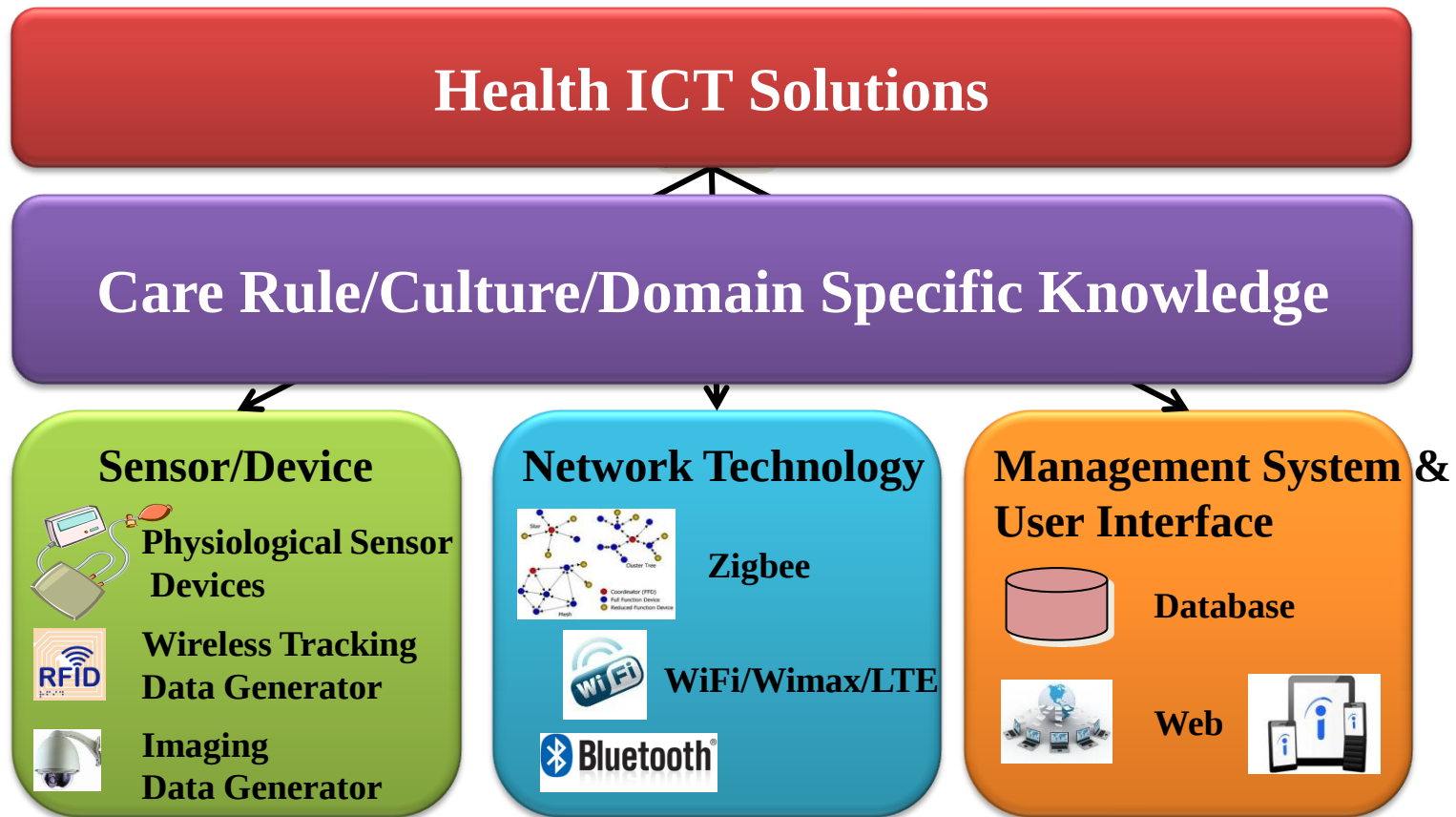
- An enhanced quality of life

When ICT meets Healthcare

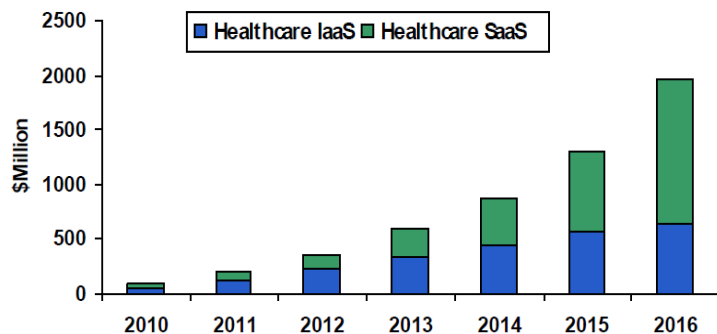
- ICT = Information & Communication Technology



When ICT meets Healthcare



Global Market Trend



\$Million	2010	2011	2012	2013	2014	2015	2016	%Growth
Healthcare IaaS	50	125	224	340	448	575	640	52
Healthcare SaaS	42	75	135	255	422	751	1,320	78
TOTAL	92	200	359	595	870	1,326	1,960	66.5

Source: Fuji-Keizai USA,2011

預估Health care SaaS (Software as a Service) 2010~ 2016年的平均成長率達78%，並且產值將於2015年開始超越IaaS(Infrastructure as a Service)。

Medical IT Segments	2010-2016 (CAGR %)
High Growth Segments	
Digital Health Devices (exclusively consumer-directed)	89
Mobile Health (smartphone apps in medicine)	87
Cloud-based Medical Software as a Service (IaaS & SaaS)	66
In-Home Remote Patient Monitoring Systems	26
Healthcare WiFi Systems	23
Healthcare RFID Systems	20

Source: Fuji-Keizai 富士經濟集團,2011/8

在 Medical IT Segments 中具高成長的的應用技術中，用於Maas & Rehabilitation Service技術，皆屬於高成長的領先項目，平均複合成長率皆超過25%以上。

P.S Monitoring include Chronic Disease Management, Post Acute Care and Single-Dwelling Elders related.

美國/中國Health ICT之市場規模

		ICT關聯市場(美元)		
		2009年	2011年	未來市場推估
預防保健領域	健康管理、預防保健	80億	合計接近 400億 (Information Week, 2011))	170億 (2014年)
醫療領域	電子病歷、 電子健康紀錄(EHR)	13.5億		14.3億 (2016年)
	醫療資訊系統(HIS)	156.9億		214.6億 (2012年)
居家照護領域	居家照護、 疾病管理	5.8億		11億 (2014年)
				CAGR
				16%
				6%
				15%

美國Health ICT市場規模推估(億美元)

■ 市場需求分三大類：

- 預防保健領域
- 醫療領域
- 居家照護領域

■ 2011年美國Health ICT約產值約佔總體healthcare花費(2.4 trillion USD) **2%**。
(2009年僅1%)

■ 預計2012至2014年美國Healthcare ICT年複合成長率為**24%**
(InformationWeek, 2011)

		ICT關聯市場(美元)		
		2009年	未來市場推估	CAGR
預防保健領域	健康管理、預防保健	5億	12億 (2014年)	20%
醫療領域	電子病歷、電子健康紀錄(EHR)	3.34億	8.56億 (2016年)	15%
	醫療資訊系統(HIS)			
居家照護領域	居家照護、疾病管理	2.6億	11億(2014年)	33%

中國大陸Health ICT市場規模推估(億美元)



工研院IEK(2010)

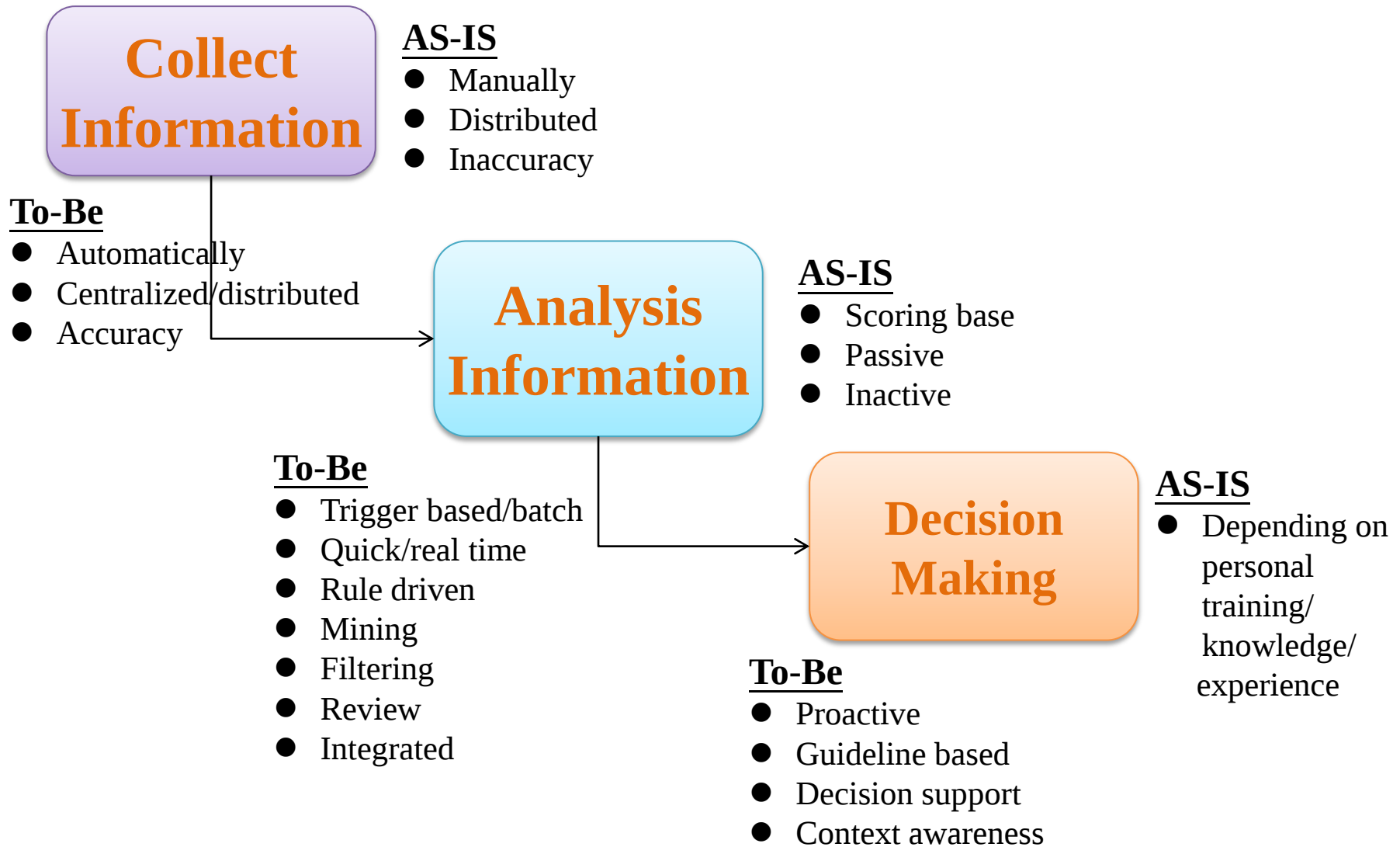
資料來源：Frost & Sullivan(2008, 2009, 2010)；工研院 IEK(2010)



HOW ICT TRANSFORM HEALTHCARE



How ICT transform Healthcare



How ICT transform Healthcare

Collect Information





How ICT transform Healthcare



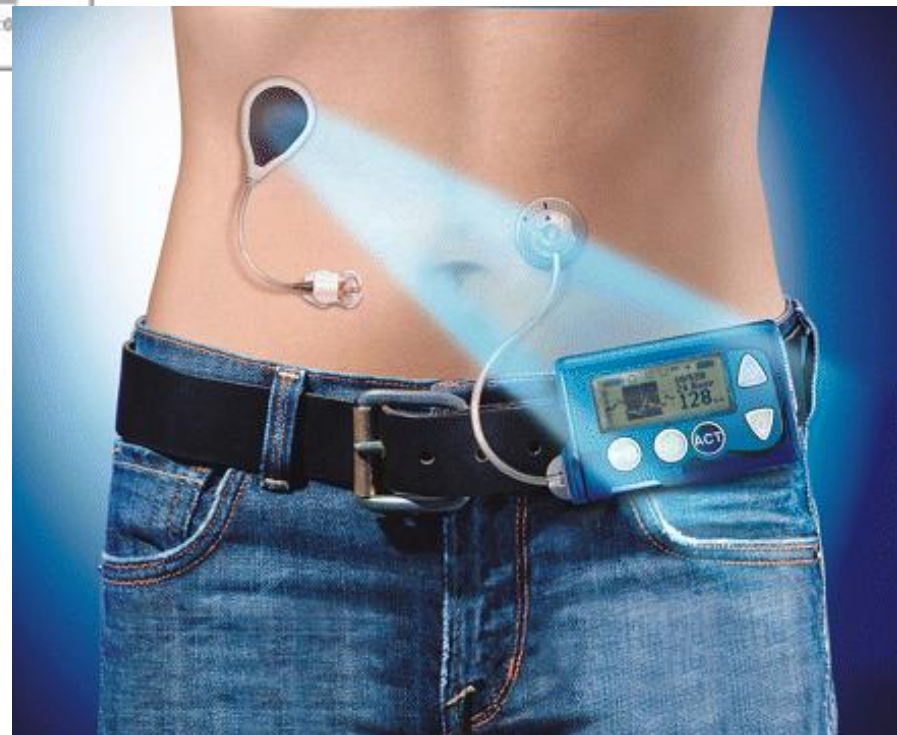
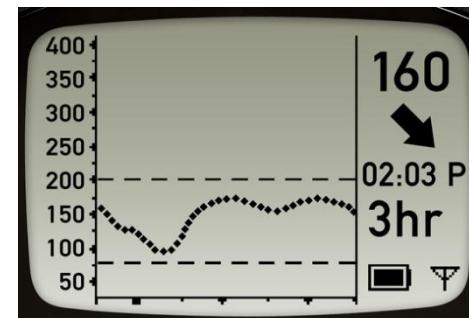
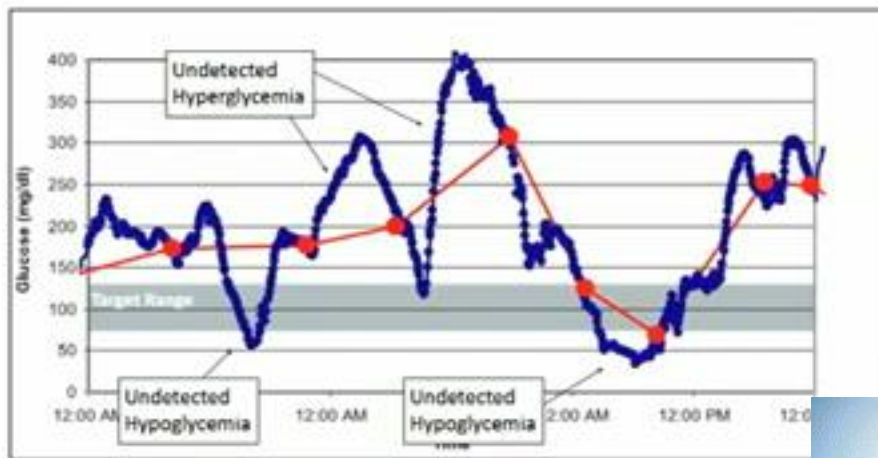
Take control of your sleep.

Zeo tracks the quality of your sleep and then gives you **personalized advice** to help you improve it.

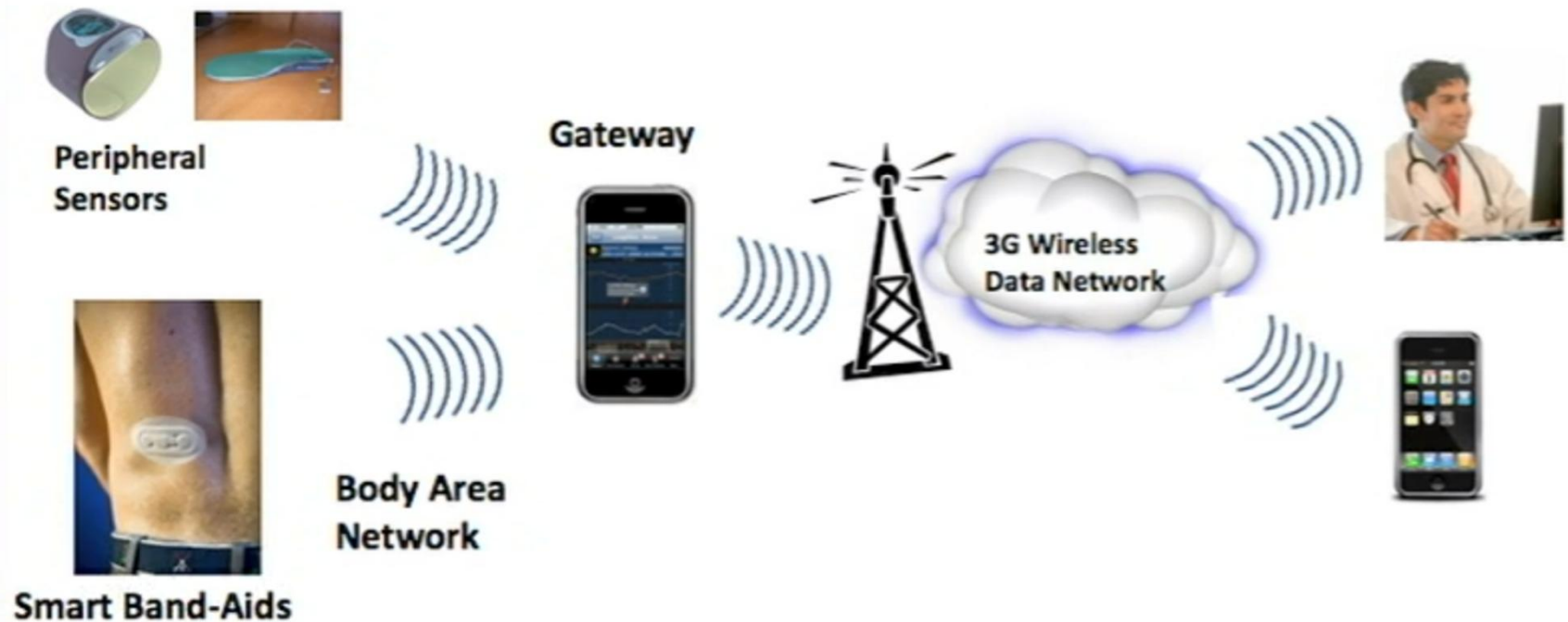
Get Started >



How ICT transform Healthcare

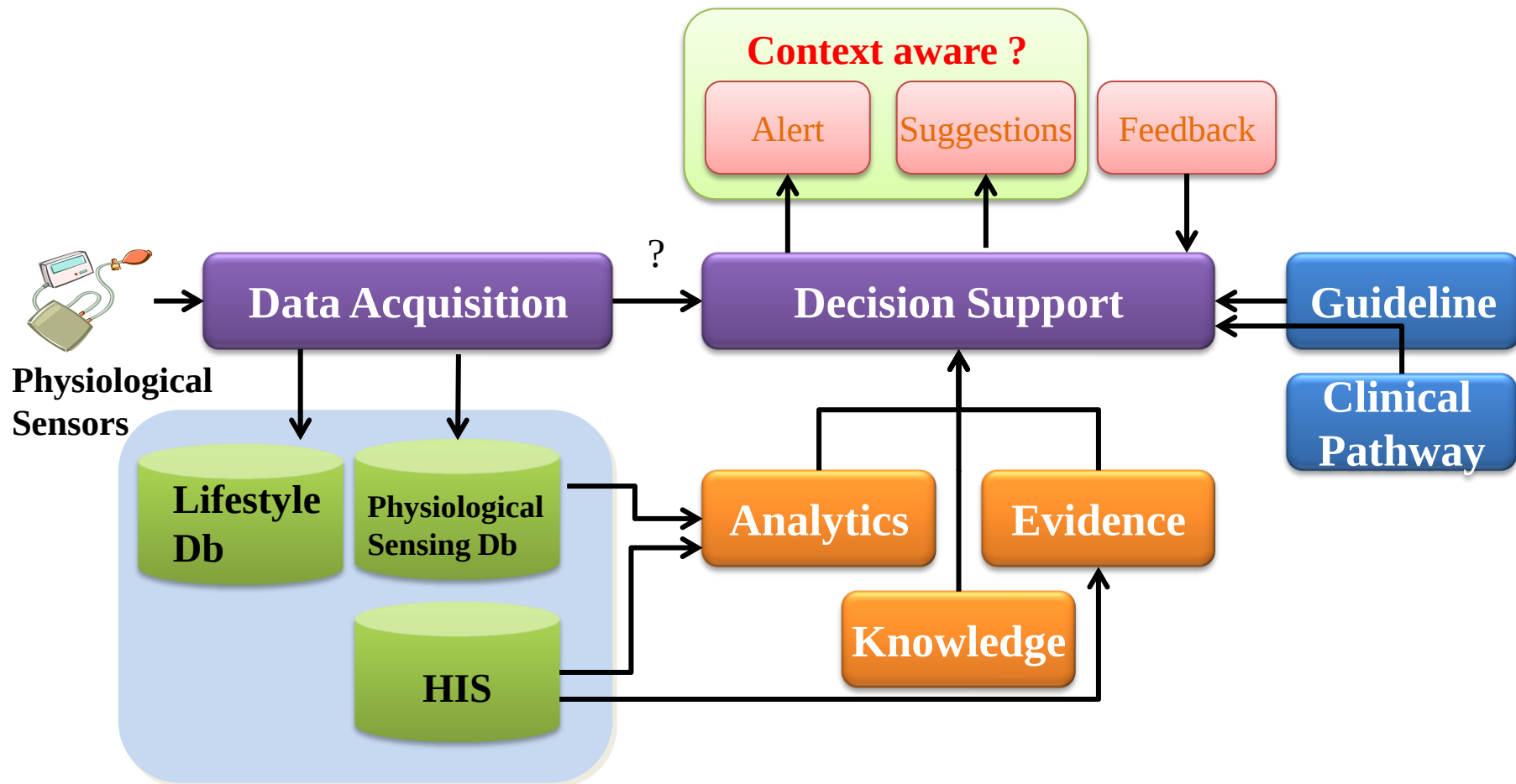


How ICT transform Healthcare



How ICT transform Healthcare

Example Frameworks for eHealth Application



How ICT transform Healthcare

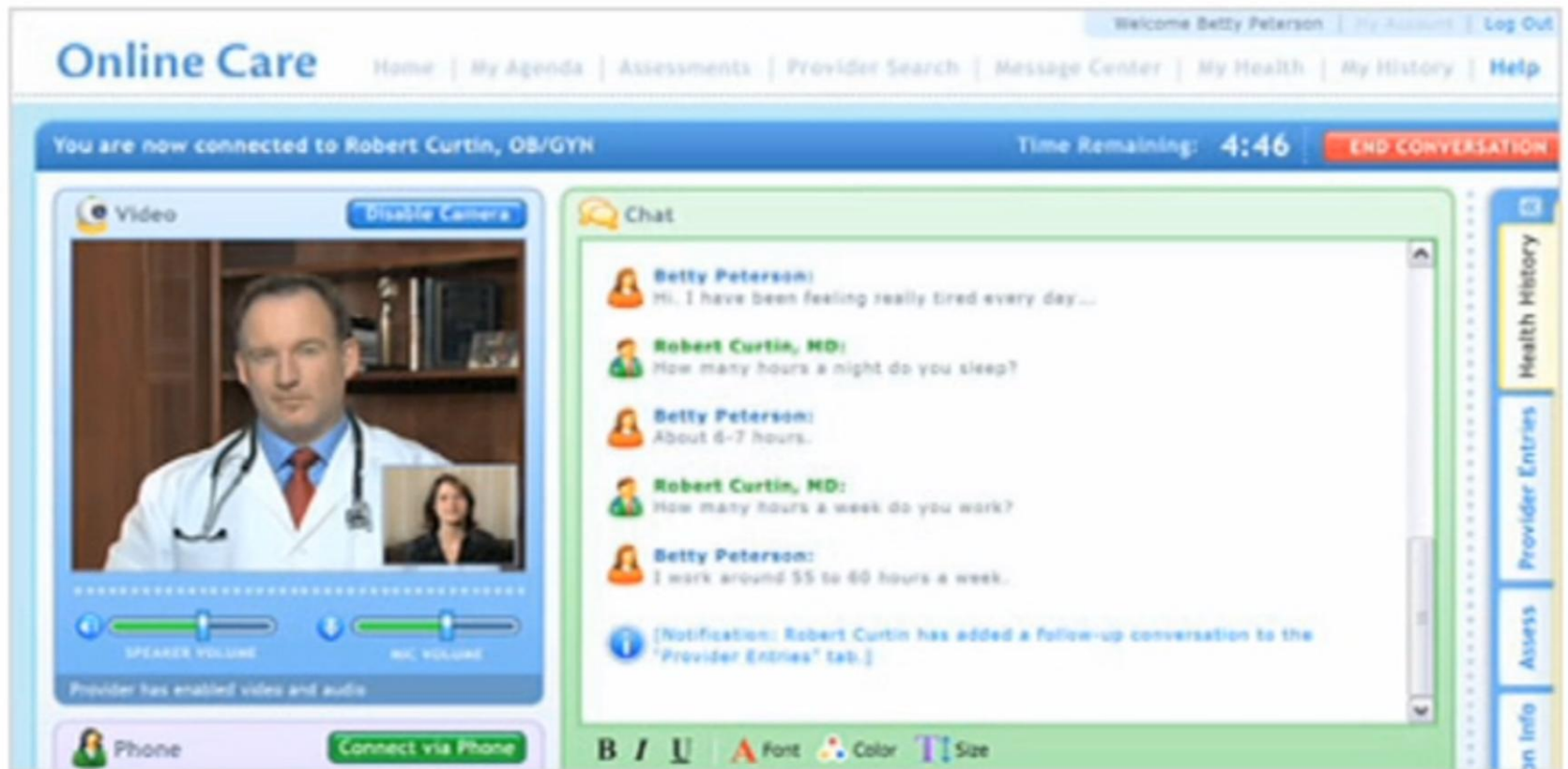


Medical
Records
Going
Electronic



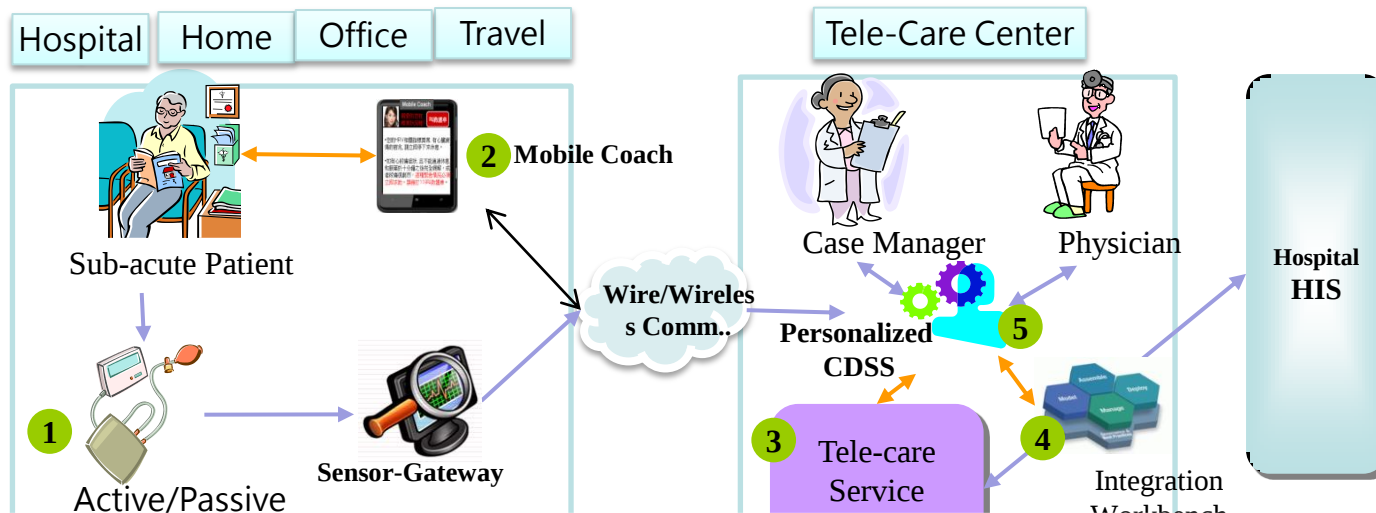
How ICT transform Healthcare

VIRTUAL VISITS & TELEMEDICINE HealthPresence



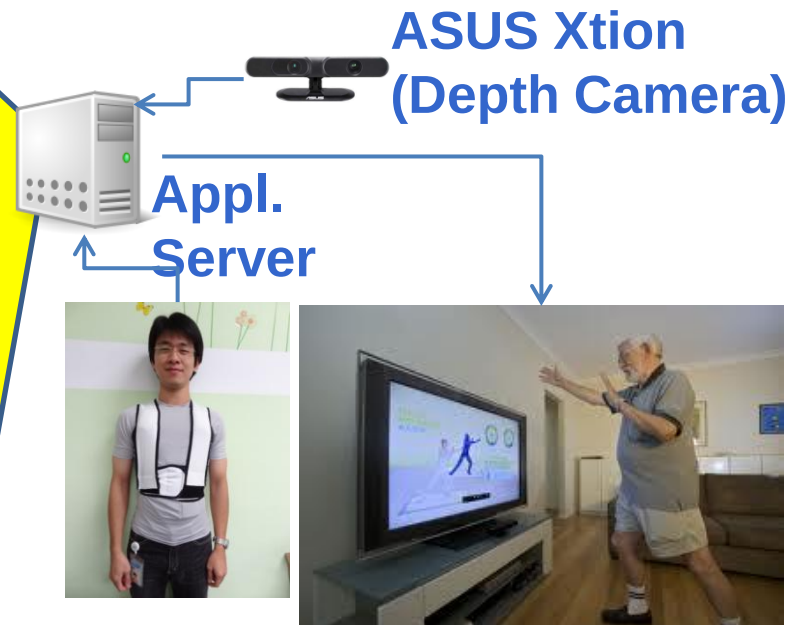
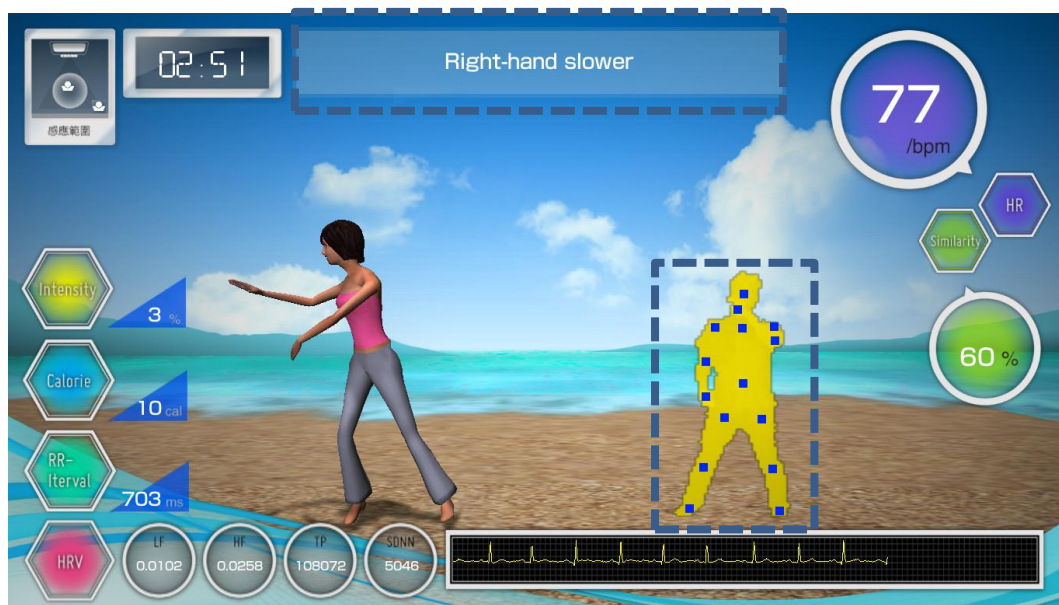
AmericanWell.com

ITRI Ubiquitous e-Health ICT & System Architecture



No.	description
1 Active Sensors	-Dual Camera for 3D posture identification -UWB Radio for physiology data sensing
1 Passive Sensors	-Integrated multi-physiological sensor suit (smart suit)
2 Mobile Coach	-Real time exercise coaching & suggestions
3 Tele-care Service Platform	-Near real time multi-channel monitoring -Video Conferencing -Health Risk Analysis -Patient Similarity Analysis
4 Integration Workbench	-HL7 standard based API for EMR data import/export
5 Personalized CDSS	-Medical guideline execution engine & guideline editing tool -Risk factor scoring/Suggestions/Reminders

Smart Frontend Solution for Easy-to-Use and Compliance Enhancement



Compliance enhancement

- Real time personalized mirroring image
- Posture similarity scoring
- Virtual coaching

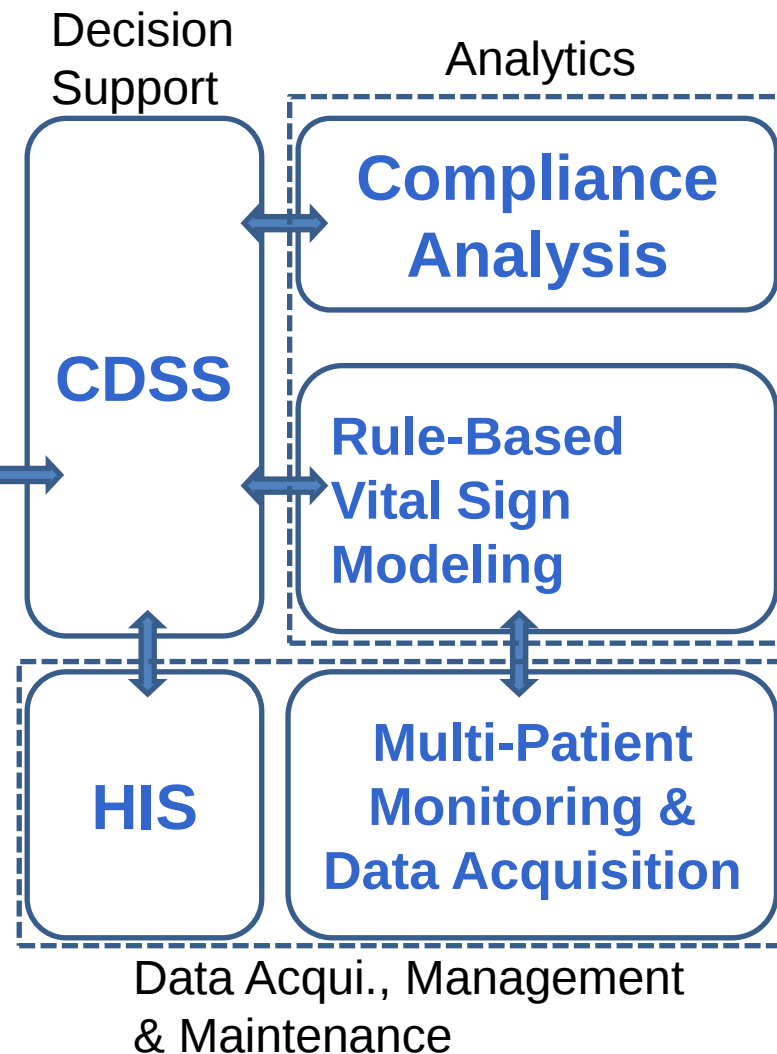
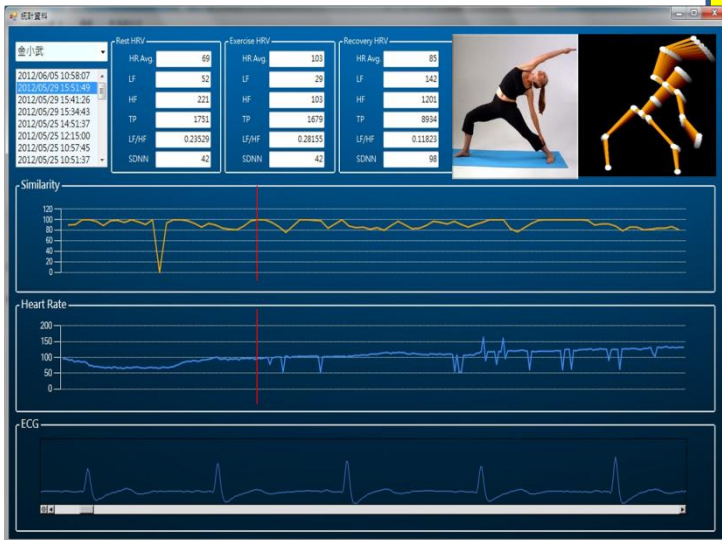
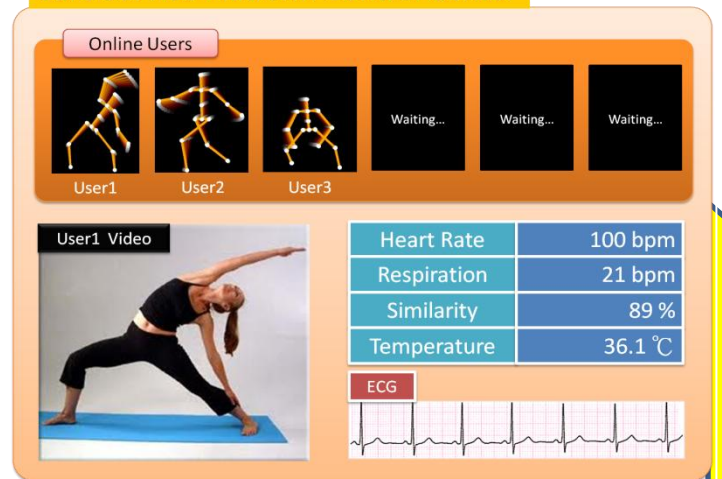
User friendly vital sign monitoring

- Multi-sensors suit integration



ITRI Ubiquitous e-Health ICT & System Architecture

Care Service Platform Control Center

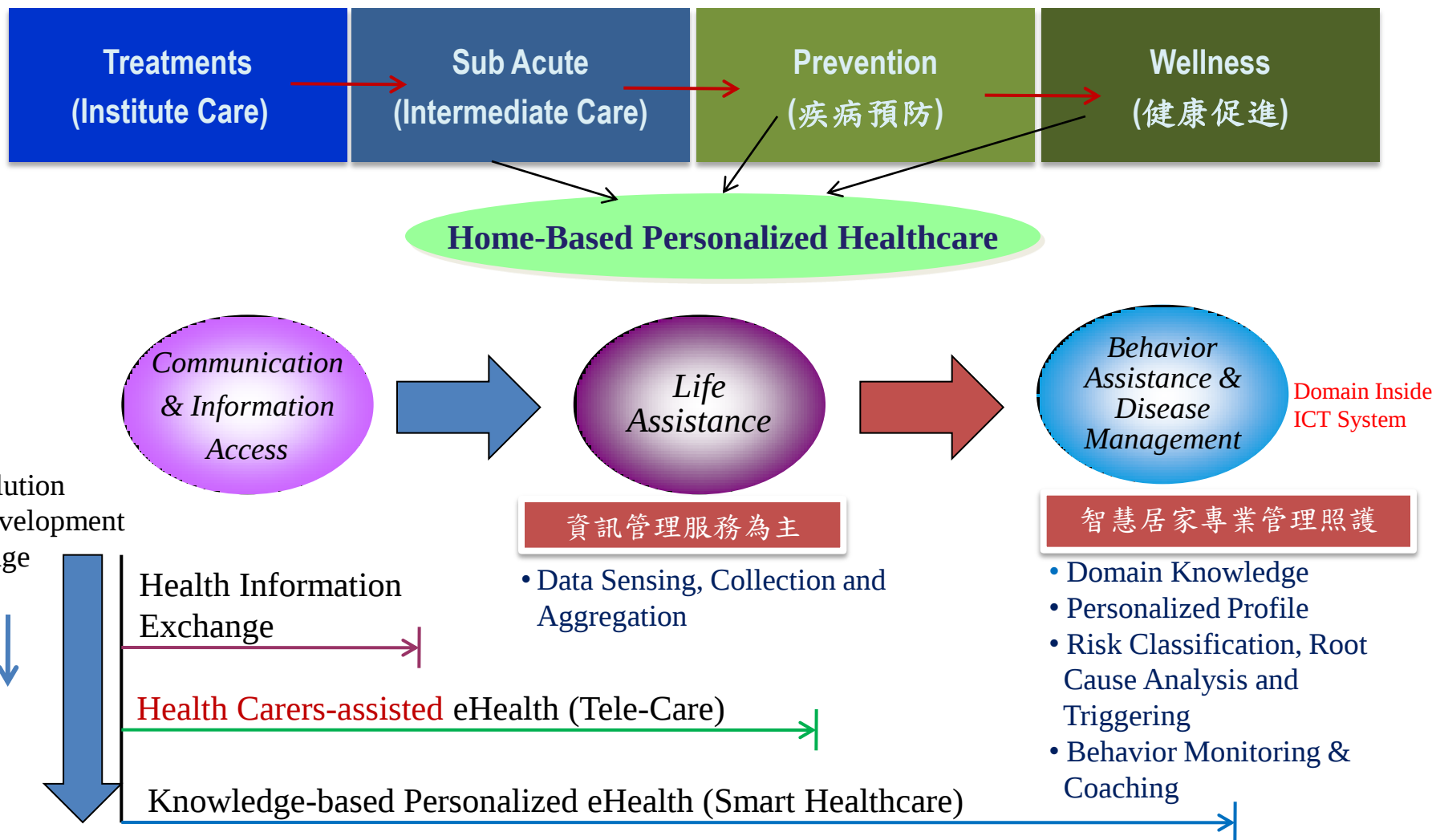




WHAT IS THE DEVELOPMENT TREND OF HEALTH ICT

What is the development trend of Health ICT

(Treatment-centric → **Prevention-oriented home-based Personalized Healthcare**)





What is the development trend of Health ICT

Health ICT 市場分類與規模

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美國資通訊技術應用於健康照護之市場規模

		ICT關聯市場(美元)		
		2009年	未來市場推估	CAGR
預防保健領域	健康管理、預防保健	5億	12億 (2014年)	20%
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市場需求大致可分為**預防保健**領域、**醫療領域**以及**居家照護**領域。其中居家照護領域包含居家照護以及疾病管理兩大主題。

遠距病人監測服務與技術發展趨勢：

1. 感測器之多元化及性能增加。
2. 影像成像及取得之技術精進，例如影像處理、低照度、顏色不失真程度以及其他等。
3. 通訊技術持續精進與成本大幅降低。
4. 計算能力的強化。
5. 改善電力耗損，例如電池壽命、電力消費經片、熱量消耗效率等。

註：(*1) Frost & Sullivan(2008)；工研院 IEK 推估；(*2) Frost & Sullivan(2010)推估；

(*3) Frost & Sullivan(2009)；工研院 IEK 推估

資料來源：Frost & Sullivan(2008, 2009, 2010)；工研院 IEK(2010)



Personalized Healthcare

- Consumer empowerment and information rich “smart care” and “independent living”
- e-Health: evidence- and knowledge- based convergence of ICT, biotech, nanotech, and medicine
 - Personalized health program: Personalized health record fusion & analysis, guideline suggestions, personal risk factor scoring
 - New approach of reducing malpractice possibilities to optimize medical intervention effectiveness and patient’s safety.



Challenges of e-Health Development

- **Interoperability**

- Cross-border operation is difficult due to lack of data exchange standards

- **Privacy**

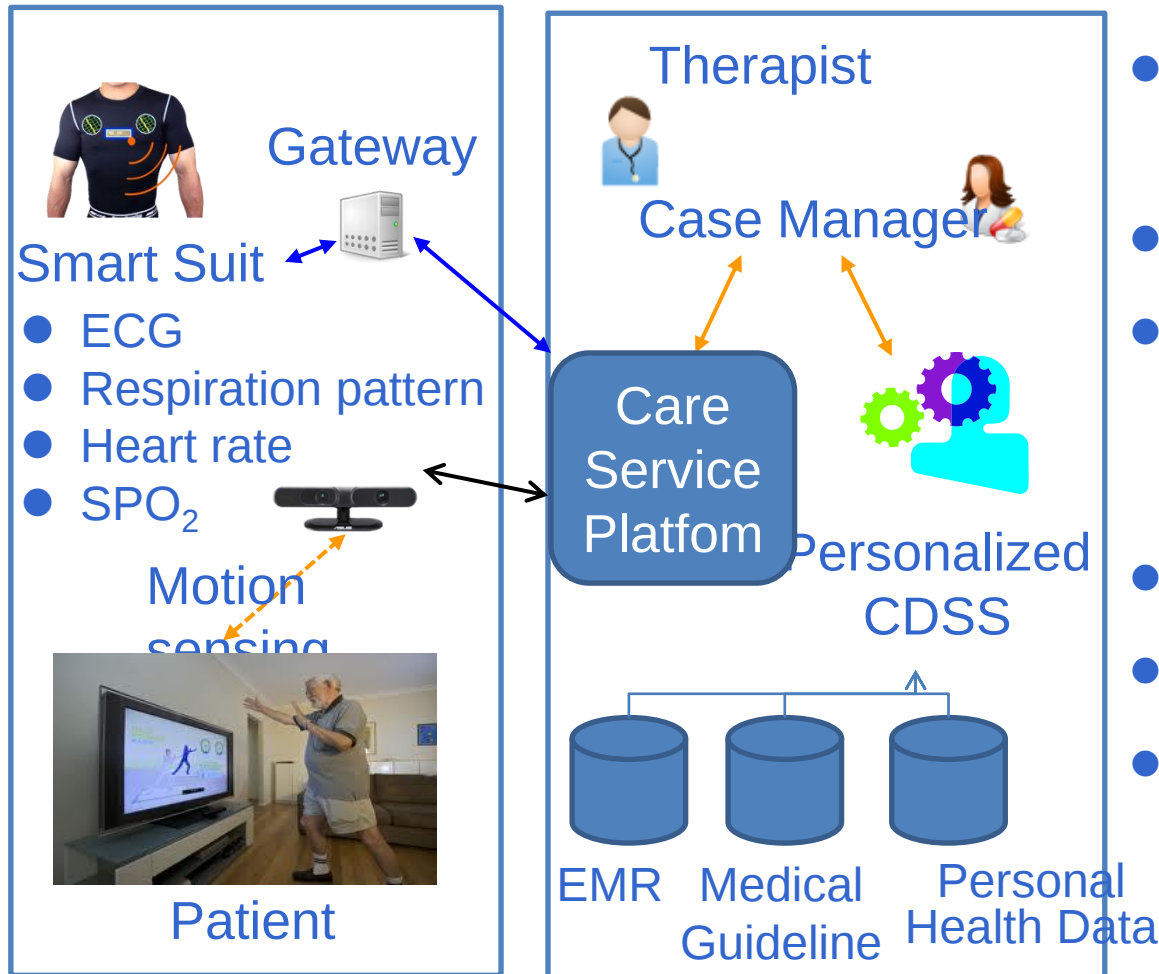
- Privacy over security of patient records

- **User Compliance & Interface**

- Users follow the clinical pathway
- Easy to use for different parties eg., physicians, caregivers and patients in all conditions

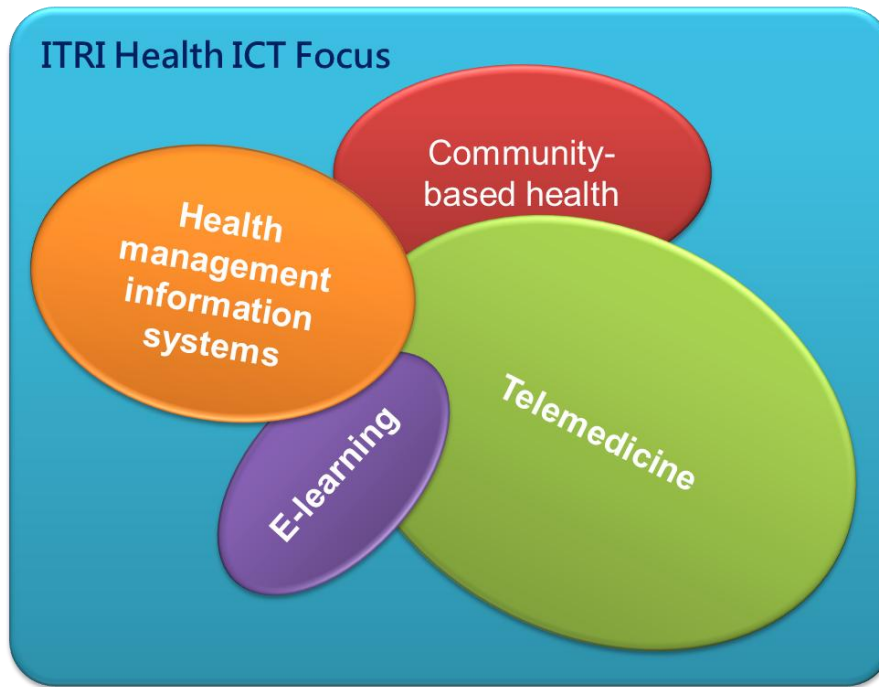
- **Scalability**

Interactive Exercise Rehab Monitoring and Coaching



- Easy-to-use sensing device
- User compliance
- Near real time monitoring of patients' physiological status
- Scalable service
- Privacy & security
- Integrated with HIS and retrieving meaningful information

ITRI e-Healthcare Technology & Solution



Related Projects :

- ✓ UCare Telecare development project
- ✓ Company employee health management project
- ✓ Community based healthcare platform development project
- ✓ Medical Hub/HATM development project
- Home based sub-acute care project

Mission:

- Improving the functionality of health care systems
- Improving health care delivery
- Improving communication between care-takers and care givers

Challenges:

- | | |
|----------------|---------------|
| ● Connectivity | ● Compliance |
| ● Content | ● Culture |
| ● Capacity | ● Cooperation |
| ● Community | ● Capital |
| ● Commerce | |

Future Health ICT development

- Wireless
- Multi-mode sensing
- Contactless
- Mobile



Future Health ICT development

- m-Health ~!?



Sleep monitor

Physiological Sensing with mobile device

Future Health ICT development



Future Health ICT development

Handheld Ultrasound—The New Stethoscope?





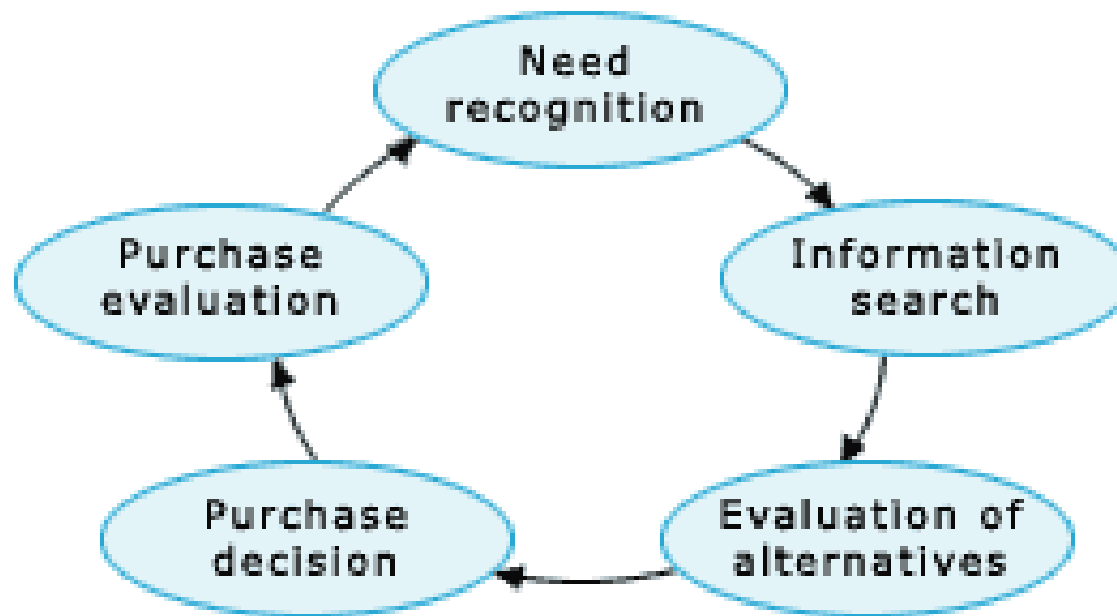
Future Health ICT development

Disease	No. Affected	Wireless Solutions
Alzheimer's	5 M	Vital signs, location, activity, balance
Asthma	23 M	RR, FEV1, Air quality, oximetry, pollen count
Breast cancer	3 M	Ultrasound self-exam → Web
COPD	10 M	RR, FEV1, Air quality, oximetry
Depression	21 M	Med Compliance, Activity, Communication
Diabetes	24 M	Glucose, Hemoglobin A1C
Heart Failure	5 M	Cardiac pressures, weight, BP, fluid status
Hypertension	74 M	Continuous BP, Med compliance
Obesity	80 M	Smart scales, Glucose, Caloric In/out, Activity
Sleep Disorders	40 M	Sleep phases, quality, apnea, vital signs

Technology Adopting Evaluation

Decision Process

- Cost V.S. Effect
- Risk Analysis
- Maintenance & Upgrade
- Standard Package V.S. Customization





Conclusion

- Aging population drives healthcare expenses up
- e-health provides promising solution to reduce cost
- e-Health development relies on easy access to internet, ready availability of ICT, and support of government policies/regulations
- Collaboration with healthcare service partners to develop e-health care systems is essential