Towards a 'Leapfrogging' Strategy for the Philippines

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What is a 'Post-Industrial' Economy?

Colin Clark, an Australian economist, observed that national economies generally grow according to a sequential pattern[1]:

primary (agricultural) production ⇨ secondary (industrial) production ⇨ tertiary (services) production

The proportion of the labor force shifts from the primary sector to the secondary sector, and then to the tertiary sector.

On the other hand, Daniel Bell, an American sociologist, observed that economic development of industrialized countries generally followed the following pattern[2]:

agriculture ⇨ pre-industrial ⇨ industrial ⇨ mass consumption

He predicted that the growing importance of information and technology, or 'knowledge' in general, will lead to a 'post-industrial' stage characterized by the primacy of high-technology services, especially research and development (R&D), to create new knowledge.[3] Scientists and experts, or people who process, possess, or generate useful information, will wield more power in Bell's 'post-industrial' society.

Alvin Toffler, a popular American writer, expounded these ideas further by observing that human civilization has experienced three major revolutionary changes or 'waves': a.) the agricultural revolution 30,000 years ago, which altered man's capacity to produce food; b.) the industrial revolution nearly 300 years ago, which altered man's capacity to use energy; and, c.) the information revolution starting about 30 years ago, which is rapidly altering man's capacity to handle information.[4] He also believes that the transition between two 'waves,' including the present shift to the 'Third Wave,' is accompanied by radical changes in power relations — 'power shifts' — among individuals and nations.[5]

Information is the essential element in four 'sunrise' industries of the 21st century: computers (processing of information), telecommunications (transmission of information), robotics (use of information for control and automatic action), biotechnology (use of genetic information), and their combinations. This is the starting point of cogent arguments as to why countries which fail to recognize the importance of information resources and information technologies (IT) would most likely be unable to successfully compete in the next century.

Is 'Leapfrogging' Feasible?

The issue, therefore, is: Can a Third World country such as the Philippines, which is in a hurry to develop and compete globally, take 'shortcuts' by 'leapfrogging' from the agricultural stage to the post-industrial stage? In other words, is not the above-mentioned theoretical sequence inevitable or unalterable in practice?

The answer is yes, leapfrogging is feasible and desirable for four reasons.

First, the type of industrialization seen in Europe and the United States in the mid-20th century was made possible by three conditions that are not present today and may never occur again: a.) cheap energy; b.) large captive colonial markets; and, c.) higher absorptive capacities of relatively unpolluted environments. This means that the more appropriate industrial approaches in the 21st century would have to possess different characteristics, to wit: a.) the use of less energy-intensive and renewable

energy resources; and, b.) the utilization of environment-friendly and less materials-intensive such as recycling and miniaturization processes.

Second, in the same fashion that industries can be structured to reinforce and increase efficiencies in agriculture, information technologies can also be made to reinforce and increase efficiencies in industry as well as in agriculture. Information technologies have become essential to any type of industrialization, including agro-industrialization in the Philippine case.

Third, historical experience shows that 'catching-up' takes less and less time, and that latecomer countries with correct policies grew faster than countries which had industrialized earlier. From 1780, during the industrial revolution, it took Great Britain 58 years to double its real per capita income, while the United States took 47 years from 1839. Starting from the Meiji Restoration Period, Japan doubled its income in 34 years.[6] Later, South Korea took only 11 years from 1966 and Thailand, about a decade from 1982. In the last few years, the double-digit growth rates of China's southern coastal provinces would have the effect of doubling their per capita incomes in only half a decade.

Fourth, the industrial or secondary sector is the most energy-intensive, while the services or tertiary sector is the most human resource-intensive.[7] The Philippines, a net energy importer and a net services exporter, must perforce seek its competitiveness more in the tertiary sector and less in the secondary sector. Manufacturing had been a weakness of the Philippine economy for decades. Therefore, a key to global competitiveness of the Philippines in the next century is to identify human resource- and knowledge-intensive subsectors in the tertiary sector, such as computer software (rather than computer hardware) in the high-growth IT industries, medical, health, helping, and other allied professions.

Some Ideas for a Philippine Leapfrogging Strategy

1. *Use knowledge-intensive tertiary technologies to enhance the efficiency of our huge agricultural/primary sector.* R&D in such new technologies will find a big and ready domestic market and increase the competitiveness of our agricultural exports.

The following are some examples:

- Computer programs that will pinpoint the most suitable crops for a particular type of soil, such as the Crop Micro-Decision Program developed by the National Economic Development

Authority (NEDA), IPDP, and electronic networks to quickly inform farmers and cooperatives about prices of commodities elsewhere in the Philippines and abroad;

- Eco-tourism which will add higher value-added services on top of agricultural production;
- Cloning of desirable crop varieties for rapid mass-production of seedlings; and,
- Genetic engineering that will develop micro-organisms with useful properties such as the single-cell protein (SCP), or which can biosynthesize high value-added products such as drugs, metabolites and quasi-hormones.

Over the long view, cooperative or community-based biotechnologies are a key to raising farm productivity, farmer empowerment, and domestic as well as global competitiveness.

2. *Develop a home-based IT services sector with worldwide clientele, or "earn dollars while staying at home."*

Developments in IT and telecommunications technology offer tremendous possibilities of integrating our professional/technical workforce with the advanced technology-based service industries abroad. This is a manufacturing or service production modality not available to industrial countries earlier in the 20th century.

In much the same way as various components of manufactured goods are now being produced in various locations all over the world, depending upon relative prices of factors of production, various components of service output (e.g., data entry for airline reservations, ticket processing, building data bases, engineering design, etc.) can be sourced from various locations. The output can be consolidated on real-time basis because of advanced telecommunications technology.

Opportunities exist, or are emerging, in many IT service areas which can seek distant subcontracting arrangements with foreign firms:

- *IT-related*: software development, data entry and data base maintenance, computer engineering and systems architecture design, computer-aided design, video-voice interface, and digitization of maps;
- *Professional services*: accounting, auditing, actuarial, general consulting; engineering/architectural design; editing, translation and technical literature; and, arts-related services including animation and film-making;

- *Specialized repairs*; and,
- *Scientific services*: biotechnology, development of new crop varieties, and statistical services.

Urban cooperatives and SMEs should be encouraged to engage in IT-related services. For example, US data encoders can command about $10/hour, while Filipino data encoders are happy with a monthly salary of P10,000/month — approximately a 4:1 labor cost advantage. The distance factor is not important; air freight of documents is the only transport cost. IT cooperatives tied to an aggressive marketing firm would enable Filipino data encoders, with only a high school education and vocational training, to earn much more than P10,000/month.

From data-encoding, the SMEs or urban cooperatives can graduate to higher value-added services such as indexing and abstracting, digitization of maps and GIS services, advanced graphics/animation, and so forth. When domestic telecommunications and airline services in major urban centers are well-developed, urban IT-services cooperatives therein can contribute in stemming migration to Metro Manila and Metro Cebu.

3. *Leapfrogging is basically taking short-cuts by copying, adopting, and improving upon technologies that others had earlier developed.* This requires a distinctly different type of technology transfer — the third type — which results in the ability to innovate or design.[9] Leapfrogging will not happen with the first and second types of technology transfer. Only a 'catching-up' will happen in the second kind (where the Philippines will always be left behind), and neither leapfrogging nor 'catching-up' will happen with the first kind.

Some steps in this direction are:

- *Select high-technology areas the Philippines can leapfrog into.* It may not be realistic nor desirable to aim to catch up with the West or Japan in certain 'hard' technologies. The quantity and quality of our factor endowments make it feasible for the Philippines to aim for developing competitive strength in a few selected 'high-tech' niches, notably, biotechnology, computer software and application-oriented microprocessors, maritime technologies, mariculture/aquaculture, and non-conventional energy technologies.
- *Identify sources*: a.) countries; b.) institutions in those countries; and, c.) experts therein who are leading in those high-technology areas.

- *Implement Stage C technology transfer*: a.) send Filipino experts for training in those identified high-tech institutions; b.) enter into research subcontracting arrangements with those institutions; and, c.) attract researchers and professors (such as Filipinos abroad who represented past 'brain-drains' and who now possess most valuable experiences and insights in leading industrial or IT sectors) in those institutions to retire or migrate to set up globally competitive enterprises in the Philippines.

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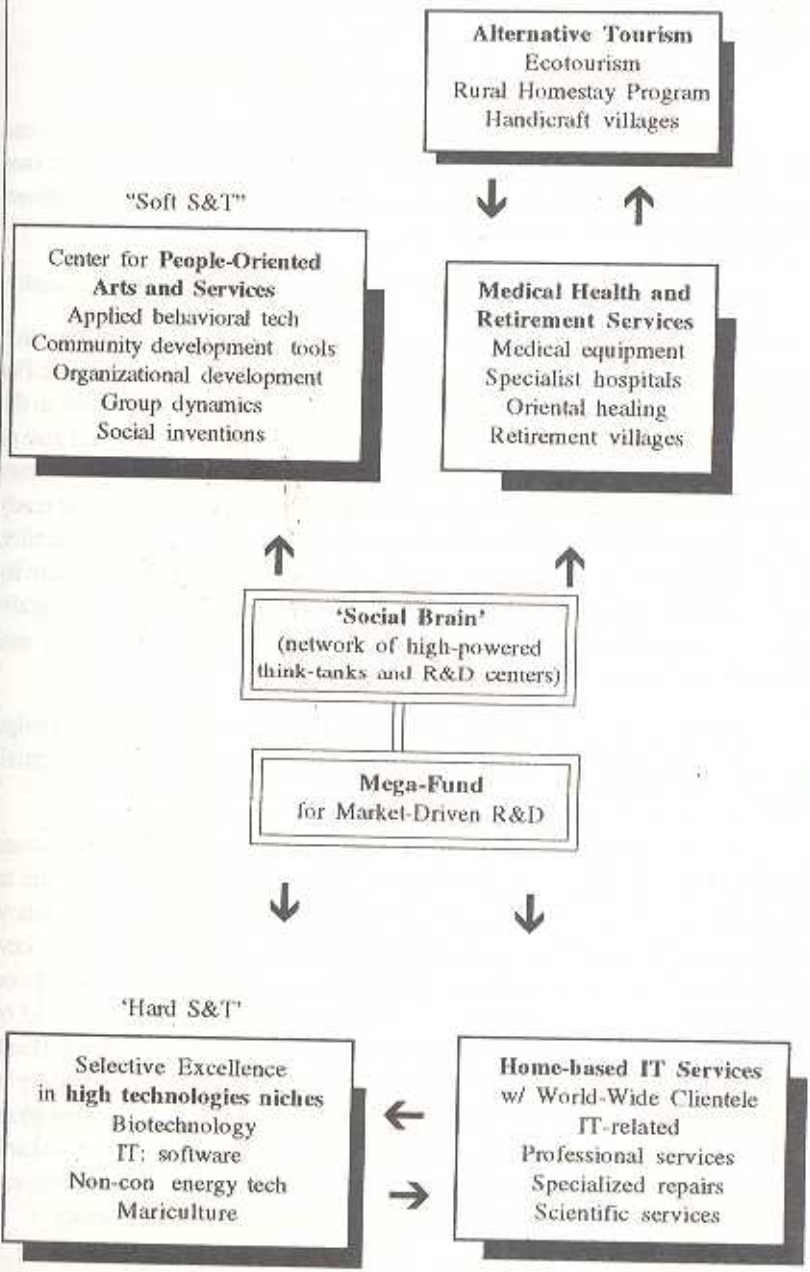
4. *Copying/adapting technology from abroad must be complemented by innovation at home.*

A developing economy with a substantial labor force (49%) in the tertiary sector like that of the Philippines and aiming towards the post-industrial stage can well adopt a strategy of excellence in international service trade. Based on an analysis of unique strengths of the Filipino character and of the natural and human resource mixes of the Filipino economy, the proposal of Ramirez, et. al., is to consolidate these strengths into a few areas and to weave them around two key infrastructures (Figure 1):

a.) a *'social brain,'* a network of think tanks and R&D institutions that will generate new knowledge and chart optimum national strategies coupled with a new culture and work ethic of innovation, high-quality decision-making, and product excellence; and,

b.) a *market-driven R&D megafund* that will provide a quantum jump in financing for generation of new knowledge, approaching 1-2 percent of GNP, by shifting fund sources from academic-driven government research grants to market-driven private R&D contracts.

Figure 1.
The Philippines in 2043:
A Knowledge Center in the Asia Pacific



Knowledge industries can touch both urban and rural areas. Of the clusters of competitive strengths identified in Figure 1, the upper three clusters are 'soft,' people-oriented niches more appropriate to rural areas, while the bottom two clusters are 'hard,' technology-oriented niches more appropriate to urban areas.

5. *Adopt an IT services-industry development game plan.*

A plan must be formulated and implemented so that the Philippines can move deliberately up the 'flying geese' hierarchy in the Asia-Pacific (see Figure 2 as an example). The development paths outlined in the figure shows the importance of prior developments:

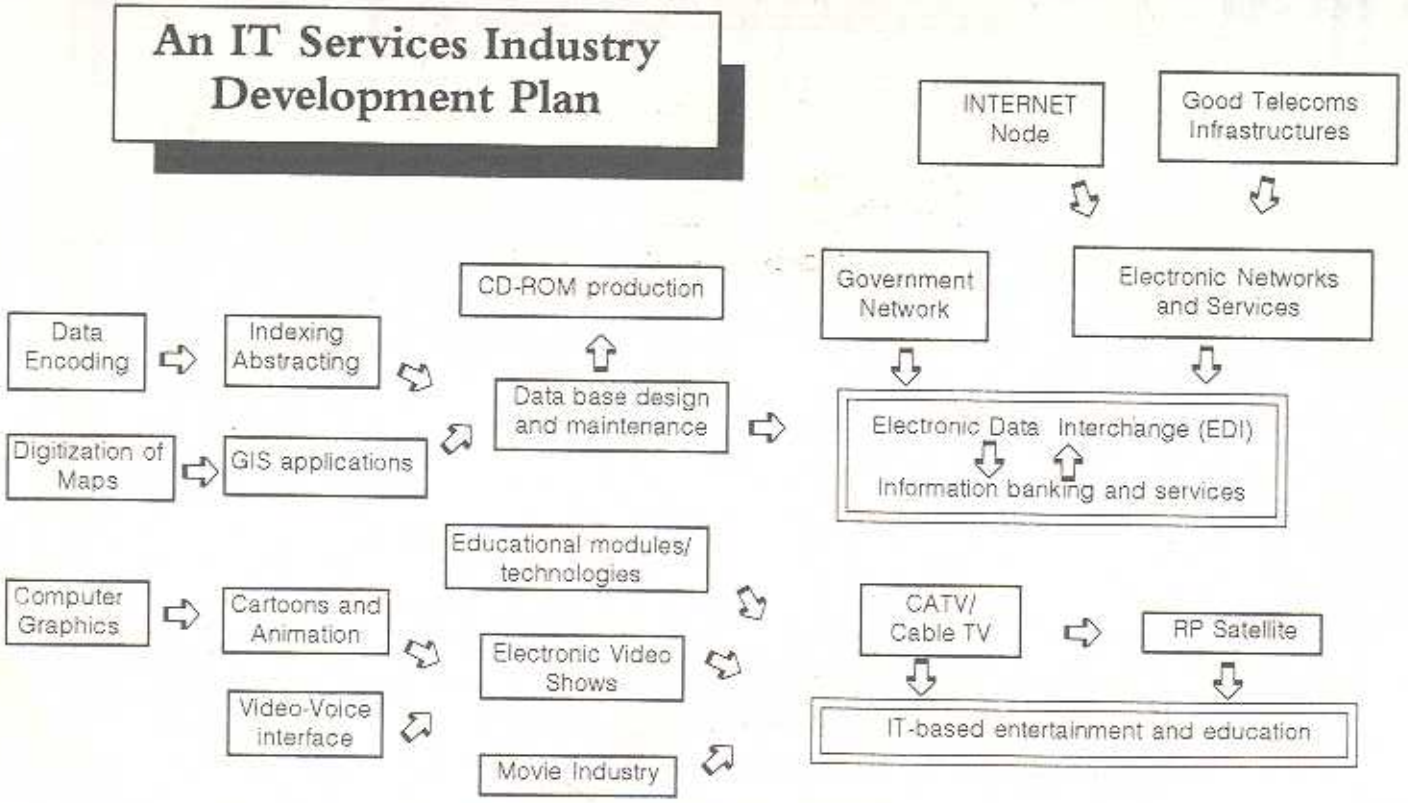
a.) A good telecommunications infrastructure is an absolute necessity;

b.) A government network can spur development of information banking and services together with an electronic data interchange (EDI). For example, computerization of the Bureau of Customs is a prerequisite to the development of a trade-oriented EDI. In general, because of the sheer size of government expenditure, deliberate increase in appropriations for IT hardware and software acquisition by government agencies can provide a single ready and sizable domestic market to pump-prime IT industries. Computerization in government can also achieve other objectives like higher productivity despite streamlining and reduction of the work force, reduction of graft-prone bureaucratic procedures, and faster coordination, horizontally and vertically, within the bureaucracy;

c.) An INTERNET node to inexpensively link Filipino knowledge workers to information sources and their counterparts abroad is also essential; and,

d.) A Philippine communications satellite creates tremendous opportunities for the private and public sectors. Not only will it provide an alternative telecommunications backbone, especially in cases of emergency, when land-based channels are disrupted, but it can also provide a new medium for distance education, entertainment, and beaming livelihood programs down to the barangay level. National unity can be enhanced by Filipino educational, cultural, and entertainment TV programs beamed to all islands and to Filipinos abroad (Middle East or US west coast, depending on longitudinal position of the satellite), and by live televised conversations between the President and farmers/fisherfolk using portable personal earth stations (PES) from any remote barangay. Our own Philippine satellite can also be an important national symbol of our entry to the 21st century.

Figure 2


An IT Services Industry Development Plan
INTERNET Node
Good Telecoms Infrastructures
Government Network
Electronic Networks and Services
Electronic Data Interchange (EDI)
Information banking and services
CD-ROM production
Data Encoding
Indexing Abstracting
Data base design and maintenance
Digitization of Maps
GIS applications
Educational modules/ technologies
Computer Graphics
Cartoons and Animation
Electronic Video Shows
Video-Voice interface
Movie Industry
CATV/ Cable TV
RP Satellite
IT-based entertainment and education

Endnotes

[1]Observe the percentage of labor force in various Asia-Pacific countries (from World Development Report, World Bank; 1992). Philippine employment mix is heavy on agriculture and especially on services.

Country	Percent of labor force in (1986-89)		
	Agriculture	Industry	Services
Developed:			
USA	2.8	18.4	78.8
Australia	5.3	16.4	78.3
Canada	3.4	19.4	77.2
New Zealand	10.0	20.1	69.9
NICs:			
Hongkong	0.9	27.7	71.4
Singapore	0.5	29.0	70.5
Japan	7.1	23.7	69.2
South Korea	17.8	26.7	55.5
ASEAN:			
PHILIPPINES	41.5	9.5	49.0
Malaysia	41.6	19.1	39.3
Indonesia	54.4	8.0	37.6
Thailand	69.8	5.9	24.3
Others:			
Bangladesh	56.5	9.8	33.7
Myanmar	63.9	9.1	27.0
Vietnam	67.5	11.8	20.7
Cambodia	74.4	6.7	18.9
Laos	75.7	7.1	17.2
Papua New Guinea	76.3	10.2	13.5
China	73.7	13.6	12.7

[2]*The Coming of Post-Industrial Society* (New York: Basic Books, 1973).

[3]'Knowledge' is used here in a generic and economic sense. The term is generic because it is defined here to embrace many forms of raw or processed information:

information*	+	interest of observer**	=	data
data	+	theoretical/conceptual framework	=	science
science	+	utility to many users	=	technology
all the above			=	**'knowledge'**
knowledge	+	ethical framework	=	wisdom

* Physically, information is any non-random pattern, measured logarithmically as the extent of departure from randomness (bits). Behaviorally, information is any non-random pattern associated with a meaning.

** For example, sounds from a running automobile engine is 'data' or 'signal' to an automotive technician but 'noise' to a layman.

The term is used in the economic sense; "knowledge" is viewed as a factor of production and as a product, both of which can be bought and sold in a market.

[4]Each of the three revolutions arose from a major technological breakthrough which has radically altered man's capacity to change the world around him and has resulted in major social changes:

Altered human capacity to:	produce food	use energy	handle information
Factor intensity:	land, labor	energy, materials	information, labor
Key technologies:	seed/seedling preparation	steam engine	programmable computer
Associated technologies:	domestication irrigation	assembly line	telephone optic cable
Key resources:	land, water, property/access rights	fossil fuels	knowledge, "meta-information"
Social dynamics:	nomads settlers	labor versus capital workplace vs. home	networking, global village
Power holder:	landlord	capitalist	R&D scientist

[5]See Toffler's *The Third Wave* and *Power Shift.*

[6]*Economist*, 15 October 1993, p. 80.

[7]The relative factor intensities of the sectors are:

	Primary Sector	Secondary Sector	Tertiary Sector
Factor intensity:	land labor	energy materials	information labor
Examples:	farming, fishing, mining	construction, manufacturing	education, banking

[8]See Mina Ramirez, Serafin Talisayon and Edgardo Espiritu, "The Philippines as a Knowledge Center in the Asia-Pacific," 18 October 1993.

[9]Transnational technology transfer can result in one of three stages of ability on the part of the receiver of technology: ability to use, ability to produce, and ability to innovate/design.

Stage	Example
Stage A: ability to use	A customer buys an imported product with a manual which he can follow.
(Transitional Stage AB: ability to repair and fabricate spare parts)	
Stage B: ability to produce	An entrepreneur enters into a joint-venture with a foreign partner who brings in a factory and teaches Filipino workers how to make the product.
(Transitional Stage BC: ability to redesign, retrofit or reverse-engineer)	
Stage C: ability to innovate or design	A Filipino expert undertakes post-graduate work in an R&D agency abroad, returns home and sets up a similar agency at home.
	A Filipino balikbayan from "Silicon Valley" brings home his savings and know-how and sets up his own IT firm that competes successfully in global markets.