

## Lessons Learned from Applications of IoT at Social Spheres

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#### Introduction

Digital Economy & Digital Transformation

### Cases of IoT Applications at Social Spheres

Concluding Remarks



## I. Introduction

Characteristic features of Asia's high-tech industrialization
 Global production/innovation networks connecting cross-border clusters in the ICT industry

**RD&I** for production and export, tapping into the GVC

To embark on economic transformation by *harnessing new digital technologies*, such as IoT, AI...

Digital economy: ICT innovation at the societal level

• Far-reaching effects of digital technologies on productivity, employment and well-being

• *Reconfigurations* of the GVC and innovation ecosystem

Reindustrialization of the developed world

• Our focus: *Applications of IoT* 

□ IoT applications have been around for years, but they are still evolving and at the "**fuzzy front-end**" stage.



• Esp. *at social sphere* 



## II. Digital Economy and Digital Transformation

# New ICT Ecosystem and Evolution: Scope of the Digital Economy





Source: Drawn from Fransman, M. (2010), The New ICT Ecosystem: Implications for Policy and Regulation. Cambridge: Cambridge University Press.

Source: Rumana Bukht & Richard Heeks (2017), "Defining, Conceptualizing and Measuring the Digital Economy," adapted from http://www.gdi.manchester.ac.uk/research/publications/di/di-wp68/。



**Internationalization of** the NIS & innovation ecosystem Solution-oriented, software & hardware integration



# Industry 4.0 in the Footwear Industry: A Game-changer?

- Impact of Industry 4.0
  *Competitors from nowhere*
  - Start-ups + Addidas, Nike, Under Armor
  - *Reconfiguration of the global value chain (GVC)*, thanks to digitalization

#### Introduction of 3D Printing

- Changing product architecture: e.g. the sole of the shoes
- Do *part consolidation* digitally in the design phase
- Print at point of assembly & consumption (e.g. *Decentralized manufacturing*)

Some countries in the GVC *at stake* 





Source:

http://www.happybai.com/img/upload/happybai/product/ nike-shoes-air-max-90-white-pinkindigo\_6276791\_1394903705950.jpg。 http://www.yahoo168.com.tw/Pic/nike/2014/1220/12202 8.jpg



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Do not do too much concurrent technology and business development Before the **critical technologies** are developed and validated!!!

Source: James Hsu (a former CTO of GM)

#### A Broader View on Customer Space

Erik Anderson (a VP of Foxconn): Smart city enables new behaviors which redefine urban spaces.



#### Graveyard of Dockless Sharing Bikes in China



Key: Neglect of **the behavior and social interface aspects** in designing the business model

Source:

http://www.sina.com.cn/midpage/mobile/index.d.html?url =photo.sina.cn/album\_1\_2841\_198401.htm?ch=1





Source: http://n.cztv.com/news/12591221.html



## III. Cases of IoT Applications at Social Spheres

#### A Case of Startup: UPARK



UPARK活化空間 停車不再一位難求



f



Source: https://money.udn.co m/money/story/10860/ 2472256

A- A+



優泊UPARK智慧停車鎖。 優泊/提供

擁有多項新型專利的「優泊(UPARK)」,經南港IC設計育成中心協助,成為政府加強投資策略性 服務業實施方案重點輔導對象,股東有國發基金及創新工研院等,已完成2500萬種子輪募資,並 獲得多項政府補助及基金投資。



- An IoT-based smart solution for O2O sharing of parking spaces
- Roadside parking spaces+ IoT Lock

#### Residential complex

New stakeholders: the management committee, security guards

Legal issues: social interfaces

 Scaling-up: From Taipei to Taichung, & elsewhere

### ETC in Taiwan: Potential Platform for Internet of Vehicle

Penetration of ETC in Taiwan: Multi-lane free flow tolling (RFID-based) solution

ETC Customer	>7 million (August, 2018)
ETC daily Transactions	Daily average: 16M Historical Daily high: 21.9 M (2015/02/21)
eTag Usage Rate	94.14%

#### KPI of ETC

Item	Audit result	Remark
System Availability Rate	99.992%	
Successful Tolling Rate	99.97%	
Vehicle Detection Accuracy Rate	99.98%	KPI: 99%

Seeking exports to some ASEAN countries & India...

### FETC's ETC Solution in Chinese Taipei and Vietnam



The Electronic, Multi-lane Free Flow Tolling in Taiwan

Total Solution of the RFID-based ETC Tolling System





A Pilot Site in Vietnam



FETC: Multi-lane free flow tolling solution for Vietnam Source: Company information of FETC.

### ETC: International Recognitions & Hurdles in International Outreach

- International awards won
  - 2017: Private Sector Excellence Award, by WITSA
    2016: Global Road Achievement Awards for Traffic Management and ITS, by International Road Federation
  - 2015: ITS World Congress Industry Award
- *Hurdles* in international Outreach
  - *Fragmented ownership and operations* of national superhighways in some of ASEAN countries
    Domestic *tolling service operators* required
  - **ODA** by some other countries

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#### Extended Application of ETC: *ETC Not Just ETC* (Outside the Superhighway)

#### **Moving on to ITS / ERP**



► Vehicle Tracking





Proposed scaling-out of FETC: ETC → Access Control Solution Provider→Logistics Flow Management and Commercial Vehicle-centric IoT commerce

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### Access Control of Cargo Trucks in Taipei Harbor: RFID-based Solution



Automated Access Gates 自動化門哨車道

ZigBee (Container terminal)  $\rightarrow$  RFID (Driver's ID card) + OCR (Optical Character Recognition): Smart access control and flow management of cargo trucks



Source: http://www.ithome.com.tw/news/90463。



Validation Station 查驗站機房



Real-time validation of status and vehicle information with data bank

## IV. Concluding Remarks

March towards the digital economy brings about *new keywords for innovation*.

Production & export vs. Production + Innovation applications/solutions

Catch-up vs. *Post Catch-up* 

■Value chain (moving upstream, services in value chain) vs. *Ecosystem (end-to-end solution, XaaS; born-servicing)* 

Production interfaces vs. *Social interfaces* 

Technological innovations vs. Compound innovations (esp. business models, regulatory changes)

Require to change the way in which we innovate and interact with the changing innovation ecosystem

☐ You cannot have clusters of tech innovation without *social* and behavioral changes.



## Thank you for your attention.

### A Conceptual Framework for Post Catch-up **Industrial Development**

#### **Initial Conditions**

**Post-catch-up Scenario:** limited chances of imitation

- A window of opportunity
- Insightful vision for industrial transformation

Uncertainty

CIEI

Fuzzy

level

front-end at

the industrial

- Equivocality Complexity
- Source: Chen and Wen (2014).

#### • Key innovation agent and capabilities Relationship among innovation

**Innovation System and Agenda** 

- agents Institutional arrangement of its principles of operation
- Interaction with external environment
- Market cultivation and promotion via public-private partnership
- Business models leading to new development paths for the
- industry
- Product-oriented, service-oriented business models

#### **Outcome**

New technological regime for emerging industries or industrial transformation Industrial development