1C11 The Similarities and disparities within Australia and Japan's structure of institutional systems and their effects on the ICT development and utilization

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1.1 Introduction

Since its emergence in the 1990s, information and communication technology (ICT) has induced a worldwide revolution. It has not only introduced new sectors and markets, but has also revolutionalized many of the previously existing sectors and markets. The global ICT market has grown from $1.3 trillion in 1993 to over $2.4 trillion in 2001. Further growth of the market in the future is evident, as between 2001 and 2005, the marketplace posted an 8.9 percent average annual growth rate.

It is a commonly accepted fact that there is a strong interrelationship between ICT and a country's economic develpoment. Researches such as the Global Information Technology Report shows that there is a strong correlation between ICT spending and productivity, and that increased utilization of ICT can lead to greater digital opportunities, not just for economic development, but also for human development through extendning health services, expanding education opportunities, and so on.

Furthermore, Erkki Liikanen (comissioner of EU) stresses that ICT is at the heart of overcoming the productivity gaps amongst countries to help induce economic development, as "*growth of productivity can lead to higher GDP per capita leading to higher real income; improve the competiviness of companies; and gurantee the financing of public services.*"

With the importance of ICT in mind, this paper analyzes Australia and Japan's ICT development and utilization potential through the study of their institutional system structures. According to the latest Global Information Technology Report (2004-2005), Asia and the Pacific performed extremely well with Singapore claiming the number one spot, Japan entering top ten for the first time at 8th, and Australia holding the 11th spot. Furthermore, Hong Kong, Taiwan, New Zealand, Korea and Malaysia were quite well positioned at 7, 11, 15, 21, 24 and 27 respectively, along with India and China who both significantly climbed to higher positions. These results reveals the growing importance and emergence of Asia and the Pacific in terms of ICT, and thus boosts the growth propects amongst these countries – whether it be developed of developing.

1.2 Overview of ICT Development and Utilization

1.2.1 Australia

Australia maintains a prosperous, Western-style market economy, with a per capita GDP slightly lower than the United Kingdom and slightly higher than France and Germany in nominal terms as of 2006. It is ranked 16th in terms of GDP by volume and 13th by per capita (2005).

The utilization of ICT by Australian industries remain at the heart of Australia's ongoing development. According to the OVUM report, ICT contributed, on average, one-quarter of Australia's GDP growth between 1995 and 2001 (the period of biggest advancement). The findings from the OECD report is consistent with these findings, as it cites Australia as a key example of ICT-led growth and that ICT will continue to underpin innovation and productivity growth in Australia in the future. The report singles out the achievements of Australia in generating increased productivity benefits from ICT as it maintained a "*lead in the uptake of ICT on almost every indicator.*"

1.2.2 Japan

Japan's industrialized and free-market economy is the third largest in terms of GDP by volume, only behind US and China, and 12th in terms of GDP per capita (2005). Its economy is highly efficient and competitive in areas linked to international trade.

After experiencing spectacular growth from 1960s to 1980s, growth slowed considerably in 1990s due to many issues including the after effects of over investment during late 1980s. Sliding

stock and real estate prices marked the bursting of the bubble economy. However, whilst other industries stagnated during this period, the development of ICT has played a pre-eminent role in the recovery of the Japanese economy. Since 1996, ICT development in Japan has shown dramatic growth, growing from ¥79 trillions in 1995 to ¥126 trillions. Since then, ICT has taken an important role in the industry, as it contributed to 12.7 % of Japan's GDP until 2003. The importance of ICT for Japan is further evident as the increase rate of nation's Total Factor Productivity (TFP) over the period of 1995-2003 was only 0.2%, while the increase rate of ICT was 3.5% (White Paper of ICT Industry, 2005).

2. Analytical Framework

2.1 Institutional Systems

Institutions can be defined as a comprehensive system where conspicuous development of industries is led by innovation, assimilation and utilization of technology that cheifly depend on economy, society, culture, habit, system and policy. North stated that institutions are made up of formal constraints (e.g. rules, laws, constitutions), informal constraints (e.g. norms of behaviour, self-imporsed codes of conduct), and their enforcement characteristics. Furthermore, he stated that "together, they define the incentive structure of societies and specially economics."

In particular, the importance of the role of institutional systems in inducing innovations was supported and emphasized by the pioneer work by Binswanger's "Induced Innovation: Technology, Insitutions and Development" (1978). More recently, Watanabe et al. (2004) performed further analysis on the behaviour of institutional systems, and based on this, this thesis defines institutional systems as a three-dimensional system consisting of (1) National strategy and socio-economic system, (2) Entrepreneurial organization and culture, and (3) Historical perspectives. It is vital to understand that these three dimension are essential to account for the socially constructed nature of an industry.

2.2 Principal Component Analysis (PCA)

In this report, PCA was employed to identify the principal components, which constitute the three dimensions of the institutional systems. In statistics, PCA involves a mathematical procedure that transforms a number of possibly correlated variables into a smaller number of uncorrelated variables called principal components. Its objectives are to discover or to reduce the dimensionality of the data set, and to identify new meaningful underlying variables.

The principal components are structured such that the first component accounts for as much of the variability in the data as possible, followed by each succeeding component accounting for as much of the remaining variability as possible.

2.3 Networked Readiness Index (NRI)

In order to successfully identify the principal components of the insitutional systems which exert influence on a country's ICT development, a multi-regression analysis will be performed between NRI and the prinicipal components of the institutional factors. NRI measures the propensity for countries to exploit the opportunities offered by ICT and seeks to better comprehend the impact of ICT on the competitiveness of nations. It is comprised of three components: the environment for ICT offered by a given country, the readiness of the community's key stakeholders (individuals, businesses and governments) to use ICT, and finally the usage of ICT amongst these stakeholders.

3. Empirical Analysis

3.1 Multi-regression analysis between PCs of Institutional Factors and ICT

In order to identify the specific institutional system factors that induced potential ICT development and utilization within the countries, multi-regression analysis was conducted between the principal components of institutional factors and the ICT industry (represented by overall NRI).

Using Backward Eliminating Method (BEM) with 5% significant level criteria, the table below identifies the principal components that exerted significant influence on ICT.

Table 1 Multi-regression analysis between PCs and ICT

	Constant	PC_{11}	PC_{12}	PC_{13}	PC_{22}	PC_{32}	adj. R^2
IT	0.705	0.446	-0.092	-0.113	0.075	0.102	0.935
	(26.64)	(4.93)	(-2.55)	(-3.35)	(2.20)	(2.65)	

These results indicated the specific institutional system factors that induced potential ICT development and utilization within the nations. In summary, the multi-regression analysis revealed that factors such as "*Quality of traditional development base*" (PC_{11}), "*Liquidity of workforce*" (PC_{22}) and "*Elasticity of heterogeneous nations*" (PC_{32}) provide countries with comparative advantages in ICT development. It is important that whilst "*Manufacturing oriented socio-economic system*" (PC_{12}) and "*Commodity trade dependency*" (PC_{13}) also exerted significant influence, they in fact proved to impede the ICT development in countries.

3.2 Scores of Relevant PCs on Institutional Factors

As mentioned above, the scores of PCs that exerted significant influence on ICT are as follows:

Table 2 Scores of Japan and Australia's Relevant PCs

PC_{11}			PC_{12}			PC_{13}		
Rank		SPC	Rank		SPC	Rank		SPC
14	Aus	0.592	14	Jap	0.362	24	Aus	-0.277
15	Jap	0.588	19	Aus	0.174	40	Jap	-1.555

PC_{22}			PC_{32}		
Rank		SPC	Rank		SPC
29	Aus	-0.710	9	Aus	0.999
34	Jap	-1.164	37	Jap	-1.233

The similarities and disparities in Japan and Australia's institutional structures are as follows:

- The closely related score of PC_{11} reveals that there are similarities in both countries' quality of traditional development base - i.e. factors such as efficiency in legal framework, overall infrastructure quality, and quality of the educational system.
- Japan held a higher score for PC_{12} but was only ranked 5 spots higher than Australia. Japan maintains a slight advantage in terms of their need for economic and social reforms, and skilled labor.
- Japan and Australia's liquidity of workforce (PC_{22}) also proved to be similar, as only 5 countries separated the two nations.
- A major disparity within the two countries' institutional systems was evident through PC_{13} (commodity trade dependency), where Australia was ranked 24th compared to Japan's 40th ranking. These results reflect the fact that Australia is rich in natural resources, whereas Japan maintains low productivity in areas such as agriculture. Australian agricultural and mining sectors account for 8% of GDP combined, and also are responsible for 65% of its exports, which explains their dependency on commodity trades.
- Another major disparity within each country's institutional systems is evident through the elasticity of heterogeneous nations. Australia was ranked far ahead of Japan at 9th, proving that factors such as Australia's national culture provide them with a considerable comparative advantage in ICT development.

3.3 Cross-country multi-regression analysis

Australia and Japan's specific strengths in ICT development and utilization were investigated through the analysis of the coefficients from the cross-country multi-regression analysis. Cross-country multi-regression analysis was conducted amongst the principal components of institutional factors, and Japan and Australia's ICT (represented by their respective Network Readiness Indices). Similar to the previous multi-regression analysis, it used the Backward Eliminating Method (BEM) with 5% significant level criteria.

Through the analysis of the coefficients from the cross-country multi-regression analysis, Australia and Japan's specific strengths in ICT development and utilization can be analyzed. The specific coefficients of the PCs for the two countries are as follows:

Table 3 Constitution of Institutional Factors to IT in Australia

and Japan

(2004) – NRI (Standardized Value in 100 Countries)

	NRI	Constant[a]	PC_{11}	PC_{12}	PC_{13}	PC_{22}	PC_{32}
Jap	1.4	0.9	0.3	0.0	0.4	-0.1	-0.1
Aus	1.2	0.9	0.3	0.0	0.0	-0.1	0.1

[a] *Fundamental institutional base essential for IT and principally common to all nations.*

While there is a common fundamental base in terms of ICT development and utilization in both Australia and Japan, the sources of their strengths differ. A few notable observations are as follows;

(i) Australia's strength can be attributed to:

a. "*Quality of traditional development base*" (PC_{11})

b. "*Elasticity of heterogeneous nations*" (PC_{32})

Whereas,

c. "*Liquidity of workforce*" (PC_{22}) impeded the potential ICT development and utilization

(ii) The sources of Japan's strength can be credited to:

a. "*Quality of traditional development base*" (PC_{11})

b. "*Commodity trade dependency*" (PC_{13})

Whereas,

c. "*Liquidity of workforce*" (PC_{22}) and

d. *Elasticity of heterogeneous nations*" (PC_{32}) impeded the potential ICT development and utilization

4. Conclusion

Whilst Japan and Australia ranked favorably in GIT revealing their strength in ICT development and utilization, this research demonstrated the different factors that contributed to each nation's success. The conclusions this paper was able to elucidate are as follows:

i. The quality of traditional base, liquidity of workforce, and elasticity of heterogeneous nations provided countries with comparative advantages in ICT development.

ii. Variables such as manufacturing oriented socio-economic system and commodity trade dependency impeded the potential ICT development in countries.

iii. Japan and Australia's institutional structures maintained similarities in the variables of PC_{11}, PC_{12}, and PC_{22}, whilst there were disparities within the variables of PC_{13}, and PC_{32}.

iv. Although the above institutional factors exerted influenced within the overall ICT market, PC_{12} did not maintain any strong influence in neither Japan or Australia's ICT development and utilization.

v. Similarities in both countries' strengths were through their quality of traditional development base. Furthermore, both countries' liquidity of workforce also proved to be similar as it impeded their potential ICT development and utilization.

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