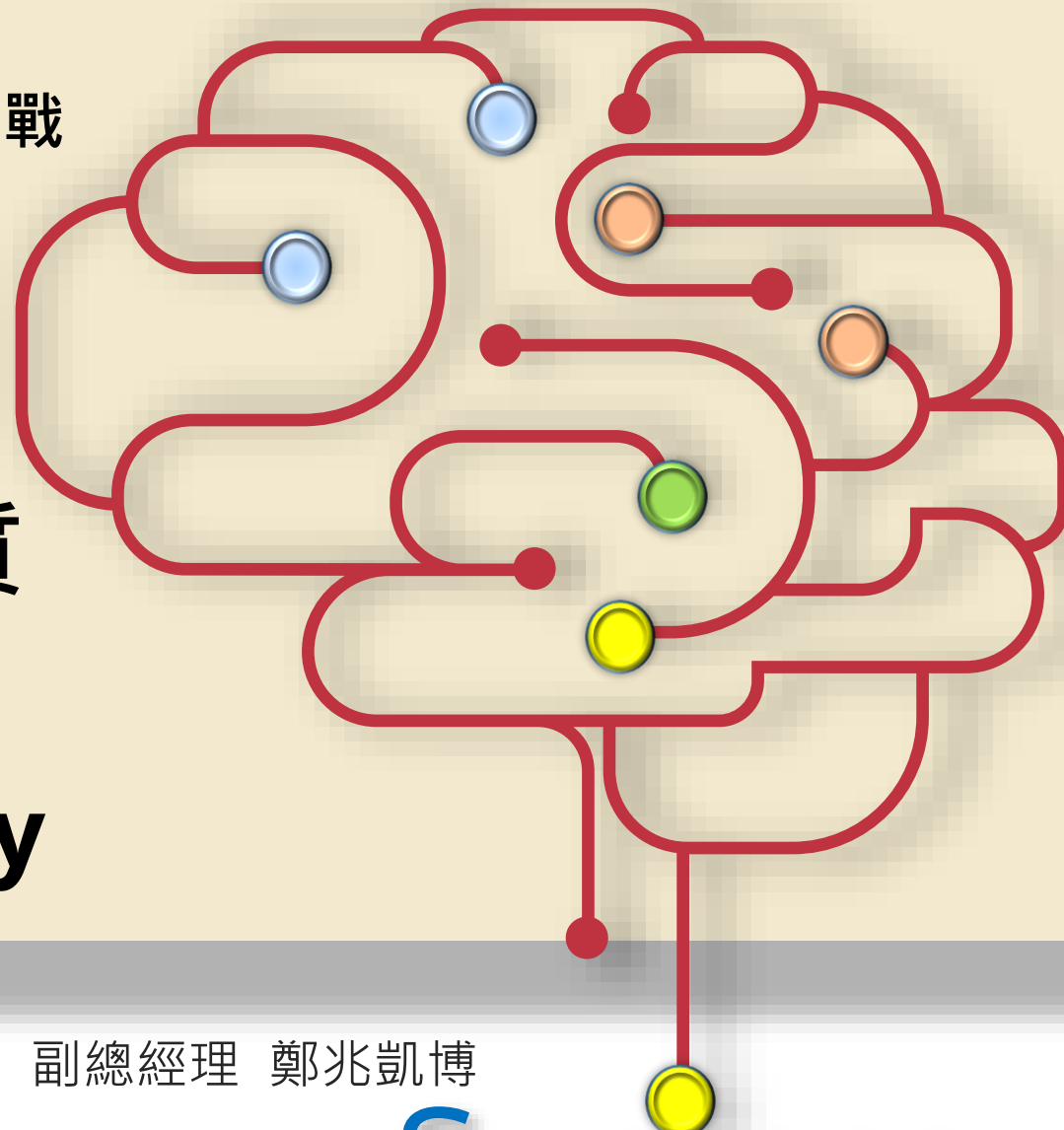


財團法人中技社

循環經濟與綠色創新對中小企業發展之機會與挑戰



# 從產業擴展看循環經濟的本質

## The Industrial Perspective in Essentials of Circular Economy

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*Innovation · Quality · Sharing*

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Success

# Company Profile & Transformation

<p>1979成立汎宜科技 1999成立上海凡宜 2003 FineTek 集團 2003 新加坡分公司</p>	<p>國家磐石獎 2007德國分公司 ATEX NEPSI</p>	<p>國家品質獎 上海高新企業 IWSN 工業物聯網 五大船舶認證 HART 7.3認證</p>	<p>桓達科技獎 產業學程計畫 2<sup>nd</sup>/3<sup>rd</sup> 潛力中堅 雷達/流量事業 PTB UL Workshop</p>	<p>IPO 興櫃/上櫃 TEXA 防爆協會 國土監測應用論壇 中華民國品質協會 宜蘭利澤1/2廠</p>
<p>1979~2002 (奠基期)</p>	<p>2003~2008 (成長期)</p>	<p>2009~2011 (轉型期)</p>	<p>2012~2014 (創新期)</p>	<p>2015~2017 (領航期)</p>
<p>    </p>	<p>   </p>	<p>      </p>	<p>TIPS 國貿局品牌台灣   </p>	<p>TAF Certificate ASME Certificate ISO 9001:2015 Emerson 供應鏈   SELECT USA</p>

# Contents

循環經濟的生態定義  
Definition



結語:台灣的策略轉型期許

循環經濟的變革.



線性經濟  
產業循環  
循環經濟.

1

2

3

6

5

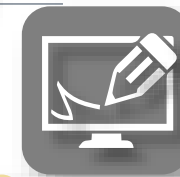
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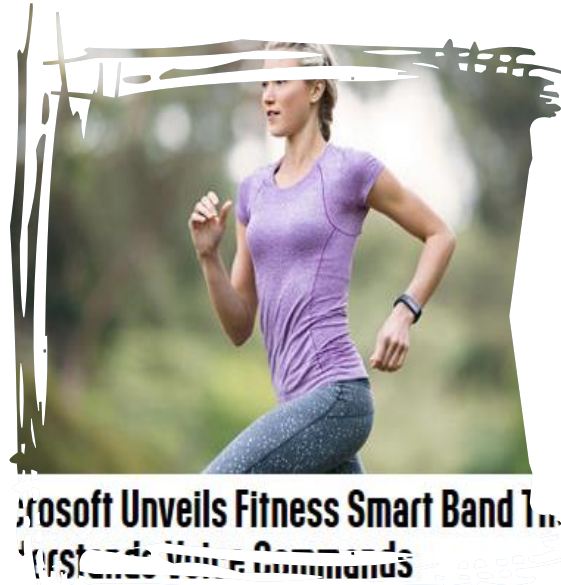
經濟的產業關鍵  
Transformation &  
Amplification



循環的要素  
Domain Knowledge



循環成為經濟的要素  
價值鏈驅動  
轉化(物理、化學  
知識、再生成)  
Business Model

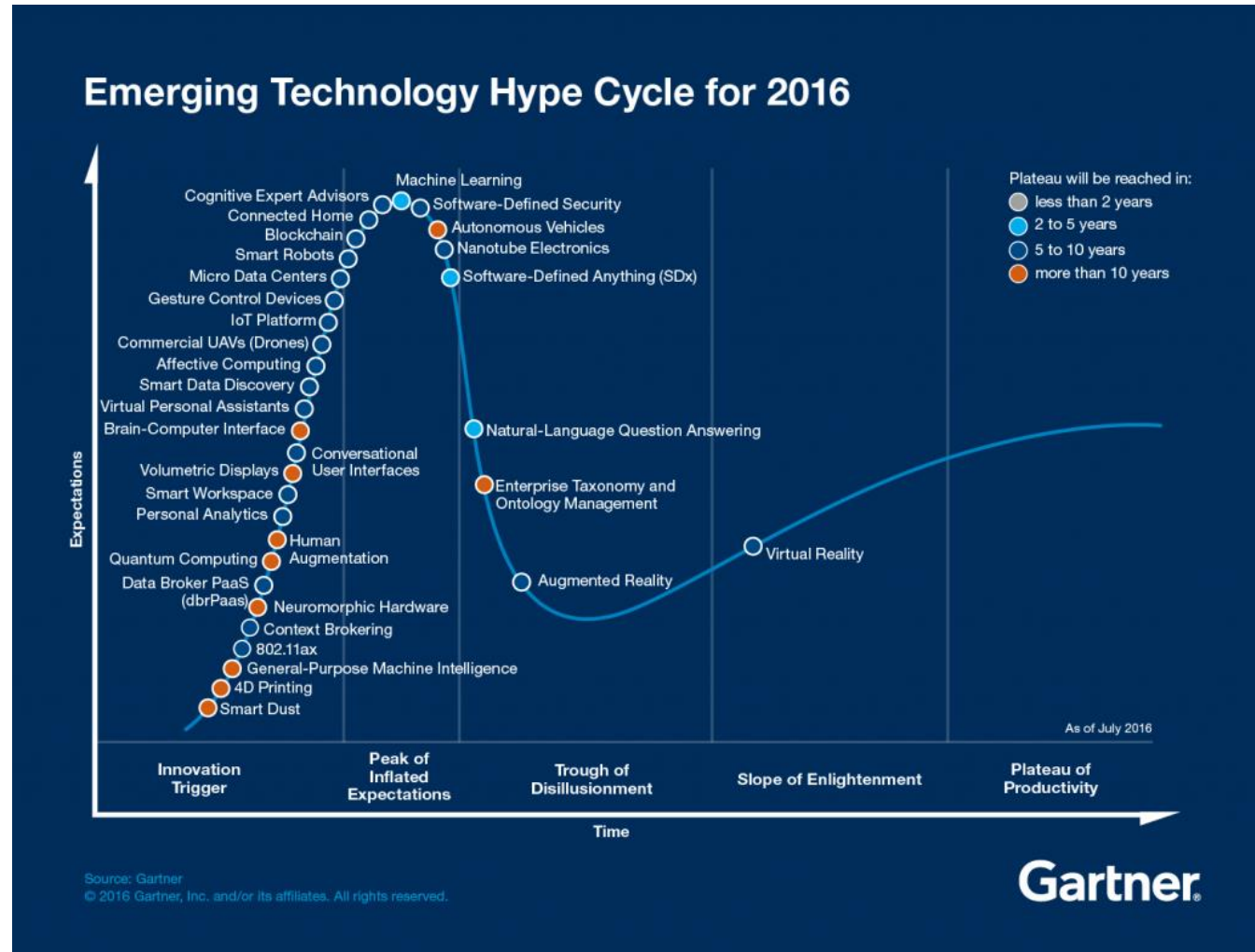


- The Internet Of Things Will Lead To The Internet Of Spaces (人由實體空間居住，變成虛擬數位空間→宅化)
- 產業的循環需求，會以人的成長(增加到90億人)為主軸，成為主軸需求
- **Green is Good, But Green is not good enough for Essential of Economy.**
- 成為循環經濟要素(心理要素)，必須讓**流程透明循環(Processes Transparency)**，產生**異業合作(Collaboration crosses different industries)**，以及**共享免費的資訊(Open Source education, SW, data, HW, Science, Standard...etc.)**。成為另一個**經濟循環的可起始點**。



By 1980, the team concluded, New York would need more than **six million horses**. It is an obvious problem, the city already had **200,000 horses** in 1880, where each one dumped a quart of urine and 24 pounds of manure every day. In total of 4.8 million pounds of horse dung and 50,000 gallons of pee already being dumped into the street. New York will not be possible afforded it.

The fact is , during 1896-1930, the new technology of vehicle let the city owns over **1,800 car manufacturers..** Not full of the dump.



**新經濟改變：美國能源部目標，2020年來自植物的生質材料市占率>10%，2050年市占率>50%。新的貿易障礙形成**



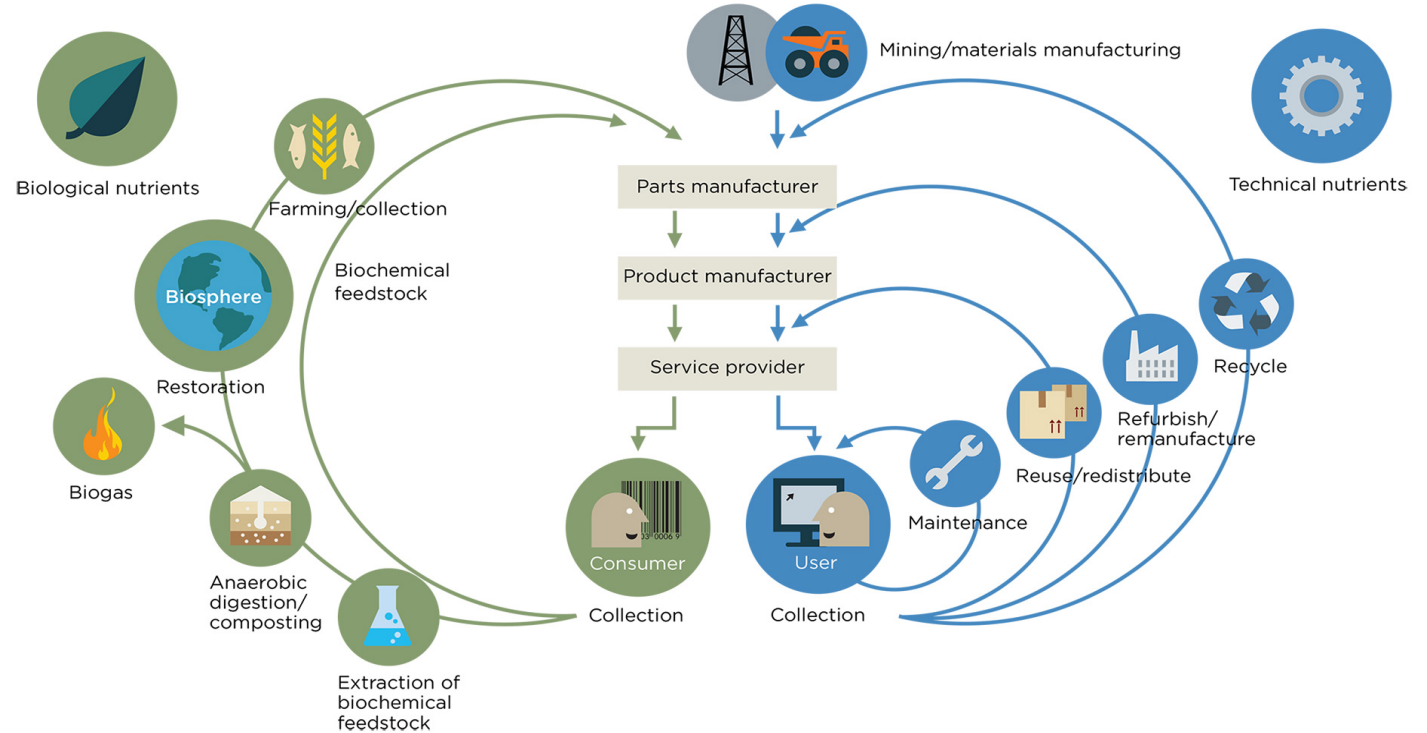
本質上觀察，這個循環圖，只說明了一個特定產業的流程。但只有循環並沒有經濟的內涵。循環流動並不能產生“經濟價值”。



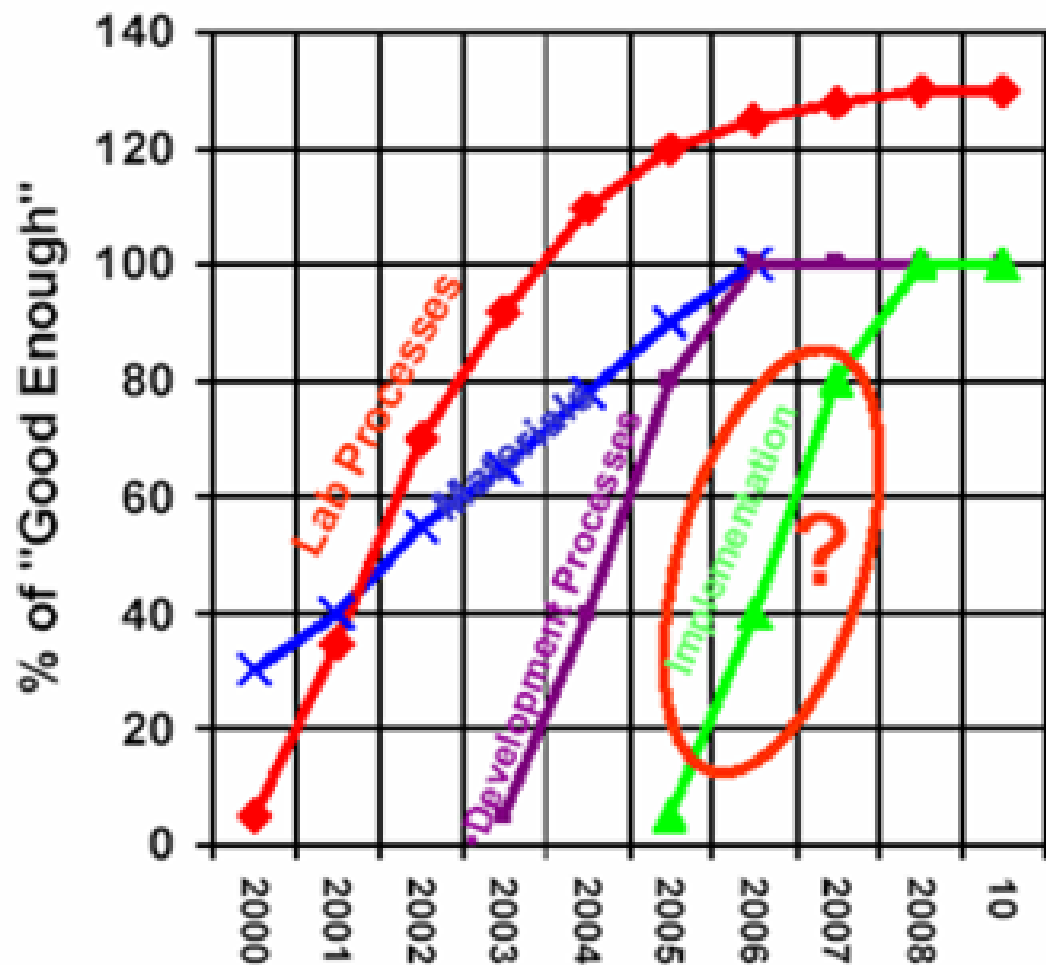
循環經濟要產生價值，過程中要有兩個要素：第一個要素為循環的過程要有新的動能(供應鏈到顧客的型態產生)，造成經濟效益的擴大。



第二個要素為，必須在整個循環過程中具有一個轉化點 (Transformation Point)。



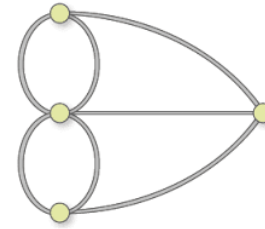
- A circular economy is one that is **restorative and regenerative by design**, and which aims to keep products, components and materials at their highest utility and value at all times, distinguishing between technical and biological cycles. (Ellen Macarthur Foundation )
- **搖籃到搖籃 (Cradle to Cradle)**概念，所有資源皆為養份，可再生使用。從產品設計階段就構想產品終點，讓物質得以不斷循環。搖籃到搖籃分成：**生物循環**及**工業循環**。(德國Prof. [Michael Braungart](#) )
- iPhone retains around 48% of its original value whereas it retains just 0.24% of this value as recycled components. Reusing a tonne of textiles retains 9.6% of the original value compared to recycling (0.4%), while car reuse retains 5.3% of the original value against its recycled parts (1.5%). (Philips)



- **Materials**
  - Converging on Good enough in 2006.
- **Research Lab Phase Processes**
  - Already Good enough
- **Development Phase Processes**
  - Moving Toward Good enough Demonstrators in 2006
- **Implementation Phase**
  - Where are the implementation machine makers.?
  - Implementation machines are on the critical path

歷史統計: 從最起始的基礎研究(or. 科幻小說)到產業興起 → 平均 20-28 年

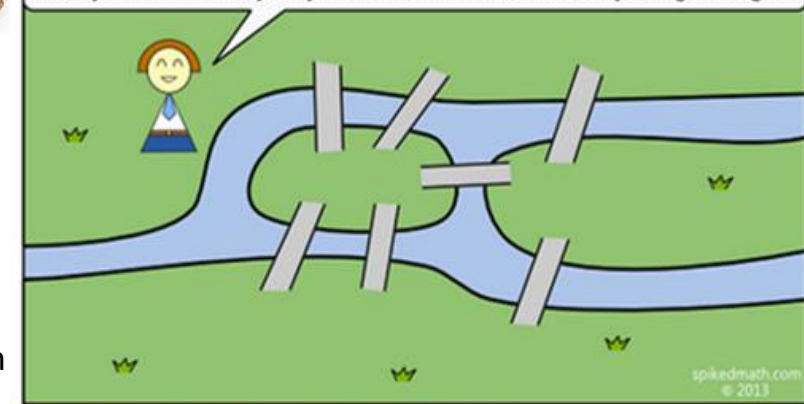




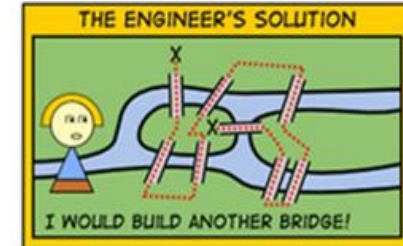
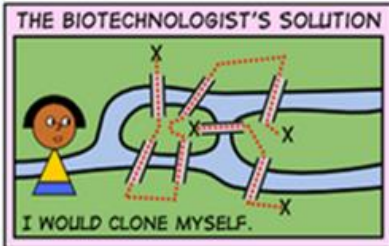
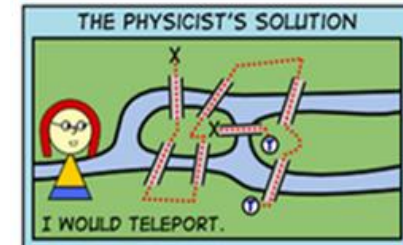
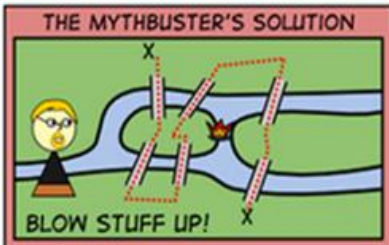
All four nodes have an odd number of edges

### The Seven Bridges of Königsberg

Below is the city of Königsberg with four land masses and seven bridges connecting the various land masses. Can you find a walk through the city of Königsberg that crosses each bridge exactly once? You may start at any land mass you wish but may only travel between land masses by using a bridge.



spikemath.com © 2013

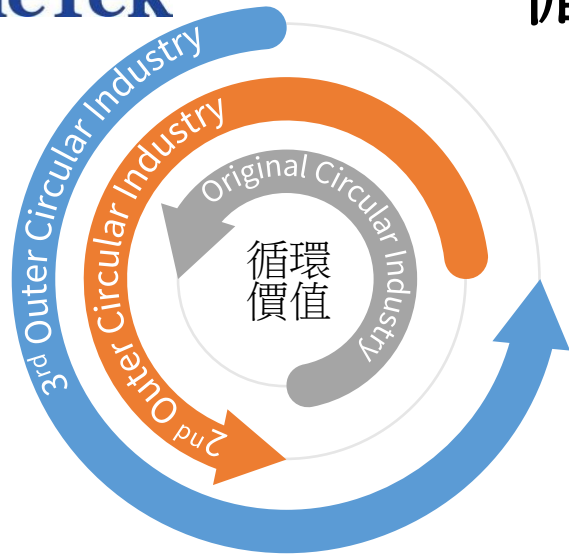
<h4>THE ENGINEER'S SOLUTION</h4>  <p>I WOULD BUILD ANOTHER BRIDGE!</p>	<h4>THE BIOTECHNOLOGIST'S SOLUTION</h4>  <p>I WOULD CLONE MYSELF.</p>
<h4>THE PHYSICIST'S SOLUTION</h4>  <p>I WOULD TELEPORT.</p>	<h4>THE MYTHBUSTER'S SOLUTION</h4>  <p>BLOW STUFF UP!</p>

1730, Euler 發明圖像理論。當時柯尼斯堡(Konigsberg)習慣晚餐後繞著鎮區河邊散步，共有七座橋。但從來沒有人可以每座橋只走一次，而且一座橋都不會遺漏。

Euler 只用了一個下午，證明的方法，回歸到問題的本質。點(小島)與路徑(橋)。用圖解理論來說明。線廣泛用於網路流量控制、交通、建築工程、大數據問題求解。

原則很簡單，三個點間若無法形成三個線，就不能回到原點。點數與線數是餘數的關係。所以上題無解。





Euler 想到，如果每一座橋只能穿過1次，就成了去而不回的單行道。對圖上的某一個點來看，一旦從某座橋進入1次，就要從另一座橋走出1次，而不會一直停留在某個點上。所以，只要看到有個點有奇數個邊，也就是有塊陸地有奇數座橋，就不可能只經過一次。正解定要有一對以上的偶點(起點和終點)連接(Euler Circuit)。或兩個奇點間無路徑(Euler Path)。

**Euler Path**：經過圖上所有邊剛好一次的路徑。(一筆畫)

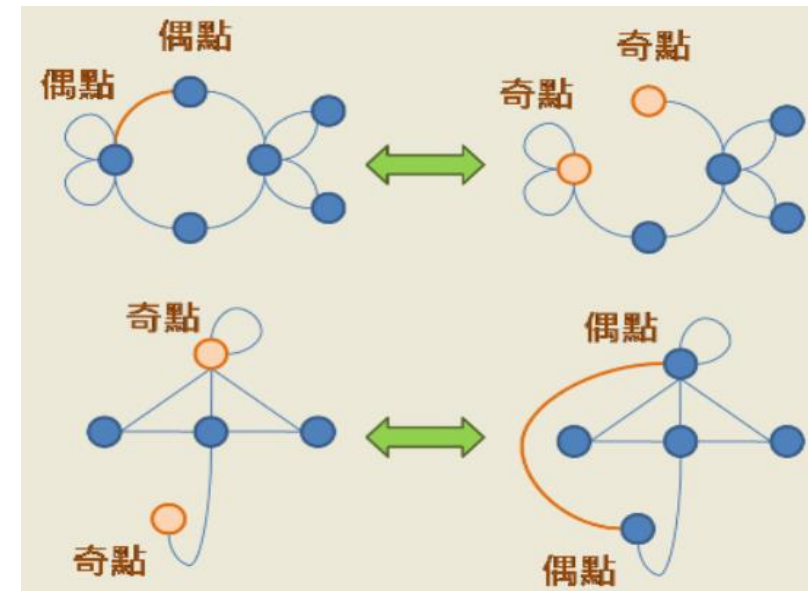
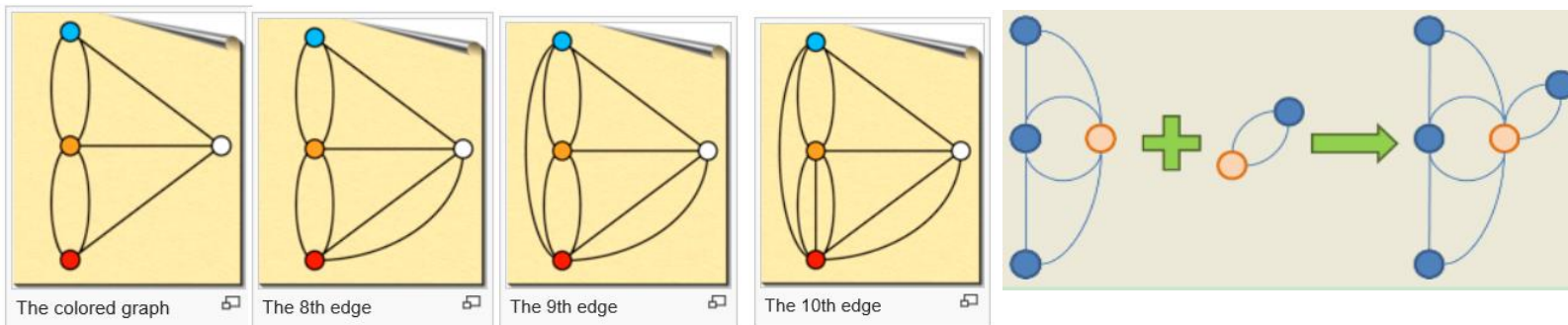
**Euler Circuit** 經過圖上所有邊恰好一次的連續路線，這條路線的起點和終點要相同(一筆畫遊戲)。Euler Circuit 去掉一條邊就形成了 Euler Path。連接 Euler Path 的起點和終點，補上一條邊，就形成了 Euler Circuit。Euler Circuit 本身也是 Euler Path，是起點和終點相同的 Euler Path。n個 Euler Circuit 可在某點相接，合成一個 Euler Circuit，所以可以拆解來看問題。

**Divide and Conquer**：首先想盡辦法在圖上亂繞一圈，如果這圖本身就存在 Euler Circuit，則亂繞一圈後所剩的邊，一定會形成一個(或數個) Euler Circuit

**Divide**：在圖上亂繞一圈，分成已繞完的邊、未繞過的邊。

**Conquer**：已繞完的邊看作是一張圖，是個 Euler Circuit 了。未繞過的邊看作是一張圖(或數張圖)，遞迴找出那些 Euler Circuit。

**Merge**：把剩下來的邊繞出的 Euler Circuit，接回原來亂繞的那圈

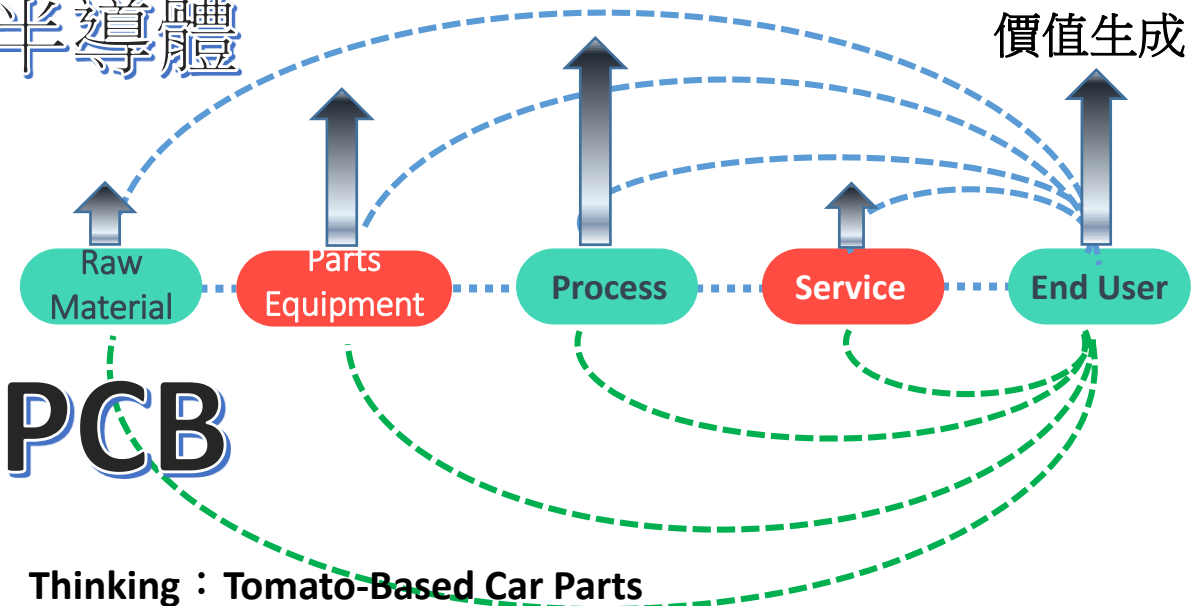


## 價值鏈的驅動力特徵

- 材料、製程、設備(系統) 達成Good Enough
- 第一種價值鍊變遷。材料、製程、設備，具有可同時Moving Forward 的特性，同時轉換(Upgrade)。

例如PCB → Semiconductor

半導體

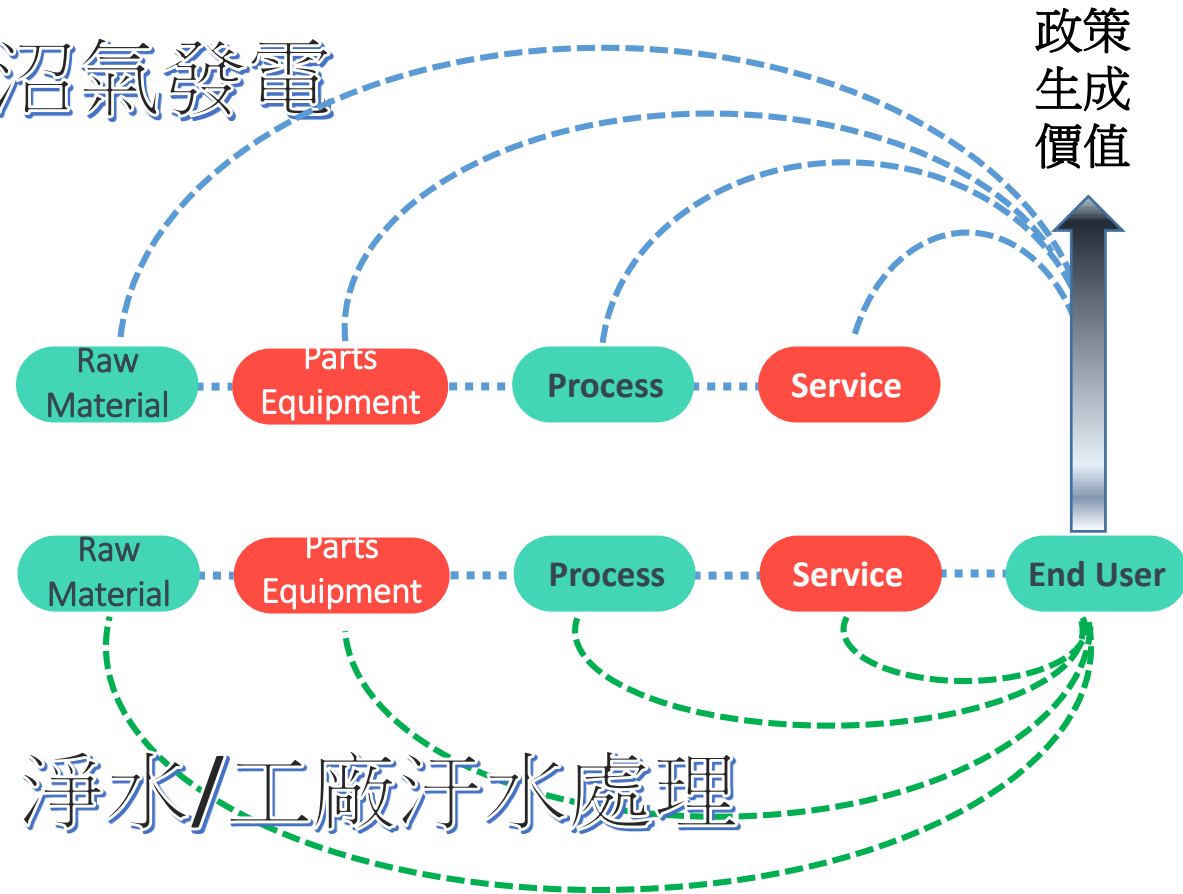


### Thinking : Tomato-Based Car Parts

Ford and Heinz are investigating the feasibility of using **waste tomato skins** as the basis of new composite materials for vehicle parts. Researchers at Ford are testing the durability of tomato fibre to see if it can act as a **bio-plastic**, which could potentially be used for vehicle wiring brackets and storage bins.

- 第二種價值鍊變遷。由顧客需求拉動。最常見的顧客需求，為政策性引導的誘因，例如水汙法、太陽能補助、沼氣發電、海綿城市、碳捕獲。

沼氣發電



## Innovation Model:

- Philips is already selling light as a service – where customers pay for the performance of lumens, measures of light output, rather than the physical hardware of a light bulb or light fitting. The “pay per lux” solution is generating significant energy savings for customers such as **Washington Metropolitan Area Transit Authority (WMATA)**.  
轉型為光能提供服務廠
- Same Story for IIOT, Sensor Manufacturer will become the Data Guarantor..... **Usership, Not Ownership**



Flyknit technology  
(80% reduced Waste)



Natural & Pure  
Green Hair Care

## 轉化點變化特徵

- 物理性：(藍海、品牌)
- 化學性：(高價值)
- 知識性：(創新)
- 再生成性：(產業增值)

亞洲髮妝界第一瓶

**100%**  
再生塑膠瓶誕生



全球最綠洗髮精  
歐萊德引領趨勢  
實踐綠色循環經濟





# 循環成為經濟的關鍵要素(3/3) : Business Model



A circular economic model is one that is **restorative and regenerative by design** and aims to keep products, components and materials at their highest utility and value at all times. In Accenture's research, five business models companies can adopt (alone or in combinations) to get this win-win-win:



- **Circular Supplies** : A companies to provide fully **renewable, recyclable or biodegradable materials** in its commercial processes

**Ex: IKEA** : It purchased a **wind farm in Illinois** as part of its effort to produce more renewable energy than it consumes by 2020. The project is expected to produce the equivalent of 130% of the energy used by all US Ikea stores. In total, 90% of US-based Ikea stores use solar energy produced from solar panels on store roofs, which helped Ikea meet 37% of its global energy needs with renewables in 2013.

**Ex: Frito-Lay**, a Pepsi co subsidiary, is using anaerobic digesters and feeding them with waste from potatoes, corn and broken chips. The current project in Turkey produces **biogas** which provides its manufacturing facility with 35% of its power needs



- **Resource Recovery.**

**Ex: Ford** is taking old floor mats and turning them into engine components, and in partnership with Novelis is recycling much of the aluminum used to build its vehicles.

**Ex: Levi's** is recovering and reprocessing fibers from old jean materials.

**Ex: Caterpillar** is re-manufacturing and refurbishing parts for use in the equipment it sells. Probably the best at this is

**Ex: Unilever** who now sends zero non hazardous waste to landfill from its 240 factories in 67 countries.



- **Sharing Platforms.**

**Ex: End of products, the end of ownership.** 分享經濟之所以興起，主因是因為人口預估到90億暴增，並沒有單一商品的產出能力足以應付 (連糧食都不夠了)。未來的顧客，active voice in shaping at every step in the value chain.” ◦ a concept referred to as **“servitization”**. They know they can no longer compete on price alone and must find ways to provide **added value for their customers.**



# 循環成為經濟的關鍵要素(3/3) : Business Model

- **Product Life Extension.** (IOT/IIOT): For the first time ever, we have the technology to identify, authenticate, locate and track materials so they can be maintained and recovered. [IoT technologies will play a vital role in enabling circular economies.](#) [Google's](#) sustainability program, is quoted thusly: "The Internet of Things...can play a key role in providing [valuable data about energy use](#), under-utilised assets and material flows to help make businesses more efficient. This is a remarkable new stage in industrial development. In a [service model](#), suppliers will be able to [monitor a product in real-time](#), enabling them to optimize equipment for their customers, lower usage costs and fix problems before they occur. [McKinsey predicts](#) that service levels driven by [IoT/IIOT might unlock \\$5 trillion in specific B2B](#) settings alone in the next decade. manufacturers will remain responsible for the product and want to ensure that it does not wind up in a landfill following its first life cycle. The usage data obtained via sensors will further enable manufacturers to adequately prepare for the product's second life. As more and more companies embrace the potential of IoT, [customer-centricity and circular thinking.](#)

**McKinsey & Company**



- **Product as a Service :** (由製造商控制減量、成本)

Ex: Chemical leasing, **UNIDO** explains in its definition of the concept, "shifts the focus from increasing the sales volume of chemicals towards a value-added approach." By using chemical leasing or chemical management services, a company can streamline its inventory and cut down on the volume of chemicals purchased. UNIDO is working on establishing pilot programs [for chemical leasing in the hotel industry](#), in which the service would be measured by rooms or dishes cleaned or area disinfected rather than in bottles of cleaning product or disinfectant sold.



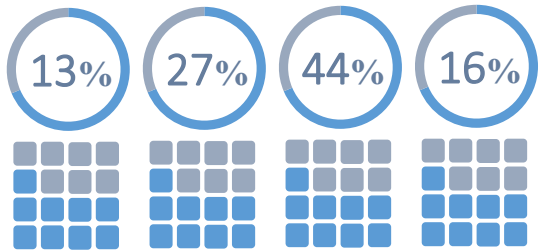
**Ex: HP's** Instant Ink service provides [printing-as-a-service](#) to individuals and small businesses. The IoT-connected printers send customers replacement cartridges, along with postage-paid envelopes for used cartridges, before they run out of ink. HP also collects data on the machine's condition for predictive maintenance and planning for new product design



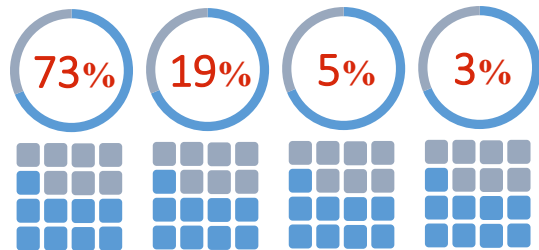
**Ex: Rolls Royce**, 16年前開始，由銷售Engines，變革為監控全球4600具引擎的“飛行時數、Engine 監控與維護服務”



1. 全球市場擴大的本質，主要是“市場分散性” & “顧客多樣性”。
2. 分散與多樣，必須進入新興市場，因此增加經營的複雜性與成本。
3. 資訊普及造成任何獨特的商品，競爭者跟進與仿冒的容易性、地域不再是商品價值不可破的天險
4. 追求多樣性與客製化，則陷入無法以經濟規模效率的泥沼；工業4.0志在解決“不規模經濟性”的生產困難，活用產業“知識整合”、“技術多樣性”與“資源效率”即時性。
5. 工業4.0的本質是加速同一產業循環經濟的商業模式，而非工業科技發明。



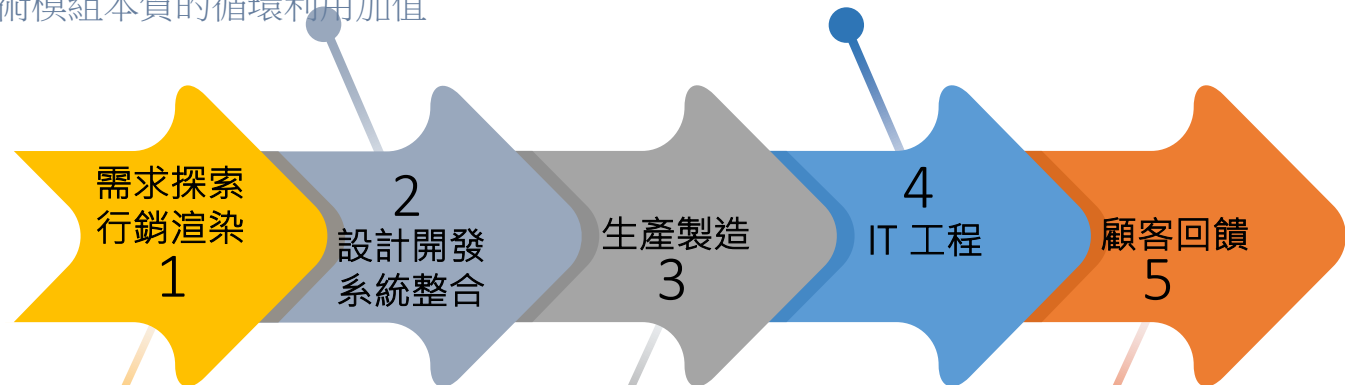
看不到 產線看板 個人PC 即時存取  
生產資訊可視化調查  
(Ref: Ubisense, 2014 Smart Manufacturing Technology Survey)



<1hr <2hr <4hr >4hr  
每日設備、換線、工具時間

- 創意的價值
- 滿足顧客多功能複雜組合
- 工業/產業標準的即時性
- 縮短功能到可靠度學習曲線
- 技術模組本質的循環利用加值

- 供應鏈共用平台
- 顧客端Data Platform
- 資訊安全
- 物流資訊
- 工業電商平台



- 商品的客製化資訊
- 不同國家的製造規格
- 不同產業的應用價值
- 產業資料Smart Data

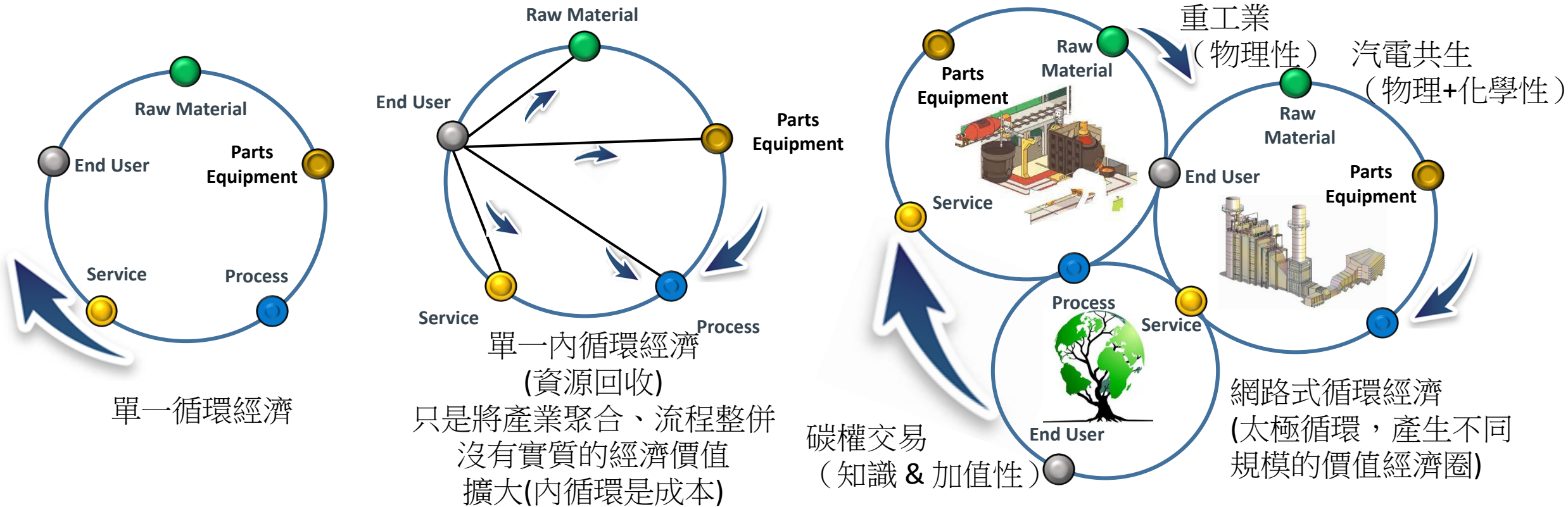
- 生產彈性調度
- 供應鏈回應的即時性
- 人工、機具協同
- 人工智慧解讀客製化
- 自動化，流程多變混線生產
- 生產流程數位化、可視化
- 產品成型(高精度) / 運送分流(低精度)
- 整合成為產品成型+運送合流(中精度長行程)

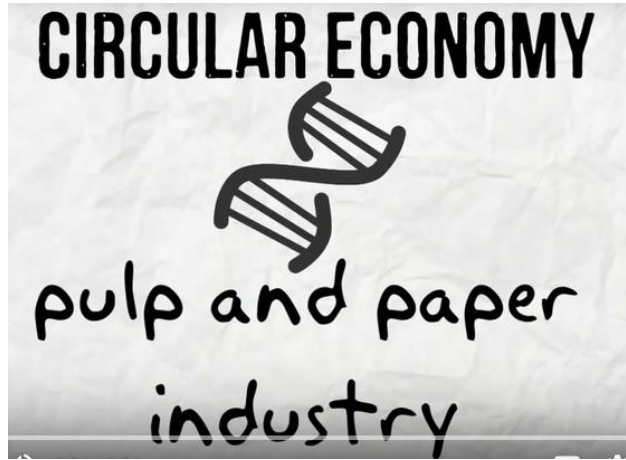
- SAVE 策略
- 技術服務
- 教育平台
- 可靠度即時回饋
- 聯網資訊PLM循環



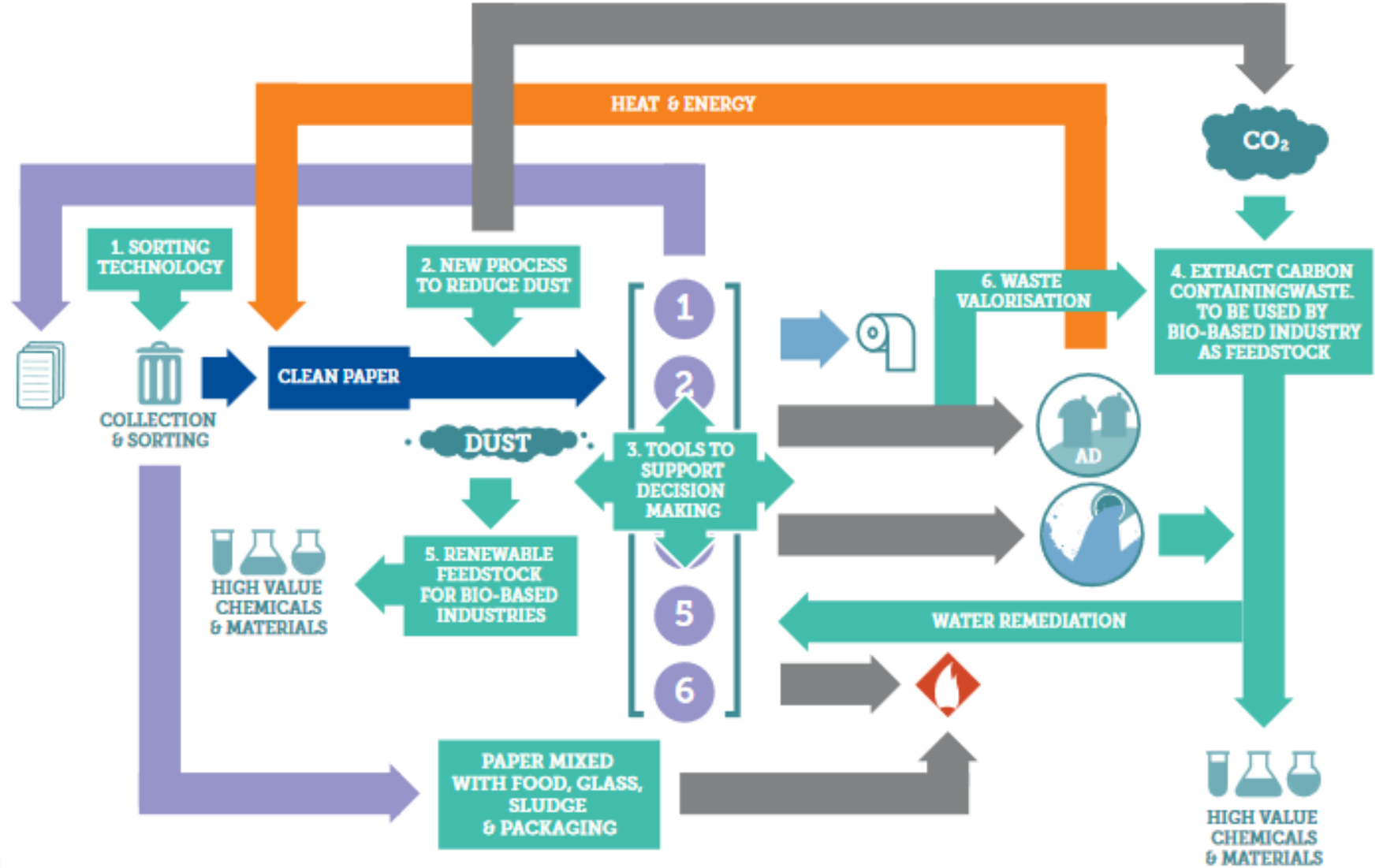
# 循環經濟的變革(2/5)：IIOT帶動不同產業的循環交疊價值產生

1. IIOT 創造的循環是一種**繼承的概念**(設備永續、設備以租代賃商業模式)
2. IIOT 創造出新的創新的經濟價值，**放大舊有價值**(智慧停車、LORA等)
3. IIOT 創造出使用者(顧客)**可負擔的價值**(不用維運伺服器、大數據可分析代價)→**變成浪費的消費**
4. IIOT 使得單一循環經濟結構，變成網路式循環經濟結構。產業的闡釋，會隨同一角色扮演(例如供應商)變化，而造成**經濟規模的價值變化**。最簡單的例子，IIOT 的通訊協定基礎(原來的供應商)，會隨著不同的產業供應者型態(消費性3G、智慧城市LORA、智慧建築ZigBee、工業網路HART等)，造成產業的角色變化遷移與多樣性競爭。





工業4.0 引發傳統回收流程，共生的新價值



<https://www.youtube.com/watch?v=lt3aHXs7FYM>

<https://connect.innovateuk.org/documents/2832130/32795723/Innovation+Opportunities+from+Industrial+Waste/e150620e-4007-4b7c-8730-93f98378739a>

# 循環經濟的變革(5/5)：循環經濟面臨的異業革命競爭 (品牌永續擴張)

# REVOLUTION



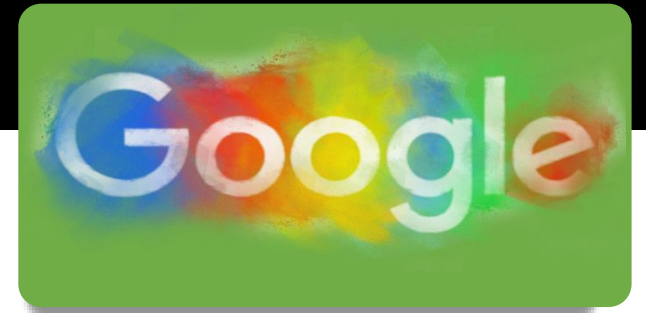
未來生活造成  
品牌認知轉變



經濟循環螺旋放  
大帶動產業轉換  
(供應鏈斗轉星移)



PLM 造成產品  
在不同地域市  
場的流動價值



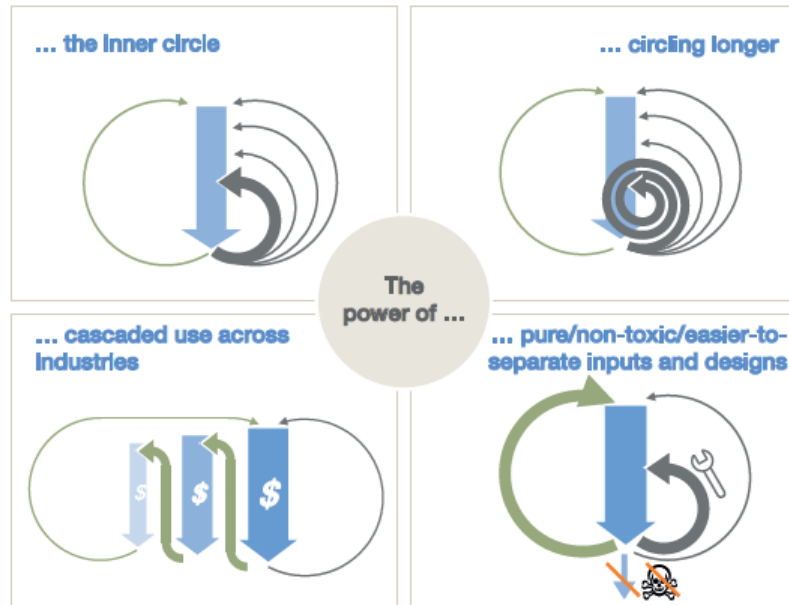
Sustainable  
Brands ' (永續品牌) ,  
品牌的價值隨經濟循環 ,  
滲透到不同的產業供應鏈。



**Reuse** 比recycle 的效益更大，循環經濟的觀點在於**創造新的經濟價值**，而不是回收再利用而已

循環經濟產業的創造，以**未來科學**的預測創新為基礎，才能將經濟規模創造。產品在較長的**PLM**生命週期循環，才能佔有必要的角色。

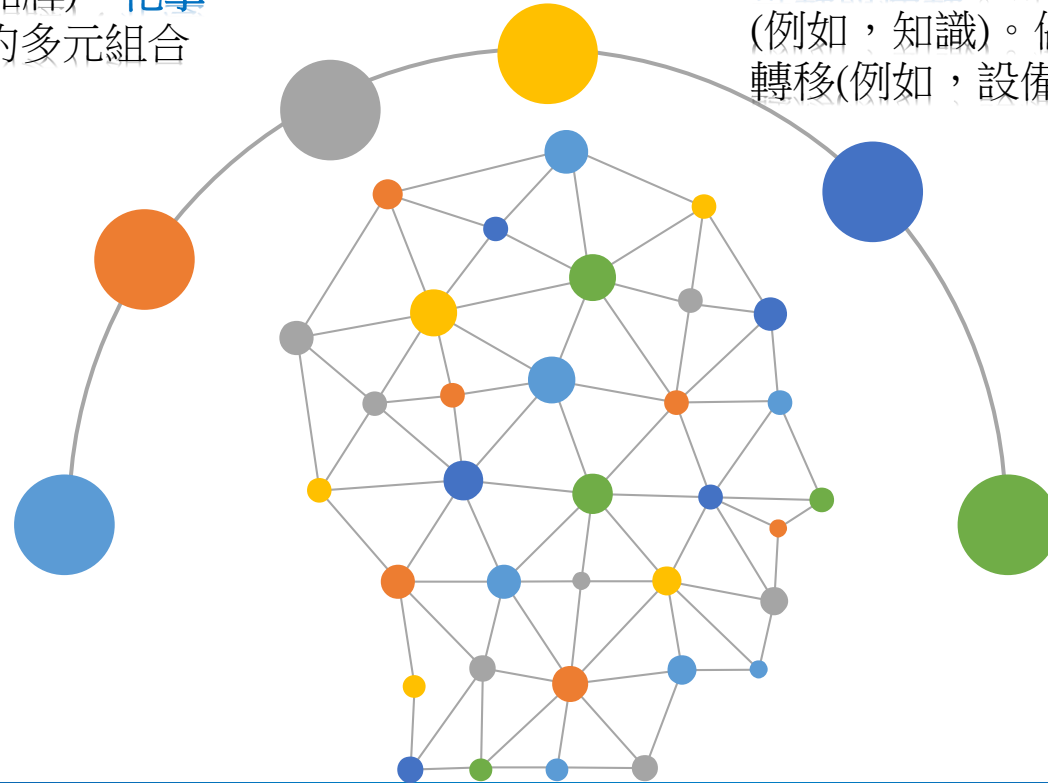
循環經濟的轉化點，包含**物理性**：(藍海、品牌)、**化學性**：(高價值)、**知識性**：(創新)、**再生成性**的多元組合



SOURCE: Ellen MacArthur Foundation circular economy team

**IOT 260億裝置**，是循環經濟過程中最大浪費。唯一的解法只有從教育著手。**Fog computing** allows computing, decision-making and action-taking to happen via IoT devices and only pushes relevant data to the cloud (節能浪費)。**Don't let fashion go to waste** (H & M)

工業4.0 的觀點，產品在**循環經濟的設計價值**，來自於顧客，而非生產製造者。找出**Eular Path 的奇點與偶點**。奇點為另一個經濟產業循環的起點(例如，知識)。偶點為不同產業間的已連結橋梁轉移(例如，設備業)



**分享經濟**模式下，製造商必須借助**顧客行為產生資訊的價值**。例如HP回收墨水匣蒐集顧客使用行為、Google 利用顧客位置資訊計算塞車。**Sustainable Brands'** (永續品牌)，品牌的價值將不固定黏著在單一產業，**品牌的價值會隨著經濟循環，滲透到不同的產業供應鏈**。這些異業透透的潛在競爭者，將造成既有的主流品牌一夕間的崩解。

# Conclusion (2/2) 台灣的循環經濟期許

建立**知識Sharing** 形成資源的有效運用。  
 (例：CNC變成自走式，工廠間的稼動率由共租資源替代)。政府應推動的商業模式是，**Sharing Platforms & Product as a Service (PaaS)**



03

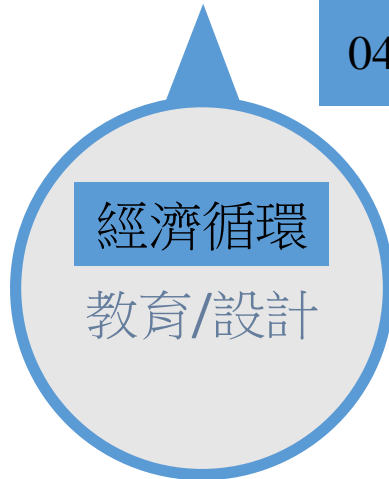


聚落的再組成性與彈性(Circular Supplier)，形成另一個產業的循環價值，政府應該做的是”**造夢者**” (法令國際規範推動)+ **幻想誘因**(商業模式)+ **情境引導**(愛麗絲夢遊仙境)

01

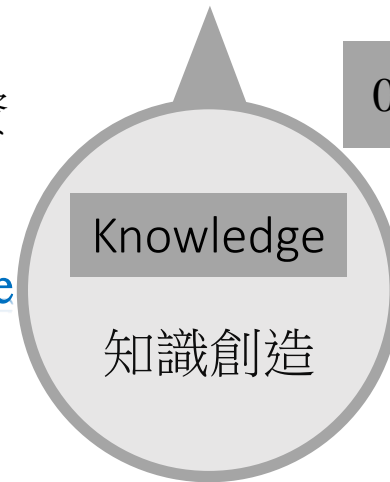


04



引導從Reuse Design，成為**Lean Design**。用次等資源，設計提升 (E: Diesel Fuel)。從**Down Cycle (單一循環回收)**，to **Up Cycle (溯源循環)** then get into **Outer Cycle (產生另一個產業的經濟循環)**

02



知識價值對於循環物質的再創造性，例如將**3D Printing & PCB、半導體產業做知識結合**，就能形成**產業再造**。政策要造成**稀有性**，而非普遍性。如此才能將Waste 變成Valuable Resource，進而形成聚落。(Ex: BioFuel添加比例強制提高，廢油的循環增值再造自然形成)。

# 附件

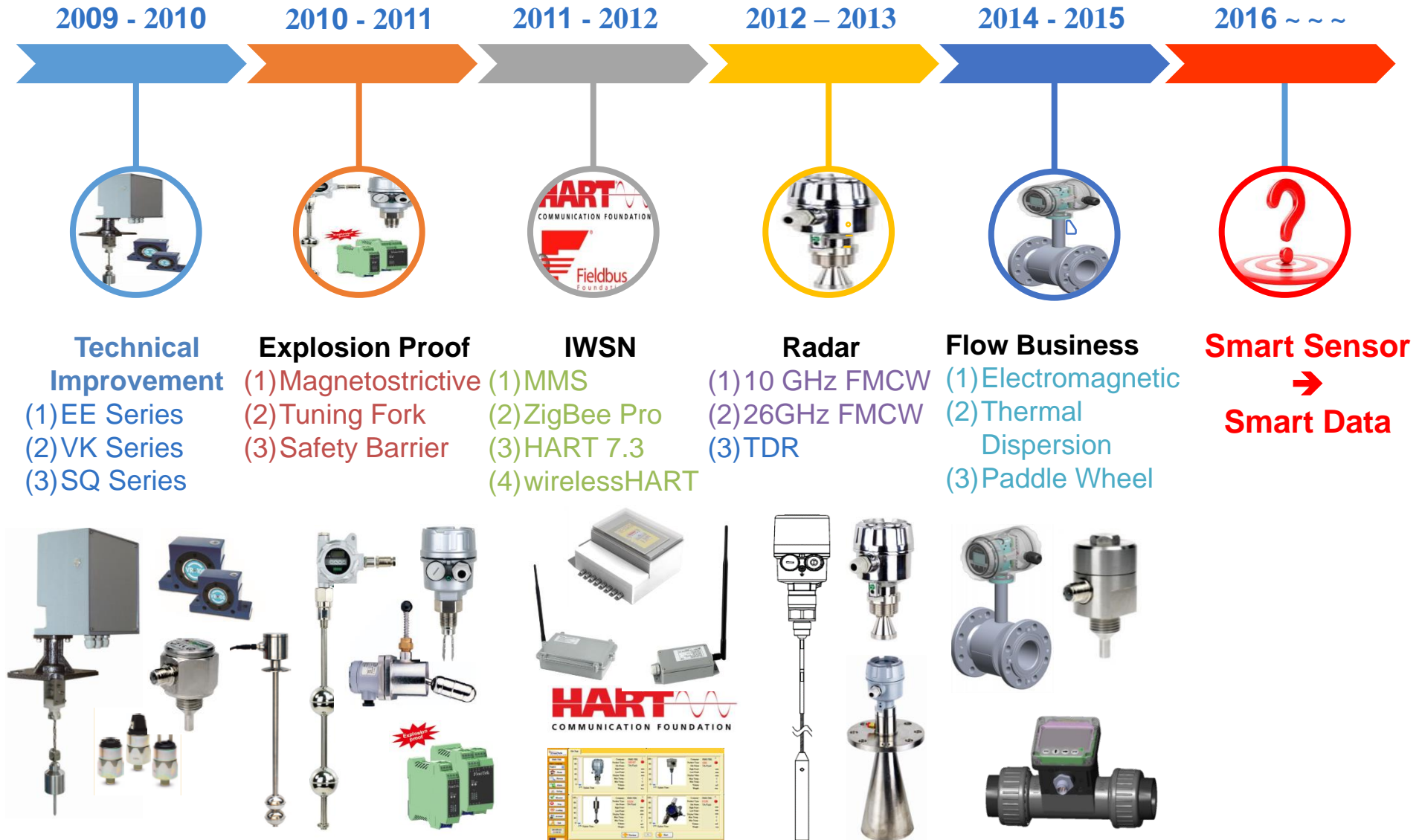


# 鄭兆凱博士 簡歷

- Aerospace & Astronautic Engineering Institute, National Cheng Kung University, Ph.d (國立成功大學航空太空博士)
- Professional Specialty: Optoelectronic, Mechatronic Design & System Integration, Flat-Panel Display, Software Design , Industrial Sensor, IIOT
- **ITRI Experiences (1998-2010)**  
1998: Project Leader    2005: R&D Department Manager  
2006: Deputy Director    2008-2010: Consultant
- **FineTek (Group) Experiences (2008~Current)**  
2008 Special Executive Assistant to GM  
2009 Assistant Vice President  
2010~ Executive Vice President
- 國土監測應用論壇召集人、中華民國品質學會/經營委員會委員
- 中華民國防爆電氣協會 常務理事    台北美國商會會員    龍華科大技術教育認證(TAC) 評鑑委員
- 科技部 計畫審查委員 / 專利審查委員    經濟部技術處 外部專家    中國生產力中心 課程講師
- Major Achievement
  - (a) 27 Research & Business Promotion Awards; including personal outstanding research award (工研院全院個人研究成就首獎, 2005, ITRI)
  - (b) Issued over 152 patents, granted & open patents over **350 items for different region** (2016/7 資料 · 中華民國128(發明)/22(新型)/2(新式樣) · 德+美+日 120件 · China 85件。)
  - (c) Issued 13 SCI journal papers & 48 international conference papers
  - (d) Conference Chair, Committee & Keynote Speaker : 41 times (PTB, IS & T, Advanced Materials, CSQ, TPCA, IDTech, Ministry of Education, Ministry of Economic Affairs ) 。
  - (e) Leading FineTek (Group) got "National Outstanding Enterprise Award, Taiwan (2010)" (國家磐石獎) "National Quality Award for Enterprise, Taiwan (2011)" (國家品質獎)  
" Taiwan Excellence 2012 & 2013" (台灣精品獎) · 2014 重點中堅企業 · 匹茲堡國際發明展金牌(INPEX)



# 雲端監測 + 智能物聯關鍵技術





# Classic Recycle Economy(殘值再利用)



Extracting Raw Material



Parts Harvesting



Manufacturing

Refurbish

Distribution

Service



End Use

Recycle



EU target for recycling

**65% / 75%** of municipal waste

/ Packaging waste by 2030; A binding to reduce landfill to maximum of **10%** of municipal waste by 2030; Promotion of economic instruments to discourage landfilling ; Simplified and improved definitions and harmonized calculation methods for recycling rates throughout the EU; Concrete measures to promote **re-use** and stimulate industrial symbiosis – turning one industry's **by-product** into **another industry's raw material**;  
Economic incentives for producers to put greener products on the market and support recovery and recycling schemes (eg for packaging, batteries, electric and electronic equipment, vehicles)

## 傳統循環經濟：以回收再生為主軸(Bridgeport, USA)

- 位於美國康乃迪克州，園區內各設施利用工業共生概念互相依賴
- 污水廠處理之廢水做為燃燒機組之冷卻水使用，而垃圾焚燒發電廠則發電提供床墊拆除回收廠使用
- 園區內容包括：
  - 可再生能源設施
  - 廚餘厭氧消化
  - 廢水厭氧消化
  - 床墊拆除回收廠
  - 生質燃料廠（廢潤滑油(料源)再利用，產製生質柴油）
  - 規劃藻類產油計畫
  - 建築垃圾回收
  - 清潔能源加氣站



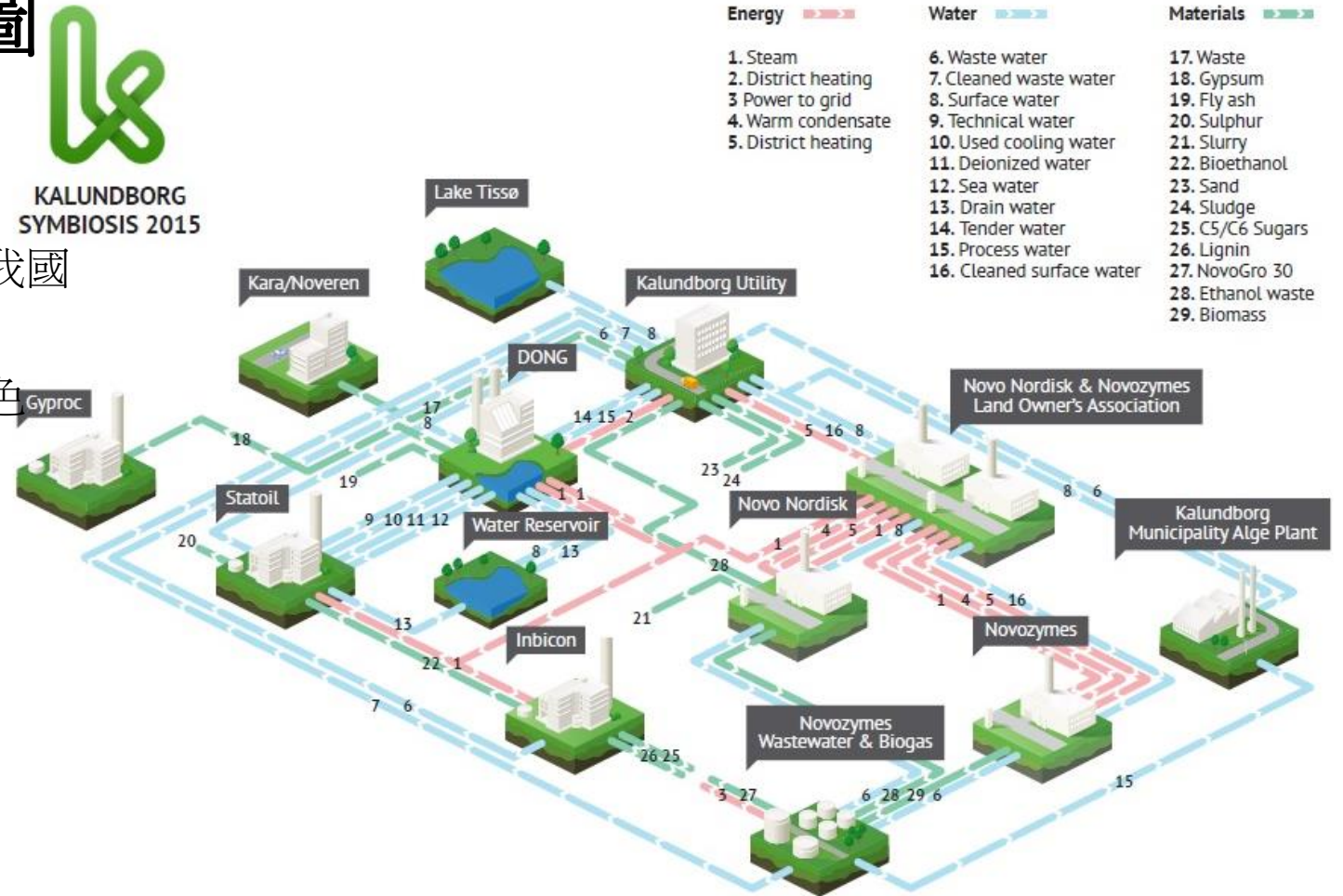


# 能源、水、物料共生鏈結圖



KALUNDBORG SYMBIOSIS 2015

- 產業共生示範
  - 卡倫堡園區已發展五十多年，也是過去我國發展環保科技園區參考的重點
  - 區內的能源、水、物料再生共生為其特色
- 區內產業
  - Novo Nordisk：胰島素製造商
  - Novozymes：酵素製造商
  - Gyproc：石膏板製造商
  - Asnæs Plant：電廠
  - Statoil：石油精煉廠
  - Kara/Novoren：廢棄物處理廠
  - Kalundborg Forsyning A/S：水處理廠





## Examples

**RE**generate



- Shift to renewable energy and materials
- Reclaim, retain, and restore health of ecosystems
- Return recovered biological resources to the biosphere

NESPRESSO

ASLM



**S**hare



- Share assets (e.g. cars, rooms, appliances)
- Reuse/secondhand
- Prolong life through maintenance, design for durability, upgradability, etc.



**O**ptimise



- Increase performance/efficiency of product
- Remove waste in production and supply chain
- Leverage big data, automation, remote sensing and steering



**L**oop



- Remanufacture products or components
- Recycle materials
- Digest anaerobic
- Extract biochemicals from organic waste



**V**irtualise



- Books, music, travel, online shopping, autonomous vehicles etc.



iTunes

**E**xchange



- Replace old with advanced non-renewable materials
- Apply new technologies (e.g. 3D printing)
- Choose new product/service (e.g. multimodal transport)



The circular economy is an **industrial system that is restorative by intention and design**. The idea is that rather than discarding products once their full value is extracted, consumers recycle and upcycling such that there is no waste or pollution. **Circular procurement is the application of this concept to the massive amount of purchasing in the business world.**

Coca-Cola focused on extracting the **utmost value from resources** so that it not only aids in environmental sustainability, but also maximizes their value, where sustainability is the core of operations. **It led to a focus on circular economy of packaging, water resources and sustainable agriculture.** All Coca-Cola bottles and cans are recyclable or contain recycled material, a fully recyclable PET bottle known as PlantBottle™, which is made with up to **30% renewable materials** from plants like sugarcane, and reduces dependence on fossil fuels, equal to **reduce 315,000 metric tons** of carbon dioxide emissions.

**DFx Design** : Digitizing the supply chain is a key enabler for this transition. Procurements and suppliers need to make the right choices early on in design phase, ensuring materials are selected based on **repairability and reusability**.

According to McKinsey, for Europe, a circular economy could result in overall benefits of \$2.05 trillion by 2030. **Many new business opportunities bubble up as a result of improved product design, focus on new production technologies and materials**

The first step is to start thinking about **suppliers as partners**. This collaboration allows for **developing new business models based on services or usage as opposed to outright ownership**. One of the key pieces to achieving all of this is bringing aboard technology to enable **collaboration, knowledge sharing, transparency and accountability**.

