Digital Economy: Opportunities and Challenges for Taiwan Service Industry

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Industry, Science and Technology International Strategy Center Industrial Technology Research Institute (ITRI) 2018/8/23











Digital Flows Contribution to the Economy

By 2025, Digital Economy to contribute 49% of global GDP



* 2016 Global GDP US\$75 Trillion. Estimated Digital Economy Market is about US\$30 Trillion * 2016 TW GDP NT\$15.87 Trillion. Estimated Digital Economy Market is about NT\$6.4 Trillion

Source: McKinsey; ITRI/IEK Consulting (2018/06)



Data Flow

Internet Video Contributes Most Data Flow

Sum of all forms of IP video will continue to be in the range of 80 to 90 % of total IP traffic.





Data Flow

Digital Life Drives Data Flow in Every Domain Technology enables integration of virtual and physical entity which facilitate our daily life in a more efficiency way



Services



Education



Sales



R&D



Source: ITR/IEK (2017/11)





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Interior Design



Digital Twin: Future of Equipment Operation Integrating AR/VR+IOT+AI technologies

Case: By integrating sensors, 3D modelling, and big data analytics to build the digital management platform, GE is able to help its clients to monitor the equipment in real-time and predict its operation.



Software Defined HA Turbine



Predix™



Digital Twin



Suite of Apps

Data Flow





Industry, Science and Technology International Strategy Center Online Physical Goods Still Growing

Online transactions will account 12.8% of total retail market by 2019, from 8.6% in 2016, and reach US\$3.5 Trillion



- Taiwan's online retail market is about NT\$680B, which accounted 13.6% of the total 5 trillion retail market
- 1% of retail digital transformation in Taiwan is equal to NT\$50B in digital economy

Source: eMarketer, Deloitte Research (2017/11)



4 Areas of Digital Transformation in Retail



- Perfect Personalization
 - 1-to-1 marketing



- Immersive Experiences
 - Multi-sensory, augumented



- Mobile & Ambient Commerce
 - Mobile payments, Al enabled



- Non-human Agents
 - Voice-controlled, Al enabled

Source: Frost & Sullivan (2017)



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Biz Flow

Digital Product-Mobile Application Market Will Continue to Grow

Combined worldwide In-app advertising and app store net revenue to exceed \$189B in 2020, CAGR 22% from 2016



Financial Flow

Digital Technologies Disrupting Financial Industry in Many Ways





Financial Flow

Financial Robot is Managing our Money

Financial robots will be managing over US\$1 Trillion funds by 2020 and US\$4.6 Trillion by 2022



JP Morgan invests US\$52.5M to an AI startup, Anki to develop its LOXM financial robot for high frequency trade and customer assets management.

Source: Business Insider Intelligence (2017/11)



Mobile Payments as the Future

Mobile payment will be the major payment tool. It's expected over US\$1 trillion transaction will be paid thru mobile payment by 2020.





Source: Visa (2017)

Digital Talent Shortage Today and Near-term



Hard to Find the Right Digital Talent.

•IBM projects that by 2020 the number of positions for data and analytics talent in USA will up to 2.7 millions. The job growth rate is about 15% compared to 2015.Especially, the demand for both Data Scientists and Data Engineers is projected to grow 39%.

The High Value Digital Talent is scarce.

•IBM says that the US Data Science and Analytics jobs advertise average salaries of \$80,265 with a premium over all BA+ jobs of \$8,736 (+12%).



People Flow

People Flow

Best Digital Talent should Equip with Cross-Functional Skills



 The best big data talent is the critical key staff members that can extract various knowledge from data, have overview of the end-to-end process and can solve data science problems based on the business development goal.



Human's Talent Extension: Augmented Intelligence

Enterprises will need to build trust, not fear, to embrace the evolvement of technology which is augmenting human's capability

Machine Intelligence Machine Learning

Human Intelligence Human Learning



Copyright 2018 All Rights Reserved **People Flow**



資料來源: Perceptio Founder Nicolas Pinto(2017/06); Internet

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Taiwan Digitization Index

Financial services and high-tech, are the most highly digitized sectors of Taiwan's economy; while traditional manufacturing sector shows less digitized

					Relatively low digitization		Relatively high digitization	
	2016 o	or latest available data		Assets	Usages	Labor		
	dge ve	Sector ¹	Overall digitization	Digital spending	Business processes	Digital spending on workers	GDP share (%)	Employment share (%)
	Knowe intensi	Finance and insurance		0			6.8	4.8
		High-tech					18.1	16.6
0	sector	Government					6.6	4.5
ildu		Education		2			4.3	0.9
		Healthcare					3.1	4.3
	Service industries	Transportation and warehousing					3.1	3.7
		Wholesale trade					10.2	13.6
		Retail trade			3		6.7	7.5
		Professional services					6.1	8.7
		Real estate					8.7	1.7
	nufacturing	Metals and manufacturing					6.9	7.7
		Basic goods manufacturing					2.9	7.4
		Chemicals		4			4.3	4.9
	Mar	Construction					2.6	6.0

Source: McKinsey (2017)

Digitization Level by Sector Taiwan vs US

Strong innovation capabilities allows US it to lead the global high-tech value chain

Taiwan 📃 US



SOURCE: Gartner, McKinsey Global Institute; team analysis



Take Control of User-centric Ecosystem



Controlling User-centric Ecosystem to Accelerate Innovation Scale-up



Source: ITRI/IEK Consulting (2016/09)



Manufacturing Accounts for About 30% of Taiwan's GDP



Source: DGBAS; ITRI/IEK Consulting (2017/10)



Manufacturing Contributes Significant Share of Taiwan's Economic Growth

Average 48%

Primary Sector Sector Sector (exclude Manufacturing) Manufacturing Fortiary Sectors



Manufacturing production

Manufacturing Production Grows Steadily, Value-add Continues to Improve



Manufacturing Value-Added Rate



Note: Value-Added primarily consists of profit before tax and interest, personnel expenses, depreciation



Taiwan's Manufacturing Strives Towards Upgrade in Value-add vs. Leading Countries



Taiwan Manufacturing Industry Portfolio by Value Add Ratio %



Note 1: x-axle (Capex/Revenue Ratio %) and y-axle (Value Add Ratio %) @2016

Note 2 : () 2016 Taiwan industry market share worldwide

Note 3 : Manufacturing Industries Value Add Ratio in 2016 calculated based on GDP/gross sum of manufacturing value

Source: ITRI/IEK Consulting (2018/04)



Copyright 2018 All Rights Reserved Size of the bubble equals revenue and US\$40b.

Taiwan's ICT Industry Strengths

- Completed clusters encompassing ICT industrial value chains
- Center of high-end IT, IC manufacturing and service

World top-2 products/services made by Taiwan

World No. 1 in 2017*

- NB PC (81.00%)
- Desktop PC (27.34%)
- Motherboards (85.30%)
- Foundry (73.73%)
- IC Packaging & Testing(55.84%)
- Cable CPE (77.11%)
- DSL CPE (65.4%)
- WLAN (67.14%)
- PND (79.7%)
- PCB (30.7%)
- Mobile Lens (50.0%)

*rank by value



World No. 2 in 2017*

- IC Design (17.67%)
- Server (18.3%)
- Large size (>10")TFT LCD (22.6%)
- Medium & Small size (<10")TFT LCD (30.97%)
- IC Substrate (26.4%)
- Tablet (44.8%)



Service Sector vs Industrial Sector in Value-add and Productivity



Source: DGB; ITRI/IEK Consulting (2017/08)



Taiwan Service Industries Key to Local Economics, Jobs, Salary Improvement

- Service sector account for 63.1% of GDP in 2016; Industrial sector accounting for 35.1% (including manufacturing 30.2%); Agriculture 1.8%
- 11.27 million jobs in Taiwan for 2016: 59.2% in Service sector, 35.9% in Industrial sector and 4.9% in Agriculture
- Among different service industries, wholesale and retailing businesses has the largest value-add at 27.2%, and the largest jobs at 27.9%

資料來源:行政院主計處、經濟部統計處;工研院產科國際所整理(2018/08)

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Human Centric Innovative Brings the Paradigm Shift via Value Creation



Source: ITRI/IEK Consulting (2015/10)

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Paradigm Shifts for Taiwan Industry Strategy User-centric Ecosystem & Soft/Hard Power Fusion





Targeting Al-powered Service Sectors

- Al "Supply": Electronic components, Computer and Electronics, Machinery
- AI "Demand": Retail, Financial & Insurance, Medical and Healthcare, Expert Services



Source: DGB; ITRI/IEK Consulting (2017/08)



Adopt AI as a Multiple Factor (AI x) in Applications of Both Manufacturing and Service Industries

- The government starts a "Digital Country and Innovative Economy Development Program"
 - Al is one of most important items
- Combine with ICT and AI, we have strong competitiveness in many fields such as:
 - AI x Smart Retail
 - Al x Smart Manufacturing
 - AI x Smart Healthcare
 - Others

"Al x" will be the key successful factor to master the opportunity in digital economy



Industry, Science and Technology International Strategy Center ITRI Case: Al Intelligent Video Analytics Technology for Smart Retail Services in Unmanned Store

ITRI exhibits Self-Checkout Technology at 2018 computex

Automatic induction **Customer identification**



- Use Computer vision/deep learning technology in **Retail Store Service Process**
- Identify user purchases items and quantity
- Use computer vision technology instead of manual barcodes for checkout process
- **Combine with AI based Smart Smart Shelf Technology**

Customer picking status Customer interaction behavior identification identification and analytics



Key Technologies: Face recognition, DNN deep learning technologies ... Source : ICL; ITRI/IEK Consulting (2018/07)



Using computer vision technology in selfcheckout



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ITRI Case: Transform Traditional Customer Service Center into Smart Service Provider

- Professional customer service personnel training costs time with heavy workload and high turnover rate, affecting clients' willingness to renew contracts.
- Using AI, staff only focus on customer's complicated questions. Increase employees salary and accomplishment.
- Providing other customer service centers with robot module in SaaS mode



ITRI Case: Big Data Analysis for Smart Manufacturing

Big data analysis to help improve yield rate for high tech manufacturing

Category:

- Semiconductor process: LED, wafer foundry, solar panel, and display panel.
- Mechanical Manufacturing: Machine tool
- Petrifaction Manufacturing: oil refining, plastic material, synthetic fiber, and textile fiber

Applications:

- Yield Improvement
- Predictive Maintenance (PdM)
- Process Drift
- Virtual Metrology (VM)

Ex. MOCVD Fault pre-diagnosis





ITRI Case: IoT-PaaS/SaaS for Manufacturing

 IoT-PaaS/SaaS: From edge-computing to move down stream in value chain towards platform-based solution provider and SI business models



Source: ITRI(2017/01)



From "Manufacturing" to "Infofacturing"



Source : ITRI/IEK Consulting (2016/09)



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ITRI Case: Solutions for Smart Healthcare

ITRI Smart Living Application Sensor and Device



Wearable Alcohol Detector



Home Energy Management System

ITRI is aggressive to transfer sensing solution/technology to industry and cooperate with ICT companies and various hospitals

ITRI Healthcare Application Sensor Technology and Device

	T					
NPNS Sensor	ECG Patch	Asthma Detector	Wearable NPWT	UWB Bio Sensor	Cloud Fitness Trainer System	
Wearable Contactless Radar Sensor	Soft patch affixed to the body between the chest and abdomen	Capture Breath sound signal from the neck to breathe	Integrate the Vacuum pump &Special patch	Contactless Sensor to detect Breath	Integrate Wearable Device & Camera Motion Sensing Technology	

Technology Transfer & Cooperation : HOLUX, IMAGER-37, NTUH, Taipei Chang Gung Memorial Hospital...

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Professional Experiences:

- Principal, Roland Berger Strategy Consultants, Shanghai
- Sr. Director, Consumer Electronics BU, Primax Electronics Ltd., Taipei
- Sr. Director, Corporate Development, Primax Electronics Ltd., Taipei
- Case Leader, Boston Consulting Group (BCG), Hong Kong
- Applications Engineer, Semiconductor Group, Motorola, Phoenix

Professional Specialty:

- Strategy, operations Improvement, organization change management, business process redesign, new product development and marketing, investment due diligence, manufacturing management
- Chairman of Committee on Policy and Legal, Cloud Computing & IOT Association in Taiwan (CCAT) (2010-Present)
- President, Asia Pacific Industrial Analysts Association (APIAA) (2017-Present)
- Consultant Committee of Science & Technology Policy Research and Information Center (2015-Present)
- Taiwan Food and Drug Administration(TFDA) Food Safety Technology Project Performance Evaluation Committee
- Ministry of Economic Affairs(MOEA) Industrial Development Advisory Council Multiple patents in power switching control and mobile phone applications



