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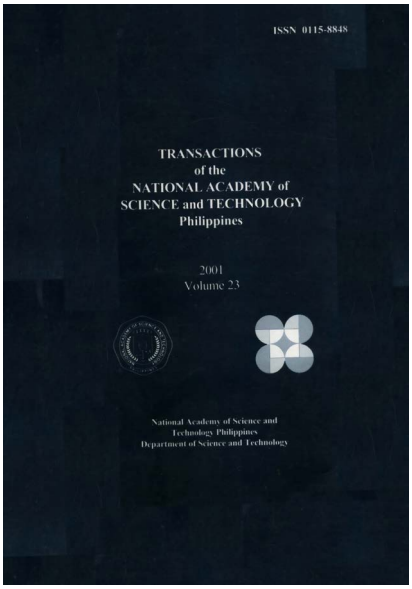

Deconstructing the Philippines for the Knowledge Era: The Role of the ICT Sector

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DECONSTRUCTING THE PHILIPPINES FOR THE KNOWLEDGE ERA: IDEAS FOR THE ICT SECTOR

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ABSTRACT

Philippine productivity has deteriorated absolutely over the past four decades and relative to those of its regional competitors in the global economy. A comparative study of other reasons behind the decline in Philippine competitiveness over the last decade vis-à-vis the larger global market suggests a key catalytic role of information and communications technology (ICT); data used are from the annual global survey conducted by the Institute for International Development in Management (Switzerland) in which AIM's W. Sycip Policy Center is a partner institute.

Given their potential contribution to production and productivity in the aggregate services sector (whose share in gross domestic product has been increasing), a few niche markets in the ICT areas are analyzed. The paper finally discusses key international policy issues in the knowledge era where the Philippines can define a more pivotal role, such as those related to the creation of technology-driven human talent intermediation systems for the new economy; in part, it is inspired by the brain flow which the Philippines has contributed to many corners of the world economy but which it can further harness in the information age using both codified and tacit knowledge.

INTRODUCTION

I would like to thank the National Academy of Science and Technology for the distinct honor of inviting me to speak on what the "Filipino is capable of in science," especially in the field of information and communications technology. On the Academy's 25th anniversary, the theme of "Science in the 21st Century" appeals to me in a most special way. As a social scientist who experienced the rise of ICT in academe, business, civil society and government, a great part of my

long-term research has been the design and execution of policy, programs and projects for national development where new technologies play vital roles. This is even more relevant that I am teaching in a professional school where the management of technology is key to the creation of greater value added of individual firms for national growth and where policy research must be conducted in a more regional and global context.

Deconstruction

Let me first define "deconstruction" to set the tone of my presentation today. "Deconstruction" is a term used in the "new economy" literature. Evans and Wurster (2000) define "deconstruction" as "the dismantling and reformulation of traditional business structures" — such as value chains, supply chains, organizations and consumer franchises — resulting from the separation of the economics of information from the economics of things. Here, the reformulation of business takes different forms for different firms and industries but share in common the utilization of ICT for a fresh look at business, e.g., selling books on-line, networking for easier access to information, etc.

The deconstruction of supply chains involves linking consumers, retailers, and product suppliers. In the industrial supply chain, there are component manufacturers, service providers, original equipment manufacturers, and distributors. The information that glues together these chains is being blown to bits by new technologies, e.g, in digital networks, broadband connectivity, and information standards that make possible "open and almost free exchange of a widening universe of rich information." (Evans and Wurster, 2000).

Some examples from the said authors illustrate the nature of deconstruction. These mainly deal with businesses in the new economy and still depend on "bricks and mortars" for the underlying value. Although these become less significant compared to values generated with the aid of ICT. Huang (2000), argues that startups lack existing "brick and mortar" businesses to deconstruct.

The newspaper business basically provides the information needs of readers and journalists; and profitable because of the economies of scale of printing presses. It is for this reason that publishers bundle various news services, classified and display ads, TV listings, stock quotations, features, cartoons, etc. This economics of things glues together that of information which journalists provide through e-mails. But why can't electronic tablets easily replace broadsheets?

In newspaper publishing, the threat of a new model like electronic tablets does not worry owners. It is the loss of classified advertisements that affects profits. Classified ads average 40% of revenue sources but only account for 10% of costs in the USA (Evans and Wurster, 2000). This is where print media is examining its vertical and horizontal integrated businesses. Where profits are largest, is likely the most competition. Thus, newspapers are now competing aggressively in the electronic classified ads business. "So the greatest threat to

newspapers is not the total substitution of a new business model but steady erosion of the business through a sequence of partial substitutions." (Evans and Wurster, 2000).

The Philippines must fully comprehend this, for its remaining strong areas are eroded by competitors sequentially and serially, rather than outright wholesale replacement in global markets. This happened in the last century in commercial crops such as abaca, bananas, and coconuts. For the latter, despite the promising cocochemicals sector in the old economy and the push it got from the Department of Science and Technology over the past decade. The Philippines was first in so many areas in the Asian scene (airlines, stock exchanges, cooperative education, IT systems, agricultural education, minimum basic needs concept, etc.), but it has been left behind. Our competitors have improved on production of goods and services as well as on the value chain to the consumer such as marketing and delivery. These competitors edged us out of the total competitiveness picture as shown in Porter's five forces model.

Deconstruction may help us move back into competition where the economics of information is identified from the economics of things.

A second example from Evans and Wurster (2000) is familiar to many Filipinos, i.e. retail banking deconstruction. The vertically and horizontally integrated value chain of the industry consists of financial products origination, packaging, selling and cross-selling through proprietary distribution channels. Electronic home banking has enabled customers not only to access information and make transactions with the bank, but also transactions (and limited information) with other service companies, e.g., utilities (phone companies, electric firms), credit firms, airlines, shipping lines and theater tickets, etc. Filipino customers will then be able to contact any financial institution for any kind of service or information the way some Americans and Singaporeans do today.

"Distribution will be done by the phone or cable company, statements by personal financial management software, facilitation and navigation by different kinds of agent software, databases and advisers, and origination by any number of different kinds of product specialists. The vertically and horizontally integrated value chain of retail banking will be deconstructed. Banks will not become obsolete, but their current business definitions will – specifically, the concept that a bank is an integrated business where multiple products are originated, packaged, sold, and cross-sold through proprietary distribution channels. The smartest institutions will transform themselves into navigators or into product specialists." (Evans and Wurster, 2000)

Whether the Philippines will transform itself is not the question. How it does in the information age is what we are interested in addressing now. In other words, how will it deconstruct its existing "brick and mortar" industries, enter the knowledge era in a globalizing world economy, and pursue long-term national objectives.

Based on my personal experience, the environment of managing scientific and technological resources for the Philippines in the globalizing world must force our national leadership to redefine the very place of the country in the international economy.

Stages of Growth and Parallel Processing

It is only through a redefinition that we face the reality of nationhood in a global age. One that is consistent with the new definition of nationalism in the face of globalization and provides assistance to our immobile assets; namely our skilled workers, our native capital, our homegrown ideas who/that have found new homes outside the Philippines.

Let me begin with the redefinition of our country. The Philippines is a microcosm of the world economy having all the stages of the historical evolution of economies. This interrelates the generations of management to the late agricultural, early industrial, late industrial and early knowledge eras. As economies evolve, the sources of wealth move from land to labor, to capital, to knowledge, while the corresponding economic organization transforms from feudal to proprietorships to steep hierarchies, matrix organizations and computer interfaced organizations, and to human networking.

Savage (1990) points out how management has changed with the first four generations of computer technology (electronic vacuum tube, transistor, integrated circuit, very large scale integration). It has passed on information through a single central processing unit; giving way to the fifth generation computer, parallel processing, whose key is in the networking of multiple processing units. Thus, he argues, management needs a fifth generation equivalent where it is possible for "functional departments to work in parallel through the use of multiple task-focusing teams. But in order to achieve this parallel capability, it must break through a bottleneck by accepting the assumptions implicit in Adam Smith's pin-making factory, reinforced by Frederick Winslow Taylor's theories of scientific management, and Henri Fayol's fourteen principles.

All of the above economic stages and management generations seem to be present in the Philippines today. The feudal structure is evident in some areas (minority and other groups in rural, especially mountainous areas), while proprietorships dominate in many villages and coastal municipalities. On the other hand, the late industrial stage is present in many urban and peri-urban areas, while the early knowledge stage is evident in some service sectors in major urban centers and the expatriate communities of Filipino professionals, scientists and high-level, skilled workers working abroad. It is the latter, human networking is effected through "a technological web of information handling systems" rather than an " informal web of personal contacts." (*op. cit.*)

Giant strides in wealth creation can result by increasing production in each stage. ICT is one set of technologies that can boost the productivity of various factors (land, labor, capital, knowledge). Simple deconstruction of various stages of agricultural production can isolate areas of intensive knowledge application e.g., research and development of hybrid rice or corn, soil analysis, weather forecasting services, protection from insect infestation, water rationing, appropriate farm equipment, storage, transportation to wholesalers, retailers and the final consumers. The information crucial to each service can be intermediated by ICT. By separating information from the delivery of the goods or service, new value can be created in a more timely manner and crucial to many agricultural products. This is the heart of deconstruction.

A new research area in economics is incorporating traditional farming know-how, rural know-who, know-why, know-what, know-when, (part of social capital) etc. in the sharing of information. This is crucial to value creation even in remote rural areas with no modern ICT. The issue of knowledge codification raises the question of the value of unarticulated knowledge ranging from collective memory and convention to stabilized, uncodified knowledge. An example of the latter is the uniform prescriptions of the IMF for all monetary and fiscal problems of developing and transition economies, leading to "its advisers dispensing 'identikit' loan conditions," (Cowan *et al.,* 1999). Information, whether codified or not, may lead to more competitive economic actors in the farm, factory shop, or virtual office.

Philippine Productivity

Productivity is most important variable that underlies Philippine competitiveness. This has been reiterated in "The State of Philippine Competitiveness" (Macaranas and Galang, 2001) which studied data from the latest global survey of IMD in Switzerland and AIM W. SyCip Policy Center, its partner institute in the Philippines. Among the findings are as follows:

1. The overall competitiveness ranking of the Philippines fell from 37 to 40 between 2000 and 2001 mainly due to the addition of two countries (Estonia and Slovak Republic) which did better than the Philippines and the rise in rank of the Czech Republic. There are now 49 industrialized and emerging economies included in the rankings.

2. There were declines for the Philippine in three of the four competitiveness input factors used to construct these rankings: from 32 to 40 in economic performance, from 34 to 37 in government efficiency, from 39 to 41 in business efficiency. It maintained the 41st ranking in infrastructure, where its basic infrastructure is ranked the lowest among 49 countries but the value system component of infrastructure is rated 30.

Among the five countries most affected by the Asian financial crisis, only Indonesia suffered worse than the Philippines.

3. Statistical tests were conducted to determine the relationship of four competitiveness indicators to all 286 criteria grouped into competitiveness input factors. These indicators are real GDP growth, domestic investment growth, foreign direct investment growth and export growth, while the four input factors are, once again, economic performance, business efficiency, government efficiency and infrastructure. IMD overall competitiveness rankings could not be used as a surrogate for the latter factors because they were based on a formula which contained most of the 286 variables and would have thus presented problems of multicollinearity.

The highest correlation coefficients, the regression coefficients and their significance levels are reported for the 49 countries, and for a subset of developing countries, 20 including the Philippines, with incomes below US $9,000 per capita. Three factors stand out as highly correlated namely, productivity, business and physical infrastructure, and taxation. These three results when more closely examined in reverse order reveal that:

a. Perceptions of proper taxation correlates highly with domestic investment and economic growth. Actual level of tax collection affects/ is affected by foreign direct investment and export growth, especially in developing countries.
b. Among developing countries, a business infrastructure that promotes basic research, encourages enterprise, and protects innovation correlates with economic, export and foreign direct investment growth rates. Physical infrastructure also correlates with export growth
c. Productivity in industry correlates significantly with growth in foreign direct investment while productivity in services correlates with domestic investment growth.

Poor Philippine productivity underscores the fact that over the past decades since the sixties but pre-1997 financial crisis Asia, the Philippines fared the worst in the growth rate of output per worker (Macaranas, 20 June 2000). Unfortunately, the Philippines is in a high productivity growth region and its performance in this regard may be seen as a drag on regional growth. These are shown in the following productivity data covering 1960-96 broken down into two periods demarcated by the OPEC oil price shocks on the economic side and coinciding with the proclamation of Philippine martial law on the domestic political side. Some conclusions are given below:

1. East Asia kept its high growth rate of output per worker from the first period to the post-oil-shock period.
2. Contrary to the claim that E. Asia only added labor and invested in physical capital to attain its phenomenal economic growth, the growth decomposition shows that it had decent factor productivity growth contributing to overall outstanding performance.
3. Sadly, the Philippines's overall growth in the first period, while at par with those of China and Indonesia, slipped by the second period commencing with martial law policies and the OPEC oil price shocks. This led to a total output per worker growth of a measly 1.0% for 1960-96, the lowest of all the countries in E. Asia.
4. The output per worker growth decomposition shows that factor productivity in fact was a negative 0.4% per annum in the 1960-96 period, while the contributions of education and physical capital were comparable to some of the Philippine competitors in E. Asia.

However, it can be argued that in a region where resource flows are more mobile now, the contribution of Philippine human resources to other countries in the region should be counted. This should include those in engineering and technical areas as well as the household workers who enable spouses to be productively employed in local labor markets.

Productivity is important in a fast globalizing world. The Philippines lost its competitiveness in world markets twenty years after World War II in terms of market shares to South Korea and Chinese Taipei in the seventies, Malaysia and Mexico in the early eighties, and to Thailand and Indonesia in the late eighties (Macaranas, 1996). The question now is how ICT can play key roles in improving Philippine competitiveness. ICT is a sunrise industry which many countries are trying to harness for their own national development.

A Scan of ICT and the Philippines

A few ICT statistics places the Philippines in a rather disappointing situation among its competitors. The World Development Indicators (2001) shows that, per thousand people, the Philippines lags behind all seven neighbors: in terms of TV sets (except India which however beats us in terms of cable subscribers), behind Thailand, Malaysia and Singapore in terms of personal computers, behind all except Indonesia and Vietnam in terms of secure servers, and lags behind China, India, Malaysia, Singapore and Vietnam in ICT expenditures/GDP. Finally, the number of Philippine Internet users is lower than all except Vietnam. The Department of Trade and Industry, however, projects that by 2003/2004, the Philippines will have absolutely more people on the net than Singapore.

'Singapore is the most-wired nation in the world as it entered the new millennium. Unable to base its economy on agriculture or import-substitution due to a small population base, the government embarked on an "intelligent

island" vision to transition the entrepot economy into a technology-driven, knowledge-based center. Singaporeans can now avail of high-speed interactive multimedia applications given their heavy investment in telecommunications, broadcasting, financial and publishing infrastructures. The island state continues to be second only to the United States in the rankings of the World Competitiveness Report.

India deliberately studied Ireland's positioning in the global ICT sector a decade ago and improved on its relative weak spots. Today India has "the distinction of having more ISO 9000 certified companies in the software sector than any other country in the world." From $1.8 billion in 1996-97, the Indian software industry will reach annual revenues of $14 billion in 2002. This is in part due to the high-speed data communication links of India enabling its users to gain on-line access to computers anywhere throughout the world on real-time basis.

China launched in 1994 several Golden Projects in the ICT fields. These will enable voice, data and video communications to provide information, entertainment and trade services in support of its economic growth. This has slowed down with the Asian financial crisis but remains among the highest in world history.

Malaysia finalized an e-commerce master plan in mid-1999 of its 20-year 3-phased project Multimedia Super Corridor. This encouraged global ICT companies to locate in a new city designed to usher the country into the information age. The clustering of related industries in a stretch of physical land captures the synergies expected of human networks of the virtual economy, otherwise the project seems an anachronism. Although the Asian financial crisis may have pulled down the economic performance of Malaysia, it has not wavered in its promotional efforts for the Super Corridor.

Taiwan's experience in attracting its high-level expatriate talents from Silicon Valley through incentives is a model which the Philippines can adopt and adapt. (Macaranas, October 2000). Over and above the scientific and technical knowledge of these brain-gained nationals was the production and management experience in US corporations so vital to the success of Hsinchu Science –based Industrial Park (set up in 1980). This model was successful that a second such park has been started in Tainan targeting 100 manufacturers by 2010, employing 70,000 hi-tech staff and a production goal of US$45 billion (Chen, 2000).

Korea's pursuing goal is to become one of the world's top-ten superpowers in information and knowledge, by developing among others the next generation Internet and the information superhighway by 2005 (Dahlman and Anderson, 2000). Like Taiwan, it has repatriated its overseas scientists for its economic development. Between 1968-1989 about 1,000 scientists returned, a small number compared to the 19,000 skilled workers who returned back to Taiwan between 1950-1988 (Austria, 2000).

ICT is a very broad field where a number of industries converge. These include components and devices, electronic data processing, consumer electronics,

telecommunications, office equipment, communications and radar, control and instrumentation, automotive electronics, medical and industrial devices, etc. At present there are nine ICT parks in the country, only two are not located in the Metro Manila area.

The Philippines, like many Asian suppliers in the global ICT industries, has been successful in attracting many firms into the electronics sector whose dominance in total exports (over 70% by year-end 2000) makes us vulnerable to slowdowns in major industrial countries (USA accounts for 26%, Europe, 22% , Japan 11% , compared to ASEAN 17% of the total electronic exports). It does not have the big domestic markets that China and India are developing to be less dependent on such ICT exports. Between 1991-97, semiconductors made up 81% of total ICT exports of the Philippines, which is among the least diversified in the region. China has less than 10%.

The value added of semiconductor exports is also low. A World Bank survey showed that local content was only 20% of semiconductors, 25% of printed circuit boards, 15% of central processing units produced in the Philippines (Macaranas, November 1999). Despite this criticism, the electronics industry has become a major employer in the country. Some 250,000 workers in 1998 were employed in 462 electronic companies and rose to 315,000 workers and 584 firms by 2000. (www.seipi.org.ph) Projections, two years after the Asian financial crisis struck indicate that investments are expected to reach $1 billion in the next three years while exports will grow to a little under $48 billion (Macaranas, November 1999). However, actual exports reached only $17.25 billion in 2000 but investments were much higher at $1.3 billion than projected. (www.seipi.org.ph)

The telecommunications sector can be divided into basic telecoms and value added services. The former includes the provision of basic infrastructure for public networks, transmission services for public data and voice communication services. The latter refers to telecom and information services utilizing the basic infrastructure of public networks.

In the Philippines, the telecoms sector consists of value added service, local exchange carriers, paging service, public coastal stations, international gateway facilities, public trunk repeater services, domestic and international record carriers, radio telephone, cellular mobile telephone service, very small aperture terminal, and satellite service. Policy reform areas in the sector have been identified by Abrenica (1999) and these relate to technological convergence in telecommunications, broadcasting and computing (voice, video and data), and the need for an infrastructure that links everyone (universal service) in thin and thick telecoms routes.

Niche Markets for the Philippines

The government, together with experts from the industry and academe, are continuously promoting the Philippines in the global arena as a center for information and communications technology, i.e., an E-Services hub of Asia.

As such a hub, firms in the Philippines will be able to extend world-class IT and IT-Enabled Services to clients worldwide, including, IT project management, application systems development, applications services provider, web development and management, data-base design and development, computer networking and data communications, software development, ICT facilities operations/management, and other services directly tied to the information technology industry (DTI, ISP.COM: The Internet Strategy for the Philippines). Examples of IT-enabled services are business process outsourcing, call centers, animation, engineering and design, human resource services, etc. There are also ICT support activities such as research and development of ICT products, training of IT workers, establishing incubators for IT projects, which are considered vital for the long-term goal of promoting ICT in the Philippines.

The establishment of ICT parks all over the archipelago would surely strengthen the capability of the Philippines to provide ICT services and to market its competence to foreign investors. These parks will provide foreign as well as local companies the proper infrastructure to undertake its ICT activities.

Clearly, the infrastructures that have been put in place (i.e., ICT zones) establishes the tone for the Philippines to readily tap the increasing demand of multinational companies and other private firms from industrial nations in IT services, IT-enabled services, and ICT support activities. However, many policies have yet to be effectively implemented, e.g., the new law on E-Commerce which gives validity and legal recognition to electronic documents, signatures and transactions, penalizes hacking and gets government on-line. Austria (2000) identifies several institutional and infrastructural bottlenecks, including an education system that fails to meet the human resource requirements of the ICT industry, as constraints to long-term growth.

One demand, the Philippines is capable of meeting, is the outsourcing of service operations. For example, Customer Care Center Inc. is preparing to tap nine international markets by mid-2001 by beefing up its resource base, increasing its number of agents and seats to around 2500 and 850 respectively (Batungbakal, "Philippine Call Center Outsourcing" 2001). Business process outsourcing is also another venue where the Philippines can avail its expertise to global clients AOL, P&G, Citibank, and Andersen Consulting, among other big corporate names, have already established backroom operations here for their business needs. Many believe, that the Philippines has a well-skilled IT workforce, with good communication skills, giving it a competitive edge against its Asian neighbors. Moreover, the geographical and the cost advantages of the Philippine ICT industry is gaining familiarity to foreign companies looking to extend their business operations in Asia.

The increasing demand of IT-related services enabled expansion of some local companies to a variety of specialized fields. From a mere data entry operator, SPI Technologies Inc. transformed itself into a well-diversified IT service provider. The company is basically involved in business center outsourcing, call center

outsourcing, and digital development. It has specific business units, which cater to a wide variety of IT services such as content conversion, scholarly publishing, software services, and even litigation support (see Cu, Outsourced IT Services). Linkages between the private sector and the academe to promote ICT support activities are now becoming prevalent. Recently, the Ayala Foundation and the University of the Philippines launched a technology park to widely promote ICT research and development and to harness scientists, researchers, and students to contribute to the age of ICT (http://www.upd.edu.ph/~updinfo/sep_oct2000/techpark.htm). Indeed, it is important for these two groups, i.e., the academe and the industry, to come together for the benefit of the Philippines.

SMEs may provide niches for the industry players and IT groups. They are significant portion of our economy and have to be provided information on funding, technology, and appropriate IT training. This would inevitably spur overall productivity and eventually economic growth.

At the moment, the Philippines is gaining ground in its current niche of assembling electronic components. For the future, it may become an "E-Services Hub in Asia" especially in IT-enabled services relative to IT and IT support services.

ICT and Productivity

A debate is raging on whether productivity from ICT has substantially contributed to economic growth. Given the difficulty of isolating the individual impacts of ICT, computers and Internet on productivity one view is that the current surge in productivity may not be related to ICT investments since labor productivity falls in recessions and accelerates in initial recovery stages (ADB, 2001). On the other hand, the "productivity paradox may be explained by three hypotheses: (1) output growth is being understated, (2) misplaced technological enthusiasm and exaggeration of ICT expenditures, (3) need for a longer period of adjustment and reorganization of firms to fully benefit from ICT.

The latter is due in part to the need for support from other areas like "a vast array of complementary tangible and intangible elements: new physical plant and equipment, new kinds of workforce skills, new organizational forms, new forms of legal property, new regulatory frameworks, new habits of mind and patterns of taste" (David, 2000).

One recent study on Korea finds that "the contribution of ICT to output and productivity growth is visible, significant and rising in many OECD countries. In Canada, the United Kingdom and the United States, the growth contribution of ICT equipment amounts to about half the entire growth contribution of fixed capital. In France, Germany and Japan... somewhat smaller but is still significant. A number of smaller OECD countries are witnessing similarly strong benefits. These benefits appear to play an important role in changing price behavior, since improved access to information is accompanied by stronger competitive pressures at the micro level and reduced prices across a broad spectrum of industrial

activities" (Dahlman and Anderson, 2000) However, the issue is more complicated than this. "Investments in ICTs is not the whole story. While it is difficult to determine the underlying sources and mechanisms, the evidence points to the crucial interplay between investment in ICTs, changes in innovation processes, organizational changes and upgrading of human skills." (Dahlman and Anderson, 2000).

This underlies the conclusion of a group of consultants (McKinsey Philippines, 2001) that ICT, while a "sexy" area, will not be a growth driver of the Philippine economy in the short-medium term because of its low share in total GDP like India. It also supports the view of Follosco (2001) that the labor-intensive, lower value-added electronic products accounting for over 70% of total exports do not address the poverty alleviation concern of and the development of an entrepreneurial culture needed by the country. Indeed, mere investments will not drive growth and supporting factors have to be included as part of a technology management strategy.

In this regard, it is instructive to review the ESCAP framework for technology underdevelopment. This points to the very interrelatedness of these factors identified by Dahlman and Anderson (2000) as production/ investment, knowledge/ information, organizational/ management, and people/ human resources. This ESCAP framework shows each of the four vicious cycles of underdevelopment feeding the general underdevelopment in the center of the diagram.

We can begin by understanding the productivity problem arising from knowledge. A quote from this year's World Competitiveness Yearbook (IMD, 2001) will stress the crucial role of the knowledge component.

"Knowledge is perhaps the most critical competitiveness factor. As countries move up the economic scale, the more they thrive on knowledge to ensure their prosperity and to compete in world markets. How that knowledge is acquired and managed is each nation's responsibility. Indeed, nations do compete." (Garelli, 2001).

The low accumulation of documentation based on local experience (earlier termed "uncodified, unarticulated or tacit knowledge) can be a valid source of low overall productivity since best practices need not be necessarily shared with members of the community, e.g., maintenance of irrigation systems, sources of high-yielding seeds, etc. This seems to be common in feudal agricultural systems where peasant productivity is constrained by lack of know-how, know-what, know-why, etc. but available to those in command e.g., hacienda owner, baranggay captain, etc.

This may lead to dependence on outside or foreign sources of information, and to the absence of a demand-pull for S&T information, thus exacerbating the low appreciation of the value of information. In turn, this may cause outdated information facilities and the inability to utilize information networks leading to low knowledge accumulation.

Investing in ICT for farm extension work (The Third Asia Development Forum, Bangkok, 11-14 June 2001), needs not create value in agricultural communities if there are no corresponding changes in the other three corners of the underdevelopment diagram. In this model, these three can overwhelm the knowledge component preventing productivity from rising. Knowledge maybe a necessary but not a sufficient condition for improving the productivity of any country.

In this regard, the Filipino scientists, engineers and technologists who contribute to nation building in the 21st century through the ICT knowledge component must be supported by good management that does not thrive on protectionism, by an education system that has an S&T bias, and a production system that develops local codes and standards resulting to competitiveness in international markets.

In the same manner, those engineers and technologists who find themselves in the production area must be supported by good enterprise managers, strong S&T R&D capability, and up-to-date information facilities. (See Sabido, "ICT and Microelectronics R&D in the Philippines," for some developments in the country's capabilities in these areas).

Philippine Human Resources

Many analysts and researchers have identified human resources as the major strength of the Philippine economy and which should be harnessed for enhancing national competitiveness. The latest IMD survey indicates that the Philippines ranked first in skilled labor among 49 industrial and emerging countries, 3rd in availability of senior managers, 4th in availability of IT skills, 6th in flexibility of workforce, 10th in skills in finance, and 12th in qualified engineers (IMD, 2001). Follosco (2001) also cites the Meta Report that places the Philippines as first among 47 countries in knowledge jobs, followed by Australia, US, Canada, and France: and the sub-categories include qualified engineers, availability of IT skills, availability of senior management, and higher education enrollment.

In the ICT sector, Lagman (2001) notes that the Filipino college graduate knowledge worker is highly trainable, creative, services-oriented, can easily learn languages and similarly adapt to the host's culture, and has positive work attitude. The DTI (2000) notes that the Philippines rates second only to India in terms of skilled labor rankings in Asia, besting even China, Australia, Japan, Taiwan, S. Korea and Singapore; ranks 26th in overall knowledge jobs and workers in the Cyber Atlas (Rubin) Report despite its lower rankings in globalization (35th), and the dynamism of the economy and competition (34th).

Diosdado Banatao, a Filipino entrepreneur who has made his mark in Silicon Valley, notes however that the Philippines is not able to compete on the front-end with Taiwan and India, although "today (it) is competing on the back-end side — manufacturing —... fairly well. On the front end part of technology, however, we are not competitive. This is largely due to the fact that we do not have enough

vertical experts. The country does not glorify our technical people, our scientists, and our engineers. A lot of the good brains in the country end up as being managers. Technology requires practice. If people don't practice, they quickly becomes obsolete. We are also not training our people the right way. It should start with the schools and industry. If we do not solve this problem, nothing can happen." (Rabonza et al., 2000).

The distribution of schools offering IT courses in the country thus deserves a closer look. Based on data compiled by the author from CHED last year, below are some interesting observations on the potential for a digital divide in the Philippines:

- ✓ IT institutions in the Philippines are mostly private-owned. (86% of the total IT institutions in the country are private.)
- ✓ NCR registered the highest number of IT schools (121), with its total private and public IT schools numbering 106 and 15 respectively
- ✓ In terms of IT courses, the Bachelors degree is the most frequently offered course in the country (574) followed by the Associates degree (309).
- ✓ Advanced degrees are rarely offered and even NCR, having the most number of schools offering IT-related courses (179), has only seven (7) institutions offering advanced degrees.
- ✓ Luzon has the most number of IT schools and schools offering IT-related courses due to the strong showing of NCR, Regions III, and IV.
- ✓ The breakdown of IT courses shows that:

    - o In Bachelor's courses, majoring in computer science is "fashionable";
    - o In Associate's courses, majoring in computer science is again the norm;
    - o In Advanced courses, MS in Computer Science is being offered by most IT institutions having graduate IT programs although only one institution in the country is offering a Ph.D. course in Computer Science, i.e., DLSU, Manila in NCR; (Note: MBAs majoring in IT, E-Business, and even Masters in Information Management are not included in the data.)
    - o Institutions that have technical/vocational courses usually offer Computer Technician courses and Diploma in Computer Technology.

In the global world, many of these graduates will naturally be attracted by market forces to where their services are most needed. This raises the issue of our ability to continuously provide for the vast gap in demand and supply expected in the medium term by most industrial countries. Germany most recently launched its IT Specialist recruitment program which will enable guest workers to convert their visas into immigrant status after a short period of time.

Spearheading the Human Intermediation Process

As the knowledge era evolves from earlier economic stages in many countries, the Philippines can use ICT to assist its own human resources and those of the rest of the world. ICT can enable globally mobile Filipinos to assist their immobile brethren in the country. Any deconstruction of both the old and new economies (ICT and non-ICT dependent respectively) will point to the human factor in production as creator of more value for human activities since knowledge is initiated by sentient beings.

In the agricultural development, natural resources were intermediated (or demand matched by supply) through traders/trading firms. In the early and late industrial development, the role of financial intermediaries became more pronounced. Those that needed funds were able to source them indirectly through banks, insurance companies, and similar institutions. These channeled the financial resources and enabled borrowers to repay the loans and earn profits. The growth of many nations in the past two centuries were largely due to the flow of financial capital from regions that had surplus funds to those that needed them.

In the knowledge era, there is a parallel role that could be played by human resources intermediaries. How can the Philippines play a key role in this area? As the country is considered a major source of knowledge workers especially in ICT, it can embark on a campaign to have international groups, public and private, profit and non-profit groups, recognize the need to have the equivalent of financial; intermediaries in the human resources field for the knowledge era. It should champion the creation of the equivalent human resource banks where individuals deposit their additional credentials, skills, experiences, etc. useful to some other individual, group or nation. The intermediary serves as the agent that matches the supply with the demand for certain skills.

Hence on the supply side of the market, there should be new institutions for human resource intermediation that will (a) develop well-vetted and continuously update, or pool other existing rosters (industry- and skill-specific), (b) that can be electronically linked in some system (regional, national, global), and (c) for specific intermediation, i.e. the matching of supply and demand, or the provision of specific skills needed in the most cost-effective way.

The roster-based intermediation could be developed along market lines as practised by private "headhunting" offices or personnel recruitment firms. However, in the Internet era, the public good nature of the international roster makes it less attractive as a purely private undertaking as many users would be free riders. Hence the need for an international agency to lead in this regard.

Many international agencies will gain from an international ICT roster since it is scarce human resources, not technology/hardware that will likely push countries and firms to the digital divide. The Philippines will be able to use such international ICT roster, to follow its human talents for many purposes, and to encourage their foreign employers and business partners to locate productive

facilities in the country. Other countries needing specific ICT skills will be able to utilize such rosters, thus giving life to many bilateral, multilateral, and plurilateral economic and technical cooperation agreements that address the digital divide.

The author knows of no such international roster developed for any field despite the advent of the internet which can facilitate it. Top multinational corporations and international financial institutions can expedite the creation of these rosters. But these have to be regularly updated and vetted for current market value.

In this regard, the Science and Technology Advisory Councils (STACs) must be revived consisting of high-level professionals, scientists, technologists, etc. residing abroad and interested in assisting Philippine economic development. Rosters can be effectively developed once they are revitalized in key cities around the world and their contribution to nation-building may be effectively harnessed in a manner consistent with the promising role of ICT in bridging communities across the seas.

CONCLUSIONS

At a time when Philippine global competitiveness has slipped, the role of the ICT sector has to be carefully scrutinized at many levels. At the macroeconomic plane, policies have to be continuously reviewed given the dynamic environment in which competition for markets takes place, e.g., convergence of voice, video and data; the growing understanding of codified vs. tacit knowledge; the regional distribution of educational facilities in IT; changing attractiveness for location of international businesses in the country, etc. At the level of firms, large or small, deconstruction processes should be undertaken to separate the economics of things from the economics of information; the Philippine vision to be an E-services hub of Asia can be best implemented by taking this approach.

Human resources being at the heart of Philippine comparative advantage, it is imperative that policies be defined for the effective utilization of mobile high-level talents especially in science and engineering. These foot-loose national resources must first be tracked in the spirit of financial intermediation that made possible the tremendous growth of many societies during the industrial era.

The proposed human resources intermediation program for the Philippines can begin with a global ICT roster of our own nationals and must be translated eventually into international programmes. Electronic matching of supply and demand of human talent can be modeled after banking institutions where those with excess resources can be matched against those in need of similar resources, in terms of human ICT talents. A country that is rated among the top in terms of knowledge workers must champion this in international fora, whether public or private, to preserve and promote its people advantage in international markets.
Such programmes must recognize ultimately that any technological progress cannot be achieved only in the realm of knowledge or knowledge workers alone, e.g., scientists and engineers. The current debate on the contribution of ICT to

productivity suggests that production, people, and management factors have to be incorporated into technology issues. A systems approach is therefore warranted. In a globalizing world, this includes programming the mobile human talents of a country to assist in it own internal growth and development.

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