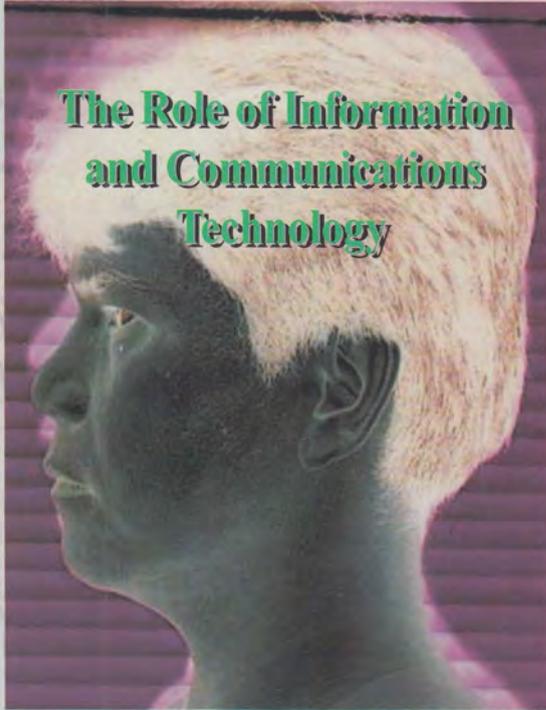


*Proceedings of the
Conference on the Knowledge Economy*



**The Role of Information
and Communications
Technology**

*May 8-9, 2000
Manila Hotel
Manila, Philippines*

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*Organized by the
Department of Science and Technology*

**Proceedings of the
Conference on the Knowledge Economy**

**The Role of Information and
Communications Technology**

8-9 May 2000
The Manila Hotel
Manila, Philippines



Organized by the
Department of Science and Technology

The National Academy of Science and Technology
and the Department of Science and Technology
Bicutan, Taguig, 1631 Metro Manila

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Printed in the Republic of the Philippines

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ISBN 971-8538-65-8

Proceedings of the Conference on the Knowledge Economy: The Role of Information and Communications Technology. 2000. The National Academy of Science and Technology and the Department of Science and Technology, Bicutan, Taguig, Metro Manila. 116 pp.

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ACKNOWLEDGMENT

Secretary Filemon A. Uriarte, Jr. and his staff at the Department of Science and Technology (DOST) kindly provided the funds for this project. Acd. Perla D. Santos Ocampo, President of the National Academy of Science and Technology (NAST) agreed to oversee the project in collaboration with the Philippine Council for Advanced Science and Technology Research and Development (PCASTRD), through the leadership of Dr. Ida F. Dalmacio, Executive Director; and the Advanced Science and Technology Institute (ASTI) headed by Dr. Delfin Jay M. Sabido, Executive Director. NAST Executive Director, Ms. Luningning E. Samarita, monitored the project. Dr. Eliezer A. Albacea, Director of the Institute of Computer Science at the University of the Philippines Los Baños edited the Proceedings and chaired the Publication, Documentation and Proceedings Committee.

M E S S A G E



The world is moving inexorably towards a knowledge economy (K-economy) in which the generation and exploitation of knowledge play the predominant part in the creation of wealth. With the K-economy being founded on human ingenuity and skill and a commitment to innovation through research and development, there is no alternative way to prosperity than to make learning and knowledge-creation of prime importance. We also need to shift our productive capacity to knowledge-based industries that are delivering the fastest growth rates worldwide.

To address these needs, the Department of Science and Technology (DOST) is promoting a knowledge economy through information and communications technology (ICT). The Department is doing this through the Comprehensive Program to Enhance Technology Enterprises (Project COMPETE), which seeks to develop two very important sectors of the knowledge economy – microelectronics and information technology – through the establishment and operation of Virtual Centers in Technology Innovation (VCTI).

The VCTI in microelectronics is aimed to catalyze research and development and original product design in microelectronics and to develop our capability in Application Specific Integrated Circuit Design or ASIC Design. The VCTI in information is aimed at developing capability for content design and software development.

Through these projects, the Department hopes to enable the country to take full advantage of the K-economy and the new global markets. For as Peter Drucker observed, "The next information revolution is well under way... It is not a revolution in technology, machinery, techniques, software, or speed. It is a revolution in **concepts**".

A stylized, handwritten signature in black ink, appearing to read 'F. Uriarte, Jr.' with a large, sweeping flourish at the end.

FILEMON A. URIARTE, JR.

Secretary

Department of Science and Technology

M E S S A G E



During the Second Global Knowledge Conference held recently in Kuala Lumpur, one issue firmly stood out: the widening chasm between the "information haves" and "information have-nots", or the "information rich" and the "information poor". It is also clear that inequality of access to information and communication technology (ICT) is a problem both among and within countries.

As developing nations, like the Philippines, continue to grapple with widespread poverty and unemployment, with the growing costs of health care, education, and other basic services, and environmental degradation, they are at the same time confronted by the ever-widening gap between those who have greater access to information and knowledge and those who have lesser access or none at all.

The challenge to us then in the Philippines, particularly to the participants in this Knowledge or K-Economy Conference, is to further build our strengths as a nation by leveraging ICT to bridge the knowledge divide in our midst. The government, for its part, will continue to pursue the adoption of market-oriented strategies to help spur the faster growth of the economy through a vibrant ICT sector. At the same time, we have to realize that sustaining our country's economic growth will increasingly depend on the capability of our human resources, not only to access, but also to use and leverage knowledge for us to compete in a rapidly globalizing economy.

It is therefore an opportune time for us to meet at this time as we face the challenges of the digital age. We have to seek and agree on clear and doable solutions to remove the barriers to faster knowledge and economic growth. We have to remember that we are not in competition with ourselves. We are competing with the rest of the world. Time is of essence, and it will not wait for us. We cannot afford to be complacent, lest we be further left behind. We have to make sure that we are on the right track and will all work together in the pursuit of our common vision of becoming a knowledge society in Asia.

I wish to take this occasion to congratulate the officers and members of the National Academy of Science and Technology (NAST) and Department of Science and Technology for organizing this Conference.



FELIPE M. MEDALLA

Secretary, Socio-Economic Planning
and Co-Chairman
National Information Technology Council

M E S S A G E



Our warmest greetings to the Department of Science and Technology, and to all supporters and participants of the "Conference on the Knowledge Economy: The Role of Information and Communications Technology".

The government, the business sector, and the economy at large must appreciate the urgent need for initiatives to transform the Philippines into a knowledge-driven Economy that will position it for effective integration into the merging borderless world economy that will be increasingly steered by the developments in IT and e-Commerce.

Thus, DTI is taking a lead role in consolidating all government efforts at formulating and promoting an e-Commerce strategy. The e-Commerce Promotion Council is now in the process of formulating a comprehensive Internet strategy towards developing an environment conducive for attracting investments and promoting e-Commerce in the Philippines. The legal framework for e-Commerce has also been deliberated in both the Senate and the House of Representatives and is expected to be signed into law soon.

In addition, DTI has launched an intensive IT investment promotions campaign to promote the country as the hub in Asia for professional IT services such as regional back room operations and call centers. In fact, the Invest Priority Plan of FY 2000 formulated by the Board of Investments has explicitly included Professional IT Services. This is defined to cover software development projects, IT-enabled services, support and knowledge-based services, and Business Process Outsourcing.

The continuing initiatives of the government in collaboration with the private sector is indeed a step forward in preparing the country for this new wave of technological developments. We are confident that with the joint effort of all concerned sectors, we will be at the forefront to grab new opportunities in the fast emerging Cyberage.

Mabuhay!


MANUEL A. ROXAS
Secretary
Department of Trade and Industry

MESSAGE



Greetings!

I would like to express my warmest welcome and heartfelt gratitude to the participants of the first-ever gathering here at the historic Manila Hotel of renowned Filipino and foreign information and communications technology (ICT) practitioners and advocates.

Personally, as president of an academy that derives its strength from academicians and scientists with advanced expertise in diverse scientific fields, our unified stand on the role of S&T to promote our society's well being brings us all to a high level of alertness when it comes to rendering service where our different scientific know-how can best be put to use.

Thus, when the Department of Science and Technology (DOST) under the stewardship of Dr. Filemon A. Uriarte Jr. called on NAST to have a proactive hand on a number of knowledge-economy oriented activities, we felt honored and much obliged to sponsor a preparatory roundtable discussion on the subject matter last April 10. From those initial meetings, its organizers and participants have come up with the basics of what k-economy is all about and tackled a number of relevant issues with multi-sectoral participation from both private and public agencies.

As the highest advisory and recognition body of the government on science and technology (S&T), the Academy had couple more of entities to tap for their combined efforts at working towards a common goal. These are the Philippine Council for Advanced Science and Technology Research and Development (PCASTRD) headed by Dr. Ida F. Dalmacio and the Advanced Science and Technology Institute (ASTI) under Dr. Delfin Jay M. Sabido.

We continue to create a higher degree of awareness and heightened interest on this new economic force so that participants to this two-day gathering can further evaluate or assess the impact of this global phenomenon vis-à-vis the different factors that come into play for the furtherance of Philippine Society.

On the threshold of the so-called Information Age, we welcome you all to this historic conference where global networking becomes a dynamic force in building both society and business.

Mabuhay!

A handwritten signature in black ink, appearing to read 'Perla D. Santos Ocampo'. Below the signature, the name 'PERLA D. SANTOS OCAMPO' is printed in a bold, sans-serif font, followed by the word 'President' in a smaller, italicized font.

PERLA D. SANTOS OCAMPO
President

National Academy of Science and Technology

WELCOME REMARKS

Conference on the Knowledge Economy: Challenges in Information and Communications Technology

Perla D. Santos Ocampo, M.D.

President, National Academy of Science and Technology

During the past few months, I have been witness to our dynamic Secretary of Science and Technology, Dr. Filemon A. Uriarte, Jr. leading the way through outstanding flagship programs to harness S&T for the country. Critical milestones have been put in place towards this goal. Among the remarkable flagship programs conceived and being rapidly concretized by Secretary Uriarte is what he appropriately labels as COMPETE—an excellent acronym for Comprehensive Program to Enhance Technology Enterprises.

Under this program is the exigent establishment of a knowledge economy and the utilization of information and communications technology for the Philippines to achieve this status.

The significant presence this morning of two vital cabinet members from two critical departments, the Honorable Felipe M. Medalla, Secretary, Socio Economic Planning and Director-Genrel, NEDA, and the Honorable Manuel A. Roxas, Secretary of the Department of Trade and Industry; and this afternoon, of the President of the Republic of the Philippines, His Excellency, Joseph Ejercito Estrada, bodes well for our goals.

Clearly, the global village is rapidly responding to the gusty winds of information and communications technology blowing towards a knowledge economy. We, too, in the Philippines, will have to bend and move accordingly unless like an inflexible and immovable tree, we assume a rigid position and run the risk of breaking.

This conference intended to raise the level of awareness as well as the evaluation and the assessment of the impact of this global phenomenon on Philippine society. Gauging from the overwhelming attendance, the manifest interest and enthusiasm are both encouraging and inspiring.

This conference will provide the venue to learn from the experiences of other countries and how k-economy enhanced their economic growth.

This conference is also intended to be among the initial steps in the formulation of an action plan towards a national policy on information and communications technology.

In short, this conference will continue to clarify the concepts and principles of knowledge economy and serve as a strong signal that the Philippines is committed to a knowledge economy through information and communications technology.

A well-attended pre-conference roundtable discussion on 10 April confirmed the urgency of what we are doing in these next two days and identified the necessity of addressing a number of issues and concerns relative to k-economy, especially the need for matching goals of different sectors, fostering partnerships and networking, and swift capability building. A synthesis of that roundtable will be presented shortly.

The National Academy of Science and Technology expresses its appreciation to Secretary Uriarte for giving it the honor of leading the preparations for the conference and the pleasure of working with other agencies such as the Philippine Council for Advanced Science and Technology Research and Development and the Advanced Science and Technology Institute.

For knowledge to be of benefit to our people and for it to lead to poverty alleviation, which should be the bottomline of these activities, it is both imperative and expedient that we do not stop at knowledge generation and creation. To utilize knowledge, there must continue to be knowledge sharing and knowledge mobility through information and communications technology.

I close by quoting from Albert Einstein, Scientist and Man of the Century:

"It is of great importance that the general public be given the opportunity to experience consciously and intelligently, the efforts and results of scientific research. It is not sufficient that each result be taken up, elaborated and applied by few specialists in the field. Restricting the body of knowledge to a small group deadens the philosophical spirit of a people and leads to spiritual poverty."

Ladies and gentlemen, in this digital age, let us utilize knowledge-economy-oriented activities to provide a better life for our people. Let this be our commitment.

Welcome to all and Mabuhay!

THE KNOWLEDGE ECONOMY: MEETING THE CHALLENGES AHEAD

Felipe M. Medalla

Secretary, Socio-Economic Planning and
Director-General, National Economic and Development Authority

Honorable Secretary Filemon Uriarte, Jr., Distinguished members of the National Academy of Science and Technology, Honored Guests and Participants in this First Knowledge Economy Conference, Fellow Workers in Government, Ladies and Gentlemen, good morning.

First of all, allow me to congratulate Sec. Uriarte, the officials and members of the National Academy of Science and Technology and the Department of Science and Technology for initiating and organizing this conference on the Knowledge or K-Economy.

I am particularly happy to note the high interest that this conference has generated among the various sectors of our society as indicated by the number and mix of participants present here today: business, government, academe, and civil society. I do hope this interest will be sustained, not only throughout the day today and the next day, but also over the weeks, months, and years to come.

The Knowledge Economy and Information Society

Let me clarify also at the outset that I am speaking from the point of view of an economist involved in policy-making in a developing country. The term "knowledge economy" is relatively new among some of us while others may already have their own mindsets on what the term really means, but which may differ in some aspects from each other.

Let us put the concept of the "knowledge economy" in perspective. Before the term "knowledge economy" was widely used, there was the term "information society", which supposedly originated in Japan, and whose use became general towards the end of the 70s, also in Japan. In 1978, the United States and Japan jointly conferred in Seattle, at Washington University, to compare the experiences accumulated by their respective information societies. Meanwhile, the Australians started to become interested in the dynamics of their "information society" in the middle of the 70s.

The Koreans were similarly interested by the 80s, at about the same time as the Canadians. Sweden, Denmark, Finland, France, and the United Kingdom moved fast as well in the 80's to quickly adopt to the innovations in information technology.

In 1997, the Canadian Government, particularly through the Canadian International Development Agency (CIDA), with the support of the World Bank, and other multilateral development Institutions organized and hosted in Toronto the first Global Knowledge Conference. This was followed this year in March by the Second Global Knowledge Conference, or GKII, which was held in Kuala Lumpur, with some 1,200 participants from 125 countries.

The **1998 World Development Report** of the World Bank, entitled *Knowledge for Development*, probably legitimized and popularized, and confirmed and reinforced during GKII, the concerns of policymakers in developing countries over the knowledge economy. The Report, as well as GKII, focused on knowledge and information; public access to knowledge; the role of government, media, and society in general. Discussions in GKII included those on knowledge as a means of empowering the marginalized sectors of society, as well as on gaps that divide countries or sectors of society, and the resulting impact on the effectiveness of markets and the future of nation states.

Philippine Initiatives for the Knowledge Economy

Relative to the Philippines, I am sure that much has also been written about information or knowledge societies and economies. For my purposes this morning, allow me to cite three documents, which incidentally can be found in the NEDA website at <http://www.neda.gov.ph>. These documents, to some extent, define our national vision, policy framework, and programs to make the Philippines competitive in a global knowledge economy.

First is the **National Information Technology Plan for the Twenty-first Century**, or IT21, which provides the overall framework for the development of initiatives in information and communications technology (ICT) within the con-

text of our medium-term Philippine development plan, more popularly known as "Angat Pinoy 2004". IT21 specifically aims for the transformation of the country into a knowledge center in Asia by the first decade of this century.

Second is the **Philippine Information Infrastructure** or PII Policy Study, which sets the direction and parameters to speed up the development of a national information infrastructure, or NII, to achieve our vision in IT21.

Finally, there is the **Government Information Systems Plan** or GISP, which is the government's master plan for electronic governance. The GISP aims to rationalize and prioritize the different ICT initiatives in government by providing a common framework and structure for coordinating the different ICT programs and projects of the various government departments and agencies.

The Knowledge Economy as New Economics

For sure, the advent of the knowledge or new economy, or sometimes referred to as the "network economy", has spawned talks on "dynamism" and "competition", "strategic partnerships" and "niche products and services", while generating debates on knowledge distribution and access, as well as security, privacy, and the accompanying threats to national sovereignty and the survival of the nation state.

Well-known economists also started having their say, including Brad de Long who claims that "[t]he new economy is about a new source—with the potential to become the dominant source—of economic growth. Economic development has become less and less about accumulating more and more physical capital, and more and more about the creation and deployment of intellectual capital."

Policy Framework for a Developing Economy

What I really find very interesting is what former World Bank Chief Economist Joseph Stiglitz said about public policy for a knowledge economy during a talk in London early this year. Stiglitz is probably more known to others as the insider who wrote about what he learned about how the IMF and the US Treasury handled the world economic crisis while he was still with the World Bank. There are insights in his talk, which I wish to share with you.

First, he cites the continuing importance of market openness and decentralization of decision-making. He recalls that "[t]he openness of a country to foreign trade seems to have a far greater effect on its economic success than would be predicted by the standard trade models of comparative advantage. One explanation is that trade and foreign direct investment provide important channels for the transmission of knowledge.

Second is the central role of institutional and cultural change in the creation of a knowledge economy. Stiglitz noted that successful entrepreneurs focused "on creativity and wealth creation, not on the rearrangements of the use of already existing assets and corporations, the takeovers and mergers, the corporate restructuring" that seem to be the dominant response to globalization.

Citing his experiences at the World Bank, he adds that "[i]mplementing a new technology in a rather different environment is itself a creative act, not just a copied behavior." It is not something that is "easily transferred or 'downloaded' to a developing country." He proceeded by saying that local economic agents must effect change within the context of local economic, political, and cultural factors.

And in the case of the Philippines, I may add, the "geographic-archipelagic" factor as well, which poses very clear challenges to our telecommunications planners and business sector partners.

The third point I would like to cite from his talk is the idea that knowledge has the characteristic of "a global public good." As is often said—and which Secretary Uriarte would often cite with much feeling—knowledge is not diminished when given away. In economic parlance, "[o]nce knowledge is discovered and made public, there is essentially zero marginal cost to adding more users." But, at the same time, if nothing is paid, "firms would have no incentive to produce knowledge ... (and) ... knowledge cannot simply be made publicly available."

Finally, Stiglitz advises: "The fact that knowledge is, in central ways, a public good and that there are important externalities means that exclusive or excessive reliance on the market may not result in economic efficiency." For those of us who believe in the power of market forces, the challenge is to find the optimal balance between market factors and government and private sector partnership and intervention.

I find all this relevant to the Philippine economic situation. For the Philippines to compete in the global knowledge market, we have to build upon and focus on our core competencies, as well as on policies that would spur faster

knowledge and economic growth. Our development strategy, therefore, need to rely heavily on close collaboration between government and private business. Government will provide the basic infrastructure and the policy, program and institutional environment that will encourage the development of knowledge as a core industry. We expect the private sector, on the other hand, to focus on seizing immediate market opportunities and making Philippine capabilities recognized internationally; develop strategic partnerships and alliances; and build upon our local capabilities over the medium to long term.

At the same time—and I am glad that we have in this conference a very strong representation from the education and manpower development sector—we must increase the quantity and quality of our knowledge workers and professionals. This means improving—or overhauling, if you will—our educational system and institutions to make them more relevant and clearly supportive of the country's thrust toward a global knowledge economy status.

Concluding Remarks

Before I close, let me just say that the challenge to us now, particularly to the participants of this Knowledge or K-Economy Conference, is to further build upon our strengths as a nation. I wish to assure you that the NEDA will continue to pursue market-oriented strategies to help spur the faster growth of the economy. At the same time, we have to realize that sustaining our country's economic growth will increasingly depend on the capability of our human resources, not only to access, but also to use and leverage knowledge for the Philippines to compete in the global economy.

This is therefore an opportune time for us to meet as we face the challenges of the digital age. We have to seek and agree on clear and doable solutions to remove the barriers to faster knowledge and economic growth. We have to remember that we are not in competition with ourselves. We are competing with the rest of the world. Time will not wait for us. We cannot afford to be complacent, lest we be further left behind. We have to make sure that we are on the right track and will all work together in the pursuit of our common vision of becoming a knowledge society in Asia.

Again, I wish to extend my sincerest congratulations to the officers and members of the National Academy of Science and Technology (INAST) and the Department of Science and Technology (DOST) for organizing this Conference.

I wish you all a pleasant day and may we have a successful and productive conference.

THE ROAD TOWARDS KNOWLEDGE ECONOMY: CHALLENGES AND OPPORTUNITIES

Raul C. Hernandez

Undersecretary and Managing Head, Board of Investments (BOI)

On behalf of

Manuel A. Roxas II

Secretary, Department of Trade and Industry (DTI)

Good morning, Information Computer Technology or ICT specialists and participants of this Conference about Knowledge Economy.

As mentioned in the introduction, I am now connected with our Philippine government and today I am here to perform the part of my new boss, DTI Secretary Manuel A. Roxas II in today's event. As you have read in the newspapers, Secretary MAR left for the United States last week to lead a top-level IT (information technology) mission related to what this conference is all about.

On this note, I bring with me this morning the greetings and sincere apologies of Secretary Roxas. Allow me therefore, to share with you Secretary MAR's message.

MESSAGE OF SECRETARY "MAR" ROXAS

"I am deeply honored and privileged to have an opportunity to address this distinguished and elite audience at the opening of what has been billed as a 'Conference on the Knowledge Economy: the Role of Information and Communications Technology'.

"It is both a topic and an issue that is timely, relevant and critical to the way we prepare today—as individuals, family units, communities and as a nation—to face the challenges and opportunities of tomorrow.

"I congratulate the convenors of this conference—particularly the DOST under the leadership of Secretary Uriarte for organizing this event. For indeed, the topics that have been lined up for the next two days, are exactly the sort of topics that should be brought to the very center of constructive public debate and discussion, awareness and understanding. And not just for the sake of academic discussion but because they can make a difference in our lives, and to the lives of our fellow Filipinos."

Capitalism Democracy Technology

"These are the three greatest forces of our age. Feeding on each other, they unleash and will continue to unleash, limitless creativity and human potential which challenge the old world and economic order and bring us to the new economy.

"Think about it—Land before was the prime source of wealth. Business growth before came from bricks-and-mortar manufacturing involving muscle and brawn. Now we are looking at a New Economy where knowledge, information technology and brainwork are the great wealth creators.

"The wealth creating potentials of the new technology based on a wired world—the Internet, e-commerce—are indeed staggering. All these are expected to raise our living standards and enhance the quality of our lives."

'Knowledge is Power'

"At no other point in time has the saying 'knowledge is power' really has been so true. Information is the source of value and those with the knowledge are the ones most likely to succeed. This new age brings with it a limitless potential to produce value—thus a limitless, bountiful source of new prosperity with hardly any physical constraint or dead end."

The good news for the Philippines

The good news for the Philippines, our country and our people, is that **WE HAVE THE MEANS, THE ABILITY, THE CAPABILITY TO GRAB AND WIN A GOOD SHARE OF THESE WEALTH-CREATING OPPORTUNITIES.**

"Why do I say this?

"If we pause and try to assess what are best assets as a country and people are, we will find that:

- The Philippines is still one of the healthiest countries in Asia—its democracy remains boisterous, and its economy is growing, no matter how grave or immediate are the problems that confront us this very day
- We have a young educated English-speaking population making up a skilled workforce that is tailor made for the Knowledge Economy, the New Economy.

"This is not a claim—it is based on hard facts.

"*Japan Close-Up*, a Japanese monthly periodical, published in its April issue, the results of the average TOEFL marks of Asian countries. The **Philippines was topped on the list**. India was breathing on our neck but we were, nevertheless, ahead. We bested the likes of Indonesia, Malaysia, Thailand, even Hong Kong, Taiwan, and South Korea. TOEFL is a standard English fluency test administered by the a US agency.

"Moreover, the study by HK-based Political and economic Risk Consultancy showed that the Philippines and Singapore are the only Southeast Asian nations that have a **labor force with the depth to move beyond manufacturing focus into high value-added functions**. Of course, the country's advantage over Singapore is that it also has the numbers when it comes to labor-availability. Said in another way, we have the quality and quantity as well as cost advantages in the knowledge industry arena.

"This is perhaps the reason why many global MNCs (multinational companies) have quietly set up backroom service operations here. Notable among them are America On-Line, Arthur Anderson, Procter & Gamble, Flour Daniels, Citibank, Caltex, which also operates a bricks-and-mortar petroleum refinery. There are also some 30 other Japanese firms who have done likewise."

The challenges now and opportunities

"Our job is to make our competitive advantages better known to the global business community that we do make an ideal site for knowledge and IT service operations. Thus, DTI has launched a series of roadshows to promote the Philippines as a choice investment site in the pipeline. An IT mission is in fact making the rounds of the US East and West coast even now. We also have to let our own people know that we have these winning traits and encourage them to participate and share in the grand adventure of growing our economy so they can better their lives.

"In this job, we hope to close ranks with the very people who can partner foreign firms in specific ventures—Filipino companies with the expertise to manage IT, service outsourcing and e-commerce ventures.

"Yet even as we say we are ready for the challenges and opportunities of the New Economy, there is brutal competition out there in the global economic arena. Which means we have to keep sharpening our skills and doing better to successfully maneuver the wild ride of tomorrow.

"We also have to remind ourselves that as we hitch and grow our economy through the value-added knowledge industries that represent the wave of the future, our bottom line is not just growth per se but the integration of everyone into that growth stream.

"I strongly feel your discussions today and tomorrow will reveal to us the likely winning scenarios of our future and the unbeaten, untried paths we must explore – with hope and courage and sans fear – to get there to the benefit of all.

"Thank you."

PERSONAL NOTE/COMMENTS

Secretary MAR certainly and strongly believe that the future of our country depends largely on the quality and quantity of our people. These are the Filipinos who are here in the Philippines and those who are working and residing abroad.

He also believes that the world is changing and changing so fast that our country must have strategic and doable plans that will make us globally competitive to continuously improve our quality of life. It is in this context that he has given focus and support to the following:

DTI ACTION AGENDA

- Increased investments / exports – rising incomes
- Intensified consumer protection
- Stable / equitable policy framework
- Preparations for the New E-World

CONCLUSION

It is on this note and allow me to say as my concluding statement that I have accepted the invitation of Secretary Roxas to be part of the millions of people in the government to face the exciting challenges among other things those related to the K-ECONOMY (KNOWLEDGE ECONOMY).

Hopefully, I can make a small but meaningful contribution during what I call as the 2nd chapter of my life.

I wish you all the best to a successful conference.

Good day !

WHY A KNOWLEDGE ECONOMY?

Dr. Filemon A. Uriarte, Jr.

Secretary, Department of Science and Technology

When I assumed my post as Science Secretary in February last year, the first thing that I did was to set a vision for the science and technology community. This vision is: a competent and competitive science and technology community with a social conscience. To achieve this vision, we prepared a Medium-Term Plan covering the period 1999 to 2004. A major component of this Plan is the implementation of six flagship programs that directly address the three elements of vision, namely, competence, competitiveness, and conscience. All six programs have been funded and are being implemented.

In February of this year, I sent a memorandum to the President recommending that the government adopt a centerpiece program—the development of a knowledge economy through information and communications technology. Since then, I have met the President three times to brief him on this proposal. This Conference serves as the formal launching of this initiative.

But why a knowledge economy? In August 1999, the IT Advisory Group of the Minister for Information Technology of New Zealand submitted a report to the New Zealand Government entitled *The Knowledge Economy*. The Report ended with the following words: "We need to look at our human resource as a part of a 'knowledge supply chain'. The education system must support lifelong learning. If New Zealanders do not seize the opportunities provided by a knowledge economy, we will survive only as an amusement park and holiday land for the citizens of more successful developed economies."

I believe that the same conclusion applies to the Philippines. If we do not seize the opportunities provided by a knowledge economy, we will survive only as supplier of raw materials and as a holiday land for the citizens of more successful developed economies.

Finland is a good example of a country that has made a deliberate decision to embrace a knowledge economy. It was not too long ago that the Finnish economy depended largely on forestry. Today, while forestry is still growing, it accounts for less than 3 per cent of GDP. On the other hand, high-tech industries jumped fivefold as a percentage of GDP. How did the Finns do it?

In 1994, the government unveiled a national strategy entitled *Finland's Way to the Information Society*. It deregulated the telecommunications sector and launched the programs to stimulate the economy. The economy diversified to embrace new technologies, ICT, environmental technology, and biotechnology. Then they invested in R&D. Private firms started investing 10 per cent of sales, more than double the OECD average. Students were exposed to ICT at an early age and computer literacy became part of the national curriculum. Schools and colleges were provided fast Web access. And universities and technical schools expanded their computer and IT programs.

Today, Finland produces five times as many science and technology graduates as law graduates. Nokia has become a symbol of Finland's shift to a knowledge economy. Once a huge pulp and paper company, that is, one dependent on forestry, it has become one of the world's leading economic companies. Today, Nokia accounts for more than 15 per cent of the country's exports.

As early as 1994, the noted economist and author, Peter Drucker, already made the following observation: He said, "Developing countries can no longer expect to base their development on their comparative labor advantage—that is, on cheap industrial labor. The comparative advantage that now counts is the application of knowledge."

The knowledge-development nexus is well established. More than half of the GDP of developed countries is now based on the production and distribution of knowledge. Information technologies are advancing at a tremendous rate. The world economy is becoming more and more integrated and global. Countries are having less and less leverage on global trends. And no country can isolate itself for so long without adverse economic consequences.

We need to put knowledge at the center of our development efforts. We need to apply the power of knowledge to a great challenge of eradicating poverty and improving people's lives. This requires three things. First, it requires vision of a desired future. Second, it requires effective policies towards that vision. And third, it requires appropriate strategies in line with policies.

First we need a vision of the desired future. We need a clear sense of how a knowledge-based economy can serve that future and help to realize it. This vision must be strategic. It must have the capacity to recognize what can be changed and what cannot. Developing this vision involves clear priorities.

I suggest that our vision of the future be this: We want a peaceful and prosperous future and we want it soon. In order for this future to come sooner, rather than later or not at all, we want to use enabling technologies, like information and communications technologies, to bring us to a knowledge economy. To achieve this vision, we need leadership by the private sector and strong support by the government. I repeat, in a knowledge economy—where the only thing permanent is change, and where technological advances occur rapidly—the leadership must be lodged in the private sector. The government's role must be catalytic and supportive. It must be predictable and consistent. Government intervention must be minimalist and simple.

In a knowledge economy, the biggest challenges are not technical in nature. Most technologies are available for most of what countries want to do. The bigger challenge is to exercise vision and leadership and to promote change.

Second, we need effective policies that will lead us to our vision. There are many such policies, but I have time to cite only a few. For us to effectively participate in the knowledge economy, we must institute policies to narrow the knowledge gaps that separate us from rich countries.

What are some of these policies?

One, we need to institute effective policies for acquiring knowledge. We can acquire knowledge two ways: firstly, by opening up to knowledge from abroad; and secondly, by creating domestically knowledge that is not readily available elsewhere. In order for us to effectively acquire knowledge from large global stock of knowledge, we need to develop the technological competence to search for appropriate technologies. And then we need to be able to select, absorb, and adapt imported technologies. To foster the domestic creation of knowledge, we need to increase investment in research and development. We need to retain our highly trained people by improving the pay and recognition of scientists and researchers. We need to offer firms incentives to do R&D or to contact directly with the public research institutes.

Two, we need to institute effective policies for absorbing knowledge. We need to promote lifelong education. To sustain economic growth in a highly competitive global economy, we need people with up-to-date technical skills. We need to promote lifelong education to enable our workforce to continually assess, adapt, and apply knowledge. With limited government resources, we need to tap the private sector in this regard.

Finally, we need strategy. Here we are faced with very difficult challenge of defining a strategy that can make the most effective use of very limited resources to implement policies and achieve our vision. To be successful, our strategy must lead us to a dynamic accumulation of skills and knowledge that will have a major impact on our development goals and aspirations. I suggest that our strategy include at least two elements, namely: the development of underlying ICT infrastructure; and the creation of conditions that will encourage the build-up of social and technical capabilities in selected areas.

I should like to end my message by citing what Singapore has done. Singapore was one of the first countries to decide to develop a knowledge economy. In 1981, Singapore launched a program to computerize its civil service. In 1986, it formulated the National IT Plan. Then in 1994, Singapore spelled out its vision for the future—that of turning Singapore into an "Intelligent Island".

To achieve this vision, Singapore adopted policies that promote lifelong learning; policies to promote an ICT culture; policies that promote research and development; and policies that reward technical and scientific excellence.

In line with these policies and having its vision in mind, Singapore developed a detailed strategy for the development of information and communications technologies. These were six very clear and simply stated strategies:

- Create an IT culture
- Plan IT human resource development
- Nurture the IT industry
- Evolve an information infrastructure
- Deploy IT2000 flagship programs
- Exploit IT in government

These strategies are so simple and clear that, to my mind, they are worth revisiting. In fact, we can adopt almost the same strategies and then adapt them to our conditions. And then we should develop and implement specific activities and actions for each strategy. I think it is worth trying.

It is worth trying because we have no choice. We have to prepare the Philippines for a knowledge economy or we will be left behind. But to bring the Philippines into the knowledge economy, we need to make difficult decisions. But we decide we must. We have no choice. This reminds me of a chant found in the popular book We're Going on a Bear Hunt: **We can't go under it. We can't go over it. We'll have to go through it.**

Thank you and good day.

KEYNOTE ADDRESS

PREPARING THE PHILIPPINES FOR A KNOWLEDGE ECONOMY

His Excellency Joseph Ejercito Estrada
President, Republic of the Philippines

At the outset, I would like to congratulate the Department of Science and Technology for successfully organizing the timely conference and spearheading the promotion of a knowledge economy in the country.

This initiative comes at a time when globalization is integrating the world's countries together, when the international economic order is evolving into a highly integrated and electronically dynamic system, and when information can be accessed in all corners of the globe at the click of a mouse. Indeed, the world today is rapidly moving towards a new economy—a knowledge economy.

It is, therefore, not surprising that *The Economist* has asked in big, bold letters on its cover: who owns the knowledge economy? It, however, provided the answer. Nobody owns it, everybody benefits from it, and the world becomes richer.

This can be illustrated with a simple example. When I share a piece of cake with you, you gain the cake and I lose it. But when I share my knowledge with you, you gain it but I do not lose it. In fact, both of us may even gain more knowledge from the exchange.

Knowledge is essential for our development. And in a knowledge economy, it is the generation and use of knowledge that assume the significant contribution in the creation of wealth and in the alleviation of poverty. In its recent report, the World Bank emphasized that if we want to live better tomorrow than today, if we want to raise our living standards as a household or as a country, we must do more than simply transform more resources, for resources are scarce. We must those resources in ways that generate even higher returns to our efforts and investments.

One of the most important enabling tools for the development of a knowledge economy is informations and communications technology, or ICT. Of the many technologies that are currently being developed and utilized, I believe will be the single most important technology that will bring about a knowledge economy. The reason for this is that ICT is an enabling technology. Like electricity, which is also an enabling technology, the impact on the economy is not much in its production—though this can also be significant—but in its widespread use and application. Just as in the development of electricity, developments in ICT bring about new markets, new products and new services. These, in turn, bring with them new sources of revenues that contribute to economic growth.

Personal computers have grown threefold between 1992 and 1997 to 120 million and are increasingly linking the world. In 1993, there were about 2 million Internet hosts worldwide. In 1999, this has increased exponentially to nearly 45 million. The Internet's explosive growth is making possible many economic opportunities which just a few years ago were inconceivable.

In 1997, the worldwide market for ICT amounted to 1.8 trillion, or approximately 6 percent of the world GDP. This is 40 percent higher than the level in 1992. It grew by about 27 percent annually between 1992 and 1997, more than five times the rate of global economic growth.

For a country like the Philippines, it is clear that a knowledge-based development can and should be pursued. The Philippines is in an excellent position to harness the potentials of a knowledge economy. We are a small country, prone to natural disasters, whose land area amounts to less than that of Malaysia, Thailand, or Indonesia, and which is spread over 7,000 islands, making the transport of goods very challenging. Our greatest asset is our people, who are imbued with a culture of education and a love for learning. We have been blessed with a large number of highly trained and highly trainable people. And since knowledge rests on people, we have the basic ingredient on which to build a knowledge economy.

This is further confirmed by the performance of the ICT industry in the country in recent years:

In the hardware sector, our semi-conductor and electronics industry has been growing in the rate of 30 percent to 40 percent per annum since 1993. Products worth nearly \$20 billion constituted 72 percent of our total exports in 1999. Exports rose to \$25 billion in 1999 and is expected to grow to over \$47 billion in 2004. The 512 companies involved in the industry have a total investment of over \$7 billion and employ over 280,000 skilled and semi-skilled workers.

This same trend is mirrored in the software and network sectors of the ICT industry in the Philippines. Many companies have established back-office operations in the Philippines. America Online, for instance, operated a customer e-mail response system at Clark. Some 600 Filipinos, manning workstations in the Philippines, answer e-mails for AOL from all over the globe on a 24-hour basis.

In short, we are in a position to capitalize on our strengths and pursue a knowledge-based development—and, so far, the demand from the ICT industry has fueled it. However, it is equally clear that we must do more. The same global ICT trends are calling us to be proactive or otherwise lose our competitive advantage and be further left behind.

In the view of the tremendous opportunities and vast potentials offered by ICT and other knowledge-based industries, we have adopted as a key development strategy the transformation of the country into a knowledge center in Asia by the first decade in the 21st century. The strategy calls for the exploitation of our potential as a nation to become a major regional hub for research and development (R&D) for knowledge-based technologies and as a major production platform for I.T.-based products and services.

Through Executive Order No. 125, which I issued last July 19, 1999, I have endorsed the *National Information Technology Plan for the 21st Century*, or I.T. 21, as our plan of action to guide our efforts in harnessing information and communications technology for global competitiveness. I.T. 21 clearly sets our vision of becoming a knowledge center in Asia by the first decade of the century.

But from the time we have promulgated I.T. 21, so much has changed and new developments have evolved. That is why I am now directing the National Information and Technology Council to review the plan in the light of these changes and new developments. I would especially want to see the wider and more effective use of ICT in government, particularly in ensuring faster delivery of public services, as well as transparency in government operations and transactions.

For us to be able to partake of the many opportunities offered by the knowledge economy, we have to build on our strengths and overcome our weaknesses. And the opportunities are manifold—substantial and increasing spending worldwide, particularly in Asia. We see a fast-growing global market, and the Philippines is poised to claim a bigger share of this global market.

Hence, I have directed the Department of Trade and Industry (DTI) and the Department of Science and Technology (DOST) to work together to make sure our country's actions are demand-driven, strategic, coordinated, and dynamic.

The DTI, under the stewardship of Secretary Mar Roxas, has taken a number of bold steps to keep our industries competitively linked to the global market, generate global demand for our ICT-Based products and services, and help prepare our people for the jobs of tomorrow.

First, and most importantly, I have directed Secretary Roxas to consolidate the number of dispersed e-commerce efforts of the national government under a reactivated and expanded E-Commerce Promotion Council, of which he is chair. Foremost on their agenda is to fulfill their mandate to formulate and coordinate the implementation of a national program and strategy for the promotion of e-commerce in the Philippines. I expect Secretary Roxas to submit this plan by end of June.

Even as this consolidation effort is taking place, however, immediate concerns cannot be put on hold. Thus, we have updated investment policies and undertaken promotional activities in order to keep the Philippines as the preferred location for I.T.-related and enabled services. Given the present competition for investments, we must ensure that we maintain our attractiveness as an investment site—or run the risk of being overlooked or sidelined by investors. Among these initiatives are:

First, the development of I.T. parks. – I have approved three so far, namely, the Eastwood Cyber Parks in Quezon City, the Northgate Cyber Zone in Alabang, and the Fort Bonifacio-Silicon Valley I.T. Park in Fort Bonifacio, Taguig—where competitive fiscal and non-fiscal incentives are offered. A software development park has also been established at the Subic Economic Zone, and the Ayala Group has announced the proposed development of I.T. park in Cebu.

Second, the explicit inclusion of professional I.T. services in the investment priority plan for fiscal year 2000. This means that I.T.- related activities will enjoy prime incentives from the board of investments.

Third, the launching of a series of focused I.T. investment mission to the United States, Korea, Japan, Europe and Australia, which will promote the Philippines as the I.T. services hub in Asia. Secretary Roxas is, in fact, in the United States for this very purpose and is scheduled to meet with a number of potential investors, locators and outsources.

Fourth, the creation of an ICT innovation and development fund to provide venture capital for ICT business start-ups and support for ICT research. The National Development Corporation under the DTI has already identified I.T. as a priority and is exploring mechanism to reach Techno-Entrepreneurs.

Finally, I.T.-related activities have been highlighted under the proposed amendments to the Omnibus Incentives Act. Our legislators anticipate that these amendments will take effect by the third quarter of this year, and will feature a number of non-fiscal incentives to match, if not surpass, that offered by others in the region.

On this note, I am happy to announce that the legal framework for our country's participation in electronic commerce is also around the corner with the passage in the Senate of the E-Commerce Bill. The bill defines our policies on electronic transaction and will enable us to participate actively in this global trend for trade and commerce. I would like to thank Senators Ramon Magsaysay, Blas Ople, Juan Flavier and Vicente Sotto for co-authoring this bill.

A national program and strategy for the promotion of e-commerce and a knowledge economy is premised on the capability to acquire and adopt global knowledge while creating knowledge locally. The implementation of a rational technology policy, which can integrate human and technological capabilities in productive ways, is indispensable. We will need to invest heavily in human capital, in innovation and research, and more importantly, in enabling technologies that facilitate the transfer of knowledge.

The Department of Science and Technology, under the leadership of Secretary Filemon Uriarte, is at the forefront of this effort.

Its *Comprehensive Program to Enhance Technology Enterprises*, or **Project COMPETE**, seeks to develop two very important sectors of the knowledge economy: microelectronics and information technology. Over a period of five years, investments amounting to around P7 billion will be made for the operation of *Virtual Centers for Technology Innovation*, or VCTI, for the two sectors. The VCTI in microelectronics will catalyze research and development and original products design, as well as develop our capability in application specific integrated circuit, or ASIC Design, while the VCTI in information technology will develop capability for content design and software development. In partnership with I.T. industry leaders like oracle and sun Microsystems, the project will produce at least 5,000 internationally certified I.T. professionals.

The DOST is also implementing a project that will enable Philippine research and academic institutions to participate in networking research and experimentation under a Japanese research initiative called the Asian Internet Interconnection Initiative. Through this, local researches will gain operational experience that will be used in expanding the internet and its use in the Philippines.

I have also asked the DOST to submit to me its recommendation for the reorganization, expansion and strengthening of its Advance Science and Technology Institute (ASTI) to convert it into the country's premier agency for ICT research and development. This will further develop our capability to conduct world-class R&D in information and communications technology. The National Computer Center has also been transferred from the Office of the President to the DOST to further strengthen our ICT efforts.

I also want the National Information and Technology Council to be further strengthened. And I want I.T.21, the comprehensive blueprint for I.T. development in the country, to be updated in the context of globalizing knowledge economy. In view of this, I encourage the organizers to identify the key challenges in k-economy within the next five to ten years. Accordingly, I ask the NITC to submit to me its recommendations.

Finally, my administration is making a deliberate push to make sure that our future generations are better prepared to access the benefits of the ICT revolution and improve the quality of their lives. For the past few years, we have been involved in upgrading the computer facilities in various high schools and providing even remote elementary schools with access to computer facilities using mobile information technology classrooms.

I cannot overstate our country's need to increase its capacity to use knowledge. Our neighbors are vigorously developing and implementing national knowledge strategies and are catching up with the rest of the develop countries. We need to do much more. We need to work much faster. We need to increase our knowledge base by investing in research and development and in human resources development. We need to take advantage of new technologies for acquiring and disseminating knowledge. We need to develop information and communications technology in the country.

Poor countries differ from rich countries because poor countries have less knowledge and a lower capacity to create knowledge. Closing this knowledge gap will not be easy and will require difficult decisions, formidable coordination and strong political will. But, once these elements are on-stream, the knowledge gap can, indeed, be closed and within a short period of time.

My administration is firmly behind this effort and key agencies have been empowered to get the job done. I am confident that we as a people are up to the task.

Thank you and good day.

PLENARY SESSION I

THE ROLE OF GOVERNMENT IN A KNOWLEDGE-DRIVEN ECONOMY

Toby Melissa C. Monsod

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On behalf of

Manuel A. Roxas

Secretary, Department of Trade and Industry

Two years ago, the US justice department joined 19 state attorney generals to file a landmark anti-trust lawsuit against Microsoft, the world's biggest software company. The charge: that Microsoft had abused its monopoly power to the detriment of consumers. In the 1st of April, the Judge Thomas Jackson, ruled against Microsoft and last Friday, April 28, the proposed remedy by US regulators was to break up Microsoft into two companies. While arguments have yet to be heard, Microsoft has taken its case directly to consumers calling the proposal 'random', 'out of bounds', showing the regulator's ignorance of how the industry works.

The issues surrounding the Microsoft saga have ranged from (1) whether or not MSN did indeed violate anti-trust laws, to (2) whether the anti-trust laws were outdated and inapplicable to the IT industry, to (3) whether the proposed remedy—a break-up of Microsoft—could indeed generate enough benefits to offset the costs and risks: will it engender healthy competition? Will consumers be better off?

Clearly, the Microsoft saga is just a sampling of what is in store for national and international governing bodies as the new economy continues to evolve. These issues will demand public-policy decisions at a speed as fast as technology travels – much sooner and faster than governments are known to act.

Preliminaries

For purposes of this paper, we define a K-economy as one where knowledge—its creation, conversion, utilization—is the central factor driving economic activity and the creation of wealth. In a k-economy, knowledge-related jobs are created and new disciplines emerge as knowledge is applied, further stimulating the economy to create more wealth. Most of the economically advanced and technologically developed economies today are knowledge-based. In these economies, knowledge is a key factor of production much the same land, machinery or other resources have been. These latter resources are exhaustible and scarce; but knowledge and innovation need not be.

In this context, the concern of government is for knowledge to be efficiently produced, equitably used, and harnessed in the interest of development.

To determine government's specific role and actions however, we first have to agree on the features of a k-driven economy which may warrant government action in the first place. More specifically where are the **market failures**—or, the **public goods, externalities, increasing returns to scale, too much risk or uncertainty** which may give rise to market failures? Alternatively, is there a social objective such as **equity** which private behavior alone will not fulfill?

We then determine what kind of responses government can consider to address these failures—including the option to do "nothing". Market failure is a necessary but not sufficient condition for government action. It is not sufficient because the remedy - government intervention - may turn out to be even more costly.

Features of the K-economy which may indicate government action

There are four features of a k-economy which may indicate government action.

1. *Knowledge as a Public Good:* Knowledge is a public good because it is non-rivalrous and non-excludable in consumption. This means that no one should or can be excluded from enjoying its benefits'. Consequently, it will be difficult to appropriate a profit from the production of knowledge and, therefore, little incentive for the private sector to engage.

Knowledge is also one of five *global public goods* (Stiglitz).² As a global public good, its consumption is not limited by geography; nor is it limited by time since every innovation draws upon a global pool of pre-existing knowledge. It is clear that for successful development a country must be able to effectively tap into this global pool.

2. *Internet as a Public Good*: The Internet as we know is the “network of networks”. It is a, if not, *the* global medium, transcending national borders and, as e-commerce is causing, fusing economies into one “seamless market”. The Internet’s pathways are non-excludable and non-rivalrous in much the same way knowledge is: so long as a user can gain access to a phone line, a computer and modem, there is no way to prevent access to the network itself and the entrance of a new user will not require an old one to go off-line. With wireless technology, access is even less constrained.

Moreover, because of its potential as a tool for learning, health care or for development (such as when it opens up market access to SMEs), it can be considered that much more qualified for treatment as a public resource.

In the face of public goods, efficiency requires public provision, that is, the state should play some role in the provision of knowledge or else it would be under-supplied. For instance, issuing patents and copyright protection for types of knowledge that underlie new processes or products is one government strategy that allows producers to appropriate benefits for a temporary period at least³. Direct government support is also an option although more risky: not will government have the burden of distinguishing between good and bad projects but the public at large would have to bear costs of any bad judgment.

Having said that, however, there are types of knowledge whose benefits cannot and should not be patentable—for instance, basic research on how to organize society, how to live healthier lives, how to manage the environment - and for which efficiency may require not only national direct support but global support and incentives for the private sector to undertake such research. Other knowledge-infrastructure that a country should have in order to tap the global pool of knowledge is good education in science and technology (beyond primary education), a mechanism to encourage foreign direct investments with great technology/knowledge spill-overs, and an effective dissemination network such as the Internet. Countries must jointly act to ensure that everyone is contributing to the global pool, that no one is free-riding and that the use of the pool is consistent with broad notions of equity.

Government’s positioning with respect to the Internet (as a public good) is less clear. On the one hand, it seems that the Internet is largely **ungovernable**. It is developing too fast for the government to try and keep up, much less regulate. Not only will it be easy for firms to simply re-route activities to avoid regulation but on-line activities cut across multiple jurisdictions, each with their own laws/policies.

On the other hand, for reasons of equity and the need to augment a small domestic market, governments cannot be totally absent either:

3. *Digital Divide*: E-commerce can just as easily exclude markets as it is now integrating them. Commerce will seek the locations which are most friendly to it and will not go to areas which are legally, technologically or economically backward. The net is also becoming increasingly congested and services performed on it (as distinguished from the pathways themselves) increasingly exclusive. It is not difficult to imagine the internet becoming a set of private enclaves where access is prioritized for a fee.

The possibility of being bypassed or the threat of a worsening **digital divide both within a country and among countries** suggests a proactive rather than a laissez faire approach to policy by individual governments and groups of nations.

4. *Small Domestic Market*: Governments in developing countries usually catalyze new industries by boosting demand and confidence thru the demonstration of applications and the promotion of mass use. The same would be true in the Philippines where, despite growth in the market, the current level of domestic demand for e-commerce/IT services remains small and society is still on a learning curve with respect to the processes, safeguards and applications of IT/e-commerce.

A Government’s Response

As mentioned earlier, the concern of government is for knowledge to be *efficiently produced, equitably used, and harnessed in the interest of development*.

From the above discussion, it seems that, all in, an active, "plain vanilla" response to the Internet (in particular) and IT/e-Commerce (in general) is the inevitable policy choice of government. This would be characterized by a focus on the "nuts & bolts" of the communications infrastructure in order to open up Internet access to as many people as possible rather than constrain private activity (and run the risk of losing the private sector during the first critical years). It would also feature direct participation in services such as education, medicine, and market access information - those with high societal benefits but limited profit potential. Finally, it would include participation in inter-governmental coalitions and policy for a, particularly for developing countries who have the most at stake in ensuring the continued open development of the net. We cannot afford to be left with an Internet characterized by restrictive private enclaves or governed by a priority system that will put poor users at the bottom of the line. Engagement in multilateral discussions is necessary to ensure international coordination and harmonization of laws as well as consistency of global policies with broad notions of equity.

Specifically, three sets of actions can be distinguished:

1. *To ensure the efficient production or transfer of knowledge*
 - Establish an enforceable regime of Intellectual Property Rights
 - Provide direct (and global) public support for basic research
 - Focus investments to build human resources/intellectual capital, i.e. in science and technology
 - Target foreign direct investments with high potential for knowledge spillovers and have mechanisms to ensure that these spillovers are utilized
2. *To ensure a more equitable use and dissemination of benefits*
 - Provide basic telecom access at low cost. Alternatively, find innovative ways to increase access to the net, such as public Internet terminals or community-based kiosks
 - Capitalize on potential externalities, such as from e-education, medicine, market access
3. *And finally, to ensure the effective use of knowledge for development*
 - consolidate government efforts and provide a focused organizing framework which can motivate efforts and popularize a vision, catalyze catch-up activities and inform positioning on an international level.

Scorecard for the Philippines

In a recent study from the Philippine Institute for Development Studies (Austria, 2000), it was observed that the long-term competitiveness of the Philippines IT industry was at risk. The industry was not exporting the right products, it was not moving up the technology value-chain, and so forth. Among the reasons listed were:

- Inadequate investments in R&D, i.e. accounting for 0.2% of GNP versus 3% among NIE's;
- Lack of specialized skills for high value-added IT products;
- Infrastructure and institutional bottlenecks, i.e. high cost of doing business, which erode profitability and competitiveness; and
- Low domestic demand for IT applications.

The most critical observation however was the lack of political will to implement a comprehensive policy to promote IT as an industry. It remarked about the lack of focus of IT 21, the government's IT plan to make the Philippines into "Asia's Knowledge Center", and the fragmented efforts of government.

Measures to correct this state of affairs have begun with the following actions:

1. **Consolidation of E-commerce promotion and development activities under the e-Commerce Council (e-CC)**, which is chaired by the Department of Trade and Industry. The first major activity of the reactivated e-CC was a private sector-led process last April 13 to articulate an Internet strategy for the Philippines, or ISP.com. This included the identification of the IT industry's **niche** products and services around which R&D, manpower development and investments can be focused.

2. **Solid collaboration between the DOST**, which co-chairs the National Information Technology Council (NITC), **and the DTI**, with the latter focused on the business/commercial aspects and the former on the technology aspects. One of the reasons e-business/commerce is not yet fully appreciated by the government is that the business or commercial imperative has not been emphasized in the "K-economy" story. But the commercial imperative is just what is needed to re-orient efforts into one which is demand-driven, rather than driven by science/knowledge for its own sake. The IT/K-

economy phenomenon is not about science per se but about globalization, commerce, survival - and we must align our efforts accordingly.

3. With respect to other key activities:

On-stream:

➤ IPR Regime: the IP Code has been in place since 1997 although enforcement must be strengthened. A "Task-Force Piracy", modeled after TF Aduana, is being contemplated.

➤ Investment promotion, particularly for FDIs with management and technology spillovers: DTI is currently promoting the country as the "IT Services Hub of Asia", making an aggressive pitch for locators and contractors of IT-enabled services.

➤ Alternative mechanism to introduce or provide access, i.e. by distributing personal computers to public schools. Both the DECS and DOST have been engaged in this and recently DTI was designated to lead a task force on 'PC's for Public Schools' to consolidate both private and public sector efforts, focused especially on public high schools. For poorer areas which cannot yet prioritize or maintain such a project, DOST has a program to deploy mobile laboratories which will provide children an initial introduction to computers. As recommended by the private sector, computers and the net must be used to enhance education in English, Math and Science, and not simply for computer skills per se.

➤ International Arena: participation in the E-ASEAN Task Force and other fora.

Still exploring: education, medicine and market access applications

Urgently needs more attention:

➤ Investments in R & D

➤ Human resource development strategy for the K-economy: A scan by private sector participants in the ECC observed that although Filipino talents were among the best in the world, we were missing out on the opportunities of IT/e-Commerce because (i) there were not enough qualified entrants, (ii) ongoing brain drain and (iii) new graduates were less skilled in math and English. The last observation is alarming since facility in English has always been one of our advantages.

¹ No one should be excluded (i.e. non-rivalrous), because, even if it was possible to exclude, there is zero cost to sharing its benefits. In which case, it cannot be privately provided, i.e. at zero price, only knowledge that can be produced at zero cost will be produced. On the other hand, it would be difficult, if not impossible, to even try to exclude (i.e. non-excludable) people from consuming it. Private producers would not be able to make a profit and consequently, no one would be motivated to producing it.

² The other four suggested by Stiglitz international economic stability, international security, international environment, and international humanitarian assistance.

³ A patent system, whether national or international, affects the way gains are shared. Consequently, its design - duration, scope, coverage - will have distributive (such as between developed and developing countries) as well as efficiency consequences (such as the pace of development). One adverse effect of an overly rigid patent system is illustrated by the Microsoft case where Microsoft allegedly attempted to leverage its power from its control over a dominant PC operating system into a broader dominance in application software (Microsoft Office). To mitigate risks associated with a patent, an effective anti-trust or competition policy may be needed.

PLENARY SESSION II

ENHANCING ASEAN ECONOMIC GROWTH THROUGH THE K-ECONOMY

Hokoan Park

President, Korea Institute of Science and Technology

1. Introduction

As the 21st century dawns, a successful transition toward the knowledge-based economy is being placed at the top of national agendas all over the world. A knowledge-based economy is one in which the generation and exploitation of knowledge plays the dominant role in the creation of wealth. Knowledge, as embodied in human capital, has always been central to long-term economic development. However, during the last several years, the importance of knowledge and technology has grown dramatically as the driving force of economic growth and national productivity.

What is the key agenda in order for ASEAN nations to make a successful transition toward becoming a knowledge-based economy? There is a consensus that closing the knowledge and technology gap is key for reaching the level of developed nations, and successfully transforming its economy into one that is knowledge-based. In this regard, a recent report from Stanford University indicates that factor-wise contributions to America's economic growth during the last 50 years have been capital: 26%, labor: 26%, and science and technology: 48%, while another report shows the importance of technological innovation for economic growth. According to the Bank of Boston, if the companies founded by MIT graduates and faculty were to form an independent nation, the joint revenues produced would place that national economy at 24th largest in the world. These research results have clearly shown the importance of technological innovation in economic growth and performance.

In discussions on knowledge-based economy, developed nations place great concern on the diffusion and use of knowledge. However, enhancing the supply side for knowledge creation is as important as knowledge use and diffusion for Korea and other ASEAN nations because there is still an enormous knowledge gap between ASEAN nations and developed nations. Therefore, there is need for a dual approach for enhancing both the supply side of the knowledge base and the diffusion side for knowledge use. This is the most important agenda ASEAN nations are presently faced with, and is a subject to find its solution.

In this perspective, I would like to examine the agenda for the transition to a knowledge-based economy, and explore the lessons from developed nations, which are in the process of successful transition. Then, I will introduce policy suggestions for promoting ASEAN economic growth largely based on Korea's experiences and policy direction.

2. The Agenda for the Transition to Knowledge-based Economy

The remarkable economic growth of ASEAN nations over the last 30 years has been the subject of worldwide attention. In 1997, this region was, however, struck by economic crisis, leading to the creation of serious economic stagnation and a high rate of unemployment, and collapsing the belief of Asia's economic growth. Lately, significant economic recovery has been realized, but the sustainability of economic growth in Asia is still uncertain.

It is widely debated that the economic crisis of ASEAN nations has been mainly due to the vulnerable financial system and reckless over-investment by industries. In particular, the financial system has brought about the inefficiency of capital usage, and has caused enormous excess production capacities in many industries. The current economic reform in ASEAN nations has been focused on financial and corporate restructuring. However, uncertainty still remains whether such restructuring is sufficient for ensuring the sustainability of economic growth.

To regain the ASEAN nations' economic growth potential and to revitalize their economies in the 21st century, the legal and administrative framework for expanding the knowledge base must be sternly and urgently enhanced. A redirection of ASEAN nations' economic structure is requisite for being adaptable and capable of attracting the best global managerial and technical knowledge. To make a successful transition to becoming a knowledge-based economy, the ASEAN nations especially need to take active action in following agendas.

First, closing the knowledge gap in all arenas, from knowledge creation to knowledge diffusion, is no less important than any other agenda. The knowledge gap is not only with technical skills, but also in managerial and

functional skills. Closing this type of gap will depend on the movement of internationally sophisticated professionals into ASEAN nations. To achieve this, ASEAN nations will need to attract foreign professionals and manufacturing firms to come to ASEAN nations, and to exploit the links ASEAN nations have already formed overseas. These changes need to be complemented by changes in the education system, particularly to enhance linguistic and multi-cultural skills.

Second, ASEAN nations will need to facilitate the transition themselves to become an entrepreneurial society. In developing nations, growth in wealth and employment frequently comes from large corporate groups. In the more developed nations, this growth tends to come from the establishment and growth of new entrepreneurial companies. This entrepreneurial growth will be crucial for the generation of economic growth in ASEAN nations and for the creation of new jobs. However, to facilitate the entrepreneurial start-up in ASEAN nations, several barriers should be removed. These include inadequate financing, difficulties in hiring skilled people, bureaucratic red tape, and a lack of incentives for the new talents who have entrepreneurial potential.

Third, becoming globally connected will be crucial for achieving a competitive economic position. One of the defining characteristics of the knowledge-based economy is that it is truly global. Markets are no longer defined by, or limited to, national boundaries. To make ASEAN nations globally connected, institutional infrastructure needs to be established for constructing the knowledge link to the rest of the world. Especially, ASEAN nations need to reduce their barrier to trade, and remove barriers to investment by foreign businesses, including obstructive legislation, multiple regulations, and inflexible labor policies. In addition, the improvement of intellectual property law up to the international standard is necessary. With these efforts, it is essential to create a social and cultural atmosphere for properly valuating the intellectual property.

As discussed above, great efforts in wide areas are required for ASEAN nations to successfully transform into a knowledge-based economy. These are also urgent agendas for Korea, which has been implementing the transformation of its economy to knowledge-based economy since the late 1990s. As indicated in the figure below, Korea has made remarkable economic growth by creative imitation of foreign technologies and rapid increase in labor and capital input. However, to revitalize its economy, it is necessary for Korea to acquire a new driving force based on knowledge, and to transform its economy into one that is technology and knowledge intensive, based on this new driving force.

The transition to a knowledge-based economy is considered as an immense challenge for Korea and ASEAN nations that have relatively a weak knowledge base compared with developed nations. Especially, building the technological capabilities is the key agenda for both Korea and other ASEAN nations. In this regard, many economists and world-level consulting firms have pointed out that the knowledge gap is a major obstacle to the revitalization of ASEAN nations' economies. Further, they have emphasized the importance of technological capabilities for the economic recovery of ASEAN nations. Finding a new growth engine based on technological innovation, and transforming into a knowledge-based economy will determine its further progress towards becoming a developed economy.

3. Lessons from Developed Nations in the Transition to Knowledge-based Economy

Most developed nations around the globe are racing to prepare themselves for the emerging knowledge-based economy. Nations respond to this new environment in various ways, as a consequence of their different cultures, national priorities, and economic status. However, the developed nations have all put it in the highest priority in implementing their economic and industrial policy. Most nations have created visions describing a future based upon the changing economic and social development, and heavily invested in acquiring new technologies to achieve those visions.

United States

In the early 1980s, factories closed and massive layoffs displaced hundreds of thousands of people, putting them from the smokestack industries onto the dole. By the mid 1990s, these dislocations had been overcome, and their losses replaced. This is mainly because of the rapid expansion of the new economy, which is generally interpreted as the knowledge-based economy. US companies were the first to realize the importance of IT related technologies and have had invested massively in them, accounting for over 40 percent of the world's investment in computing. As such, US manufacturers have effectively made the transition from the smokestack era to the information age. They have replaced mass-produced consumer goods with sophisticated products that contain a huge proportion of intellectual capital. The cultural element is also not to be underestimated in the accomplishment of this success. American culture generally encourages individualism and entrepreneurship, and it dramatically opens up to energy and talent rising from the bottom up.

Generally, the US spends vastly more on research and development than its competitors, and the gap between the United States and the rest of the world is growing. The US government raised its science and technology budget ratio from 3% in 1996 to 5% in 2000. The US government is also implementing the 'Information Technology 2 Initiative' project to acquire technological leadership in the IT arena. Furthermore, the US is active in gaining technological leadership in nanotechnology, which is considered to lead the next industrial revolution. Nanotechnology is a key technology that has huge impacts on other technologies such as information & communication, biotechnology, and new material. The US plans to double its R&D investment in nanotechnology by 2001, and assist related research areas in the long-term period.

Canada

The Canadian government strongly believes that knowledge becomes a more important source of economic growth and comparative advantage than traditional sources of comparative advantage in Canada. To foster the knowledge-based industries, the Canadian government set the criteria to select knowledge-based companies. According to the criteria, companies with a high ratio of R&D expenditure to gross revenue and a high ratio of knowledge workers to total personnel are selected as the knowledge-based companies. Currently about 25,000 businesses in Canada fall in the knowledge-based category, and they are rapidly growing their contributions to Canada's economic performance. In 1998, the contribution by knowledge-based companies to the Canadian economy accounted for 56% of its total GDP.

Canada recognizes the central importance of education and the need for its young people to form the core of the technologically literate and versatile work force in the knowledge-based economy of the future. In 1999, the government announced a budgetary investment of US\$1.2 billion in IT projects, incorporating a US\$134 million investment in the education system. In addition, Canada has invested heavily in transportation, education and telecommunications infrastructure to support economic growth through the expansion of the knowledge-based economy. The Canadian government strongly believes that the building of a solid knowledge infrastructure will stimulate growth through creating new jobs, and will increase productivity through innovative new processes, in both private and public sectors.

Finland

Finland is considered as excellent model that has very successfully transformed into a knowledge-based economy. In the past 50 years Finland's agricultural population has declined from 70 percent to 6 percent. It has effectively transformed itself from being a commodity-based economy to one that has embraced new technologies. Many of its agricultural firms have converted to new knowledge industries. Nokia has come to symbolize Finland's high technology shift. Once a huge pulp and paper company, Nokia changed its business focus only in the late 1980's, but has become one of the world's leading electronics companies. The company now accounts for more than 15 percent of the country's exports. Currently high-tech industry as a percentage of the Finnish GNP has jumped fivefold in one decade. As a result, Finland's GNP per capita has increased very rapidly.

How did the Finns do it? Finland had pursued high levels of information technology penetration with a clear national vision and strategy. In 1994, the government announced its national strategy, *Finland's Way to the Information Society* (Ministry of Finance, 1996), and backed it up by deregulating the telecommunications sector and launching programs to stimulate a knowledge-based economy. The government has made huge investment in education, making computer literacy a key component of the school curriculum and producing large numbers of graduates in technical fields. Also, Finland's innovative firms do not wait for handouts from their government and invested heavily in R&D. While the world's top 300 companies spent an average of 4.6 percent of sales on R&D, Finnish companies spent more than double the OECD average, at 10.4 percent.

In many ways, ASEAN nations can learn from the developed nations, which may facilitate a successful transition toward a knowledge-based economy. First, governments played a key role in creating vision and strategy in accelerating the transition to the knowledge-based economy. Government involvement was somewhat inevitable in the stage of creating vision and strategies, in particular for developing economies because they have not completed the transition to the market-led economy yet. Second, those nations heavily invested in education and R&D, especially in the newly growing areas of IT, bio-technology, environment, etc. This is because they recognized that knowledge workers and technological capabilities are key for making a successful transition to a knowledge-based economy. As part of this, they implemented the national R&D program to acquire core technological capabilities together with increasing the R&D budget. Third, creating an entrepreneurial culture is also not to be underestimated. In the knowledge-based economy, the challenges, creativity, and entrepreneurialism of each individual are the substantial assets that ensure economic prosperity.

4. Policy Suggestions for promoting ASEAN's Economic Growth

ASEAN nations have made remarkable economic growth. Today, the growth potential of this region is bigger than any other region in the world, and its success is the subject of worldwide attention. However, ASEAN nations are faced with new challenges in successfully transforming their economies to knowledge-based ones. To do this successfully, building the core technological capability is considered to be the most important and urgent subject for ASEAN nations. In this perspective, I would like to discuss the policy suggestions for building core technological capabilities based on Korean experiences to promote ASEAN's economic growth.

First, to make the successful transition toward the knowledge-based economy, it is very important to enhance the capabilities of the knowledge generation, especially core competency that ensures creative fundamental and basic technology. Creative fundamental technology is the basis of the knowledge-based economy and a strategic asset for economic growth. There are a number of examples that represent the importance of creative fundamental and basic technology. As an example, since CDMA (Code Division Multiple Access) was commercialized as a Korean standard of mobile telecommunication system in 1995, Korean mobile service providers and handset makers have paid around US \$490 million to Qualcomm, a US based multinational firm, until June of 1999 in return for licensing of CDMA fundamental technologies.

The above example clearly represents that it is hard for Korea and ASEAN nations to catch up with developed nations without acquiring creative fundamental technology. The economic gap between developed nations and developing nations means, in essence, the gap of capabilities in fundamental technology. In developing nations, the public sector such as public research laboratories and academia should carry out key functions in developing creative fundamental technology. Public research laboratories should especially realize the production of new knowledge through basic research with its newer role of collaborating with industry in the transfer of knowledge and technology through licensing and spin-offs.

In this perspective, KIST (Korea Institute of Science and Technology), of which I am president, would provide valuable lessons and guidance to ASEAN nations. Since the middle of the 1990s, KIST shifted its research direction toward developing creative fundamental technology to correspond to future needs, by re-establishing its long-term mission and role. Currently, KIST is concentrating its research capabilities on 4 strategic research areas, namely biotechnology, new materials, information technology, and environmental technology.

Though only five years have passed since KIST shifted its research direction, the result has been very successful in terms of its range of application and its socio-economic impact. The representative examples of research outcomes are molecular design and surface modification by ion beam irradiation, microbial fuel cell type BOD sensor, and oral pneumonia vaccine. These research results have been transferred to industry as a licensing and entrepreneurial start-up business. Currently 22 high-tech start-up businesses are undergoing the incubation process in venture center located in KIST. In order to transfer its technologies and facilitate entrepreneurial start-ups more effectively, KIST is implementing the creation of a venture valley by networking universities, research institutions, and enterprises around the Hong-Reung area where KIST is located.

Second, the facilitation of entrepreneurial start-up businesses is of the utmost importance. Entrepreneurial start-ups will be indispensable to drive the next wave of growth in ASEAN nations and to modify the nation's economic structure toward the knowledge-based economy. In order to facilitate the entrepreneurial starting-up of businesses, governmental support is inevitable in the initial stage, in the aspect of creating an entrepreneurial environment and infrastructure.

In this way, Korea's experience can provide very meaningful policy lessons for ASEAN nations in facilitating entrepreneurial start-ups. Korea is one of the fastest growing nations for increasing entrepreneurial start-up businesses. Currently, around 5,600 start-ups are operating, most of which were introduced within the last 2 years. The Korean government has played a central role in helping entrepreneurialism in Korea to flourish. The government launched a set of initiatives to encourage entrepreneurs and venture businesses. A law has been enacted in 1997 to offer tax incentives to entrepreneurial start-up businesses and to create a genuine venture capital market. Additionally, public research laboratories and universities assume responsibility for creating an environment that will help to accelerate entrepreneurial challenge. They are motivating potential start-up businesses through expanding business incubation facilities: and creating a network of shared technical and marketing information.

Furthermore, they actively encouraged their researchers and professors to spin off or start businesses by providing various incentives. For example, some public research laboratories allow their researchers to return to the institute if they leave jobs to start a business. This means that institutes share risks with entrepreneurs by providing job guarantee

in the case of business failure. As a result of these efforts, approximately 250 businesses each month are starting in the fields of information technology and bio-technology. As can be seen from the Korean experience, government initiative is very important in facilitating entrepreneurial start-ups in early stage.

Third, to make a successful transition to the knowledge-based economy, securing highly skilled workers is indispensable. The transition to the knowledge-based economy is dramatically increasing the demand for highly-skilled workers due to both the rapid expansion of knowledge-intensive industries and the sharply increasing importance of creating and exploiting knowledge and information in all sectors of the economy. ASEAN nations' ability to attract, retain and develop highly-skilled talent is of critical importance for enhancing its competitiveness in the knowledge-based economy. In addition, as the market for skilled workers becomes global, ASEAN nations must compete with others for highly skilled people. This international competition is intensified by the fact that a shortage of them exists worldwide in areas such as information technology, and biotechnology. These are making it increasingly difficult for ASEAN nations to secure the highly skilled workers they need.

To secure highly skilled workers, ASEAN nations need to review their long-term perspective on the educational system, and construct a new human resource development system. It is especially important for companies in ASEAN nations to use a number of tools to meet the challenge of retaining and developing highly-skilled employees, including in-house training programs, flexible work arrangements, innovative human resource management strategies, and life-long learning system. Furthermore, governments need to develop their institutional and physical infrastructure to attract and retain highly skilled workers by promoting ASEAN nations as an appealing place to work and live.

Finally, to accumulate the technological capabilities that are the core of the knowledge-based economy, research experience and resources, and information at national levels must be shared. Especially, scientific and technological cooperation between Korea and ASEAN nations is essential. This will provide various opportunities to diversify the import sources of technology for ASEAN nations and to expand the basis of future economic cooperation for Korea. In scientific and technological cooperation, R&D institutions are very effective because they have practical experiences of technology development, and as such, can play a leading role in exchanging their development experiences. In this perspective, KIST can be a good example of sharing and transferring experiences and know-how with ASEAN nations.

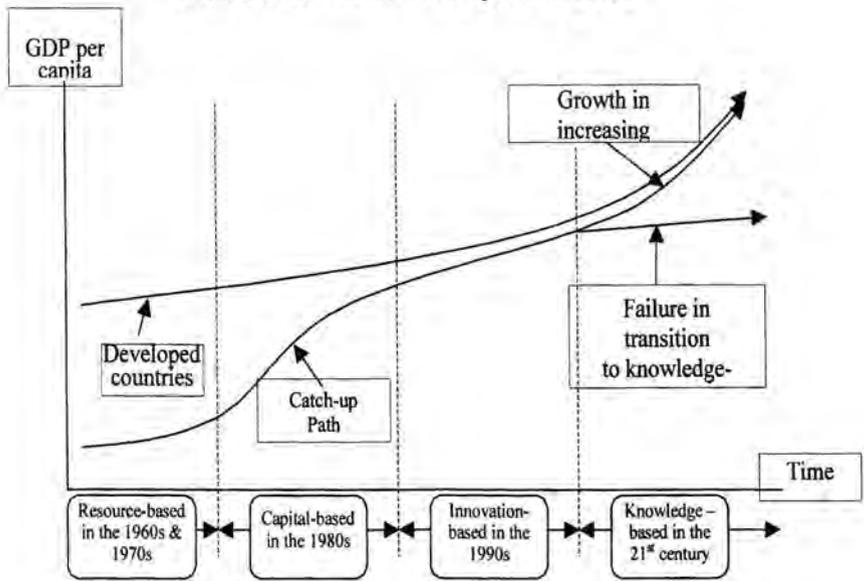
KIST is currently conducting a collaborative project with Vietnam to assist in establishing a KIST-model public research institute in that nation. Establishing such R&D institutions in developing nations will contribute to building their own technological capabilities for industrial development. KIST's assistance to Vietnam will include training of researchers, dispatching experts, granting research facilities, and so forth. Such a collaborative activity has great potential for expanding cooperation, which in turn will provide opportunities for cooperation between private sectors. We can see it clearly from KIST's case. BMI (Battelle Memorial Institute) in the United States has helped found KIST in the initial stage, providing consultation in designing research and management systems. It contributed not only to the successful functioning of KIST, but also to efficient technology inflow from the United States. The assistance from KIST to Vietnam is expected to produce similar effects, and can be a typical example of a bridging role by Korea to advance S&T cooperation with developing nations.

In addition, about 100 visiting researchers from developing nations are annually conducting research projects at KIST in areas such as new materials, information technology and environmental science. KIST has every expectation that transferring or sharing scientific knowledge, experiences, and skills will be made through such cooperation, as well as through interactions with other nations. Especially I wish to facilitate the cooperation between KIST and public laboratories in ASEAN nations in developing technological capabilities together.

Following the "information revolution", the "knowledge revolution" will be penetrated in the 21st century as the key for enhancing national competitiveness and creating socio-economic value. Most developed nations started the transition toward the knowledge-based economy, and have already obtained considerable outcomes. There is an important fact that we must recognize, that all developed nations, which made a successful transition to the knowledge-based economy, developed their own distinctive capabilities in technological core and unique technology development system.

While developed nations have at least 100 years history in technology development and knowledge accumulation, ASEAN nations recently realized their importance. Therefore, the transition to the knowledge-based economy is a big challenge for ASEAN nations. However, ASEAN nations have the potential to overcome this challenge, considering that ASEAN nations successfully closed the gap from the developed nations in only 20-30 years. In particular, it can be considered as a chance for ASEAN nations to jump to the level of the developed nations if they can successfully complete the transition to the knowledge-based economy. In ASEAN nations, the transition to knowledge-based economy is no longer optional, but mandatory, to continue their economic prosperity in the 21st century.

Economic Growth and Catch-up Path in Korea



PLENARY SESSION III

EDUCATION IN THE KNOWLEDGE ECONOMY

Andrew Gonzalez, FSC

Secretary, Department of Education, Culture and Sports

1. Introduction

This present century has been variously described as the era of the knowledge economy or the information society. In simpler terms, it means that the new source of wealth (and therefore of livelihood) for the majority of society will be based on information and knowledge more than manual labor and that therefore a premium will be placed on intellectual ability and productivity more than brain. As the management guru Peter Drucker stated many years ago, society will be dominated by knowledge workers instead of manual workers.

When these pronouncements were being made more than a quarter century ago, I do not think that most of us really understood the consequences of these projected developments now upon us. The consequences are staggering and for us in education or the knowledge enterprise, they demand a paradigm shift that few of us are really ready for.

We must stress, however, that the developments do not apply to all societies, only to certain societies that have attained a certain level of social and economic as well as scientific development. What is awesome is that if a society fails to catch up with the rest, then the distance between that society and the rest of the societies in the knowledge society domain will be greater, the cultural lag larger, and the time and resources needed to catch up will be even more pronounced making it more and more difficult for the delayed society to have the wherewithal to enjoy the same benefits for its people as the modernizing societies will have.

2. Implications for Basic Education

I should like to dwell only on basic education, which is my area of responsibility and concern.

At one time, as President Estrada so often mentions in his speeches, in the 1950s, our economy and our accompanying systems (including the educational system) were second only to Japan. This is no longer true less than fifty years later, for we are lagging far behind in science and mathematics achievement, even in information technology. Few of our universities measure up to world-class standards because of their lack of sufficiently trained faculty with PhDs and worse the absence of research in all but a handful.

Our grade schools continue to do well in basic and functional literacy, but not in beginning science, and our secondary schools are far behind in information technology, mathematics, and science (including the quantitatively oriented social sciences such as economics and sociology).

Yet, even with all our limitations and lack of resources and our inability to implement reforms we know that we should undertake, our products are marketable in the worldwide marketplace: there is a market for our health sciences personnel not only in North America but in Europe (our nurses) and in the Middle East, and I predict, in the future, for Japan's aging society. Our engineers and technicians continue to be in demand in the Middle East, our accountants and managers in ASEAN, and our IT workers for Contractual work done right here in the Philippines as well as for markets abroad in North America. The few PhDs we have are however, part of the brain drain; while showing the potential of the Filipino, their loss to the developed countries makes development even more difficult here. Even our teachers, with all our complaints about their lack of adequacy for specialized subjects, are in demand as teachers in Papua New Guinea, some countries in Africa, and now even in North American elementary schools. In addition, we are providing the most sophisticated nursemaids and housemaids to Asia and Europe.

Hence, while we make declarations on how poor our system is at the macro level, when we examine individual grades with their special individual talents or individual differences, we find much that commends itself in our system except for the lack of research (and hence our inability to do indigenous science and technology) and our lack of sufficient scientists (mathematics, breeder scientists, advanced technologists).

tion of the economy and the breaking down of frontiers through various improved ways of communication, all practically electronics based.

If we are to find jobs for our large population, still growing at 2.3%, and if we consider the foreign market as an outlet for our future knowledge workers, then we had better be competitive in the production or training of such workers not only for the foreign market but even for our own internal needs to develop our own enterprises and industries.

Thus to be competitive, it is not enough that we are fluent in English; we must be able to use English as a tool for access to the world's knowledge and must hone not only our oral skills but our reading and writing skills especially in critical thinking skills.

It is not enough that our students gain access to computers (our private schools at all levels already do; we expect our secondary and then eventually elementary schools at the elementary level to follow suit; tertiary education now has access to IT facilities) but we must right things, put the horse before the cart (and not vice versa) by spending money on mathematics and science education, without much IT makes very little sense since IT is a tool for learning, gaining access to further learning, a tool for research, and a tool for better communication and management or getting things done by society. It surprises me no end when schools are willing to spend money for computers (which most of them underutilize by using them for word processing instead of calculations and information retrieval) but are not willing to spend money for laboratories which are essential to scientific knowledge and training.

3. Towards a Realistic Strategy

I am a pragmatist by orientation and have little patience for dreams and visions. We are far behind and need to catch up and have to do this with limited resources. Hence, we must hurry but make sure that our precious few resources are utilized optimally to catch up with countries in Asia such as Singapore and Hong Kong and in the case of IT and science, India. I would like to propose the following guidelines:

- a) We must tie-up the knowledge economy not only with computers and IT but with over-all improvement of basic education through math and science, (English for Science and Technology) and then IT.
- b) Our latest National Elementary Assessment Test (NEAT) and National Secondary Assessment Test (NSAT) results for SY 1999-2000 are out; our efforts towards science improvement and in general improvement of basic education have bore fruit, thanks to the years of efforts and thanks to better measuring instruments. Both NEAT and NSAT results show that most of our schools hit the pre-set standards (based on a careful sampling to constitute the standards) with only a small number scoring below the minimum national standards. More important, our science high schools (practically all public) have surpassed in achievement our so-called elite private schools even in Metro Manila. To put it plain and simple, our science-oriented high schools have as a group achieved better for their levels than the group of so-called elite schools (most of all private and mostly Catholic). Hence, we should encourage the private sector to open science educated elementary schools and science high schools and multiply these and ask them to share their expertise in teaching better English in our public schools, for in English language competence, the private schools still have an edge. We must also systematically search for talent in rural grade schools, bring these promising students to urban centers, house them in dormitories and nurture their talents as intellectual not economic elites (both from rich and poor families) in our IT sophisticated and science programs in our leading colleges and universities.
- c) We must teach computer literacy in our grade schools, public as well as private, and try to find a feasible way for providing equipment through lease rather than purchase.
- d) We must provide a basic affordable configuration for elementary schools to teach computer literacy together with e-mail and Internet access and creative ways of using the computer for accelerating and enhancing learning.
- e) We must do the same at the secondary level but increase the capacity of our hardware to handle software for science and its applications.
- f) After we have provided basic science laboratories (demonstration science labs for elementary schools and actually working laboratories for secondary schools) we can then go on to more sophisticated IT hardware. We should develop lease arrangements for computers in our schools but also for science laboratories and equipment.

- g) We should encourage top schools (one per region) to have a competence computer science course and graduate schools in Manila to have graduate programs in IT.
- h) We should encourage commercial and stock corporations to open colleges for different grades of skills and training in IT. The traditional nonstock nonprofit institution may be passé under new demands since small institutions are more flexible and their ties with industry will make the training as relevant as possible.
- i) We should encourage SUCs to do the same for their laboratory needs, scientific instruction needs, and IT needs. Lease from commercial companies and charge fees to be paid by the parents.

4. Conclusion

We have to jump start our math, science and IT improvement for the knowledge-society that is already with us since we do not want to be left behind much longer. We need jobs for our growing population and knowledge workers are needed and can be provided by our society not only for our country but also for the region.

EDUCATION IN THE KNOWLEDGE ECONOMY "THE INTERNET CHANGES EVERYTHING"

Darren Rushworth

Director, Asia Pacific Division, Oracle Global Learning Initiatives

"Today we are witnessing the early, turbulent days of a revolution as significant as any other in human history. A new medium of human communications is emerging, one that may prove to surpass all previous revolutions — the printing press, the telephone, the television, the computer — in its impact on our economic and social life." Don Tapscott, *Creating Value in a Network Economy*.

"If you do not see the Internet as your future, your company will have none." Dr. John Donovan, *The Second Industrial Revolution*.

The Internet is changing everything. Many industry observers like Don Tapscott and Dr. John Donovan are making very strong statements.

The Internet is simultaneously the most over-hyped and under-estimated influence of the modern age!

Is there any truth to the hype? Further investigation is required.

For a medium to be classified as a mass media it must have an audience or subscriber base of at least 50 million people. It took electricity and the radio 46 years and 22 years respectively to obtain an audience of 50 million people. The Personal Computer took 16 years (*Newsweek 1998*). The Internet achieved a subscriber base of 50 million accounts in under 4 years and reached 100 million subscribers in just 5 years!!!

Date	Invention	Years to Mass Use
1873	Electricity	46
1876	Telephone	35
1886	Gas Automobile	55
1906	Radio	22
1926	Television	26
1975	PC	16
1983	Mobile Phone	13
1994	The Web	4

Further, Internet traffic is doubling every 100 days and in 1999 more data was sent over the world's telecommunications networks than voice traffic for the first time.

These incredible numbers are conservative! Why?

The number of Internet 'users' reflect the number of Internet accounts (specific addresses) whereas more than one person may have access to the internet through a given account. An example of this would be an Internet café, or a home account where more than one member of the family uses a single account.

What about the acceptance of the Internet by Higher Education?

- 44% of classes use E-mail
- 33% Require Internet research
- Approximately 50% of students and faculty access the Internet each day—higher % for administrators
- Expansion of "virtual" colleges and universities

(K.C. Green, US Study: The Campus Computing Project 1998)

The use of and acceptance of the Internet by Higher Education is growing rapidly. Just 4 years ago Internet usage was less than 10% for email, research or administration.

This is staggering given Higher Education's resistance to prior technologies from overhead projectors to CD-ROMS.

According to Dr. Mark Milliron, President, League of Innovations, *"The acceptance is not surprising considering how effectively Internet technologies connect students and faculty to educational content, rich context and each other."*

Internet tools have succeeded precisely because they have more quickly and easily made the connection to the core mission of Higher Education than had their technical predecessors.

Can this new 'phenomenon' provide a platform to help with the administration of a Higher Educational facility or assist in pedagogical goals?

I will now examine some of the challenges facing an Educational Institution in the areas of Administration, Learning, Access and Community, and offer some options as to how the Internet may help address some of the issues, and indeed, create some issues of its own.

Administration Challenges:

1. Changing Demographics

There is a continuing trend towards older (mature age) students and a huge increase in the number of non-traditional students. These students may participate in part time study, continuing education (re-education), professional training, and be located either on campus or not. Indeed, an institution must cater for every demographic from 'cradle to grave' or indeed, kindergarten through to Ph.D.

2. Declining budgets and increased demands

Financial pressures are requiring University administrators to do more with less. "More scholar for the dollar". Budgets from governments continue to decline whilst increasing student numbers, offerings or competitive pressures push the University to be more consumer orientated.

3. Increased Global Competition

No longer does a University compete just with those institutions in its locality. Today's education market is fiercely competitive with institutions from around the world enticing students with flexible learning options and other incentives.

4. Complexity of school environment and accountability

What is the University of Today? A publicly funded service? A commercial training institute? A business? An industry research laboratory? All of these? None of these?

Not only is the environment complex but changes in public policy are requiring more and more institutions to privatize or seek funding outside the government coffers.

5. Increased student demands

Students feel empowered to 'vote with their feet'. Today a student can choose when to study, what to study and where to study. No longer can a University rely on local youth to fulfill its enrolment quotas.

6. New education providers

New organizations are providing education. A leading concern for existing Universities is the number of Universities being established by industry. These include diverse organizations from McDonalds to Motorola all over the world. Further, education brokers and other third parties are offering retail outlets for degrees, and time and place education. An example would be a professional who enrolls in an Internet based continuing education program that allowed him/her, to study a single subject, at home, in the evening.

What can information technology and particularly the Internet do to address some or all of these Administrative concerns?

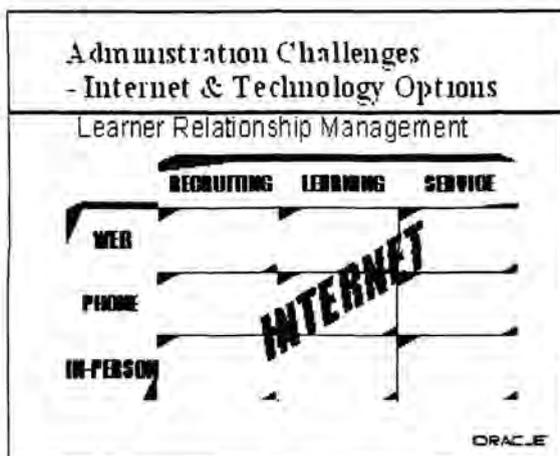
To effectively manage a University the administrators need the same tools and information as a corporate Chief Financial Officer (CFO). These tools should allow the administrators to effectively manage the processes of the University, increase administrative productivity, and provide accurate and timely information for decision making.

A Learner Relationship Management (LRM) system allows an institution to manage and track a prospective student inquiry (lead) through to lifelong learner. All information is stored in a central database which provides timely information to all participants and brings faculty and students services closer together producing a better environment for students.

The Internet provides a common platform to help with recruitment, teaching and managing the University business. Further, it puts the information in the hands of those who need it, when they need it, in a self-service fashion.

A study by *Harvard University* found that up to 60% of general student inquiries could be managed by computer systems. If these systems are Internet based this allows self-service, providing immediacy, accuracy and efficiency.

Additionally, technology such as the Internet provides a delivery mechanism for Universities to compete for mature and distant learners.



Learning Challenges:

1. *Life Span of a Technical Degree is less than 5 years*

This statistic is now outdated with Dr. John Donovan contesting that the life span of a technical degree is now only 3 years! Due to the incredible pace of the I.T. industry it is nearly impossible for Universities to keep up to date. Even some of the concepts or fundamentals change in very short (educationally speaking) periods of time. The Internet's n-Tier model is an example of this.

The consequences for Universities are not just keeping up, but also in the demand for re-skilling and shorter professional orientated courses placed on it by working students.

2. *Use of Technology now a Basic skill*

Every University graduate today must know how to perform basic functions on a computer. This is true regardless of the discipline studied. Computers have influenced our lives to such an extent that every profession requires at least the basic use of a computer.

Further, to participate in today's information society a person must know how to use a computer to communicate with others and participate in electronic commerce.

Most Universities only offer I.T. training through science and technology disciplines. These must be expanded to all students of the institution.

3. *Providing Quality education to anyone, anytime and anywhere*

The key here is quality. Whilst it is possible to post lecture notes on a web page and make them available to

everyone, everywhere, there is no link to learning and education. Not only do students want options, the challenge for Universities is to ensure those options do not degrade the standards of the institution and in fact, should enhance them.

4. *Industry demands of higher education*

Industry requires graduates with the skills that make them productive in a company. Many graduates do not have the skills needed and industry complains about the cost of providing these skills. Often there is conflict between a University's pedagogical goals and industries' requirements.

5. *1 Million vacant high technology jobs globally*

The shortage of I.T. professionals is causing an increase in the number of students enrolling in I.T. related courses. Additionally, industry has raised salaries for I.T. professionals to such a degree that faculty are being attracted to industry away from academic careers. Students in their desire to earn large salaries are bypassing formal education altogether and completing vendor skills certification instead.

6. *Technology does not necessitate better teaching or learning*

Teaching and Learning may not necessarily be better under an Internet platform. The Internet has the ability to make terrible instruction more widely available.

What can technology provide to address these Learning Challenges?

The Internet can enhance the learning experience and offer a mechanism to reduce current learning boundaries like time and place.

The key to 'Internet learning' is not the technology but still the content, methodology, framework and support provided by the teacher. With this in mind:

- The Internet can provide anywhere, anytime learning, to time and place conscious students.
- The Learning experience can (and should) be enhanced by collaboration between students (anywhere), faculty and peers.
- Rich media enhances the learning experience. The more senses used in learning the more likely a student will retain the message. The chalk and board method of teaching predates the invention of the printing press by Gutenberg, the last major change in teaching medium.
- Internet and other technologies can provide a framework for the sharing of curricula and industry/education partnerships.

In an experiment conducted by Maryland University, collaborative learning was tested in several ways. Without going into detail the most effective method of learning was found to be a Multiple loop Collaborative Learning approach.

This involved a teacher giving a case to be worked on to several groups of students electronically using a GroupWare program. Each group submitted their completed case to a central server where it was routed blindly to another group for review and comment. The case was then sent back to the server where it was routed back along with group number 2's comments to the group who originally created the case response. The initial group then made modifications and submitted the final casework to the teacher for marking. All casework and responses were blind.

Now whilst this is an interesting experiment on learning models the purpose here is to demonstrate an effective use of technology to facilitate learning. The technology is not being taught but it is a platform to build on. It could be argued that the Maryland Multiple Loop Collaborative Learning experiment would not have been possible without technology.

Access and Community Challenges:

According to the Federal Computer Week, July 1999 NCES:

- Families with a household income of US\$75,000 or below are less likely to have access to the Internet.
- Few than 20% of low income schools have an Internet connection for learning

1. *Significant access disadvantages for minorities, rural areas and developing nations.*

Education budgets are often inadequate to provide the latest in technology to schools. This is most obvious in areas with low-income families and geographic dispersion. Some countries are yet to experience a high penetration of telephones and other services required to enjoy Internet access.

2. *The Digital Divide*

The societies with the technology and resources are advancing at a rapid rate. This is true for commerce, learning and financial markets all mainly driven by the Internet and the information society. Unfortunately the others who do not have the access are being left further and further behind. This is known as the Digital Divide and results in the 'haves' and the 'have nots'.

3. *Rate of Change*

The rate of change being brought about by information technology and the Internet forces some people who can't keep up to be left behind whilst others never had the chance to participate in the first place. Additional effects are the cost to corporations who must continuously reinvest in technology and their own reinvention to survive.

4. *Human Connections*

The Internet must act as a catalyst to bring people together and must be an embellishment to existing communication methods not a replacement for them.

5. *Technology as a Positive Catalyst*

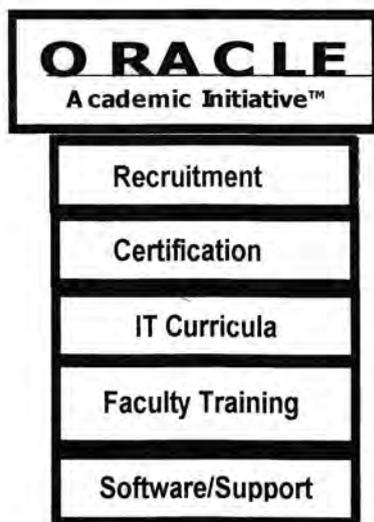
Given the widespread impact of technology, we must ensure it is used to enhance learning, interaction and experience, not restrict us to a pre-programmed script.

Ways must be sort to put the Internet into the hands of the minorities and developing economies who will benefit the most.

What is Oracle doing to address some of these Learning, Access and Community concerns?

Oracle has created a dedicated group of people to focus on these issues. The group focuses on a range of initiatives known collectively as Global Learning Initiatives (GLI). The charter of Oracle GLI is:

"To deploy programs and services that build strategic relationships with government, education, and industry to address key information technology issues surrounding access, learning, and community."



Oracle has invested US\$250 million in more than 1,000 Higher Education institutions globally to help address the shortage of I.T. professionals through the Oracle Academic Initiative.

Additionally, at the primary and secondary level, Oracle has provided teacher training and given away over 6,000 computers, software and content, to more than 125 schools, to provide access to the Internet and enhanced learning.

More programs have been implemented to give students email access and even to teach introductory Internet skills and programming at the secondary education level.

Oracle's GI team are committed to investing more in the Education Sector worldwide to increase the number of I.T. professionals, improve access to those less fortunate, and to demonstrate a leading role as a good corporate citizen.

Where does the Philippines fit in all of this?

The Philippines is the second largest provider of I.T. manpower in the world after India. However, India graduated over 50,000 computer science bachelor degrees last year whilst the Philippines had approximately 6,000 IT graduates (CHED 1997).

I.T. is a core requirement of the knowledge economy. I.T. fundamentals **MUST** be taught in all courses and at all levels of schooling. Singapore is demonstrating its leadership in this area by the government's massive investment in education infrastructure and internet based learning systems for primary and secondary education.

Major investment must be made in DECS' I.T. infrastructure for administration, teacher training and to put the technology in the hands of the students nationally.

The Philippines is attracting some foreign investments but much more could be done. With a large population of motivated, English speaking students, the Philippines could realistically transition to a dominant force in the k-economy if provided with the right backing and educational guidance.

In summary:

The use of Information Technology and the Internet in Higher Education is a very large topic. Although I have covered only some of the issues and options available I would like to add the following points for consideration:

- Technologies should not be layered atop existing course; instead, instructional goals should drive the adoption of technology. (University of Washington)
- *Institutions cannot keep up with the pace of change and must explore partnerships with other institutions, content providers and industry.*
- *A student perusing all the information 'out there' is not the best way to learn. Teachers provide a framework, direction, coaching and PASSION.*
- An integrated Learner Relationship Management (LRM) System Provides a Means of Managing from Lead to Life-Long Learner.
- What will tomorrow's (today's) institution look like? In the information/Internet Age a school has not been built and the industry is undergoing significant upheaval to reinvent itself. Tapscott, The Digital Economy.

"When you take the first step of a journey you are half way there", Chairman Kun-Hee Lee, Samsung Corporation.

PLENARY SESSION IV

KNOWLEDGE MANAGEMENT—FOCUS ON THE KNOWLEDGE WORKER

Jose Neil Hortillo

County Manager, Technowledge Asia, Pte Ltd

Unlike e-commerce, which addresses the needs of customers, Knowledge Management focuses on the firm's most important resource, its people. In today's highly dynamic digital market environment, companies are beginning to realize that their most valuable assets are the knowledge and skills of their employees.

A brief reality check reveals that innovative products and excellent service are created and delivered by the most competent members of the organization. Not only will a highly skilled staff bring in more revenues and profit, but likewise increases a company's corporate valuation. However, issues on Knowledge management have thus far been addressed at the philosophical and technological level, leaving managers with little understanding on how to proceed and confront these issues.

Definition

The term Knowledge Work was first coined by Peter Drucker in the 1960s, and he defined it as any work that requires mental power than physical power. Dr. Richard McDermott, a leading consultant who has extensively written on Knowledge Management for the past several years, gives a more comprehensive definition, "Knowledge work involves analyzing information and applying specialized expertise to solve problems, generate ideas, teach others, or create new products and services."

Knowledge workers are the smart people in the organization, in the teams that analyze, process the information and make decisions.

Knowledge assets are the knowledge regarding markets, products, technologies and organizations, that a business owns or needs to own and which enable its business processes to generate profits, add value, etc.

Four Principles of Knowledge Management

The four basic principles of Knowledge Management that we shall briefly discuss allow us to better understand, consolidate, and set the limit to the various definitions given to Knowledge Management.

1. *Knowledge Management is about managing PEOPLE and the KNOWLEDGE they bring to the workplace.*
A company's wealth is now measured on the level of its human capital competencies than the efficiency of machineries. Intellectual property takes primary role in today's company success or failure displacing the competitive advantage of the past. Proximity to raw materials once considered an advantage can be bought and moved wherever they are needed. Access to capital once bestowed a significant advantage, but now capital is like any other commodity that can be borrowed in New York, Tokyo, London, or from anywhere else in the world.
2. *Knowledge Management is about COLLABORATION, TEAMWORK, and nurturing the CULTURE of SHARING.*
Before we could establish these values, we must first build a level of trust and respect among all members of an organization. In an organization where there exists a culture of sharing, knowledge will be abundant. It will definitely not be depleted, but shared, improved and developed. With knowledge shared, innovation will be cultivated.
3. *Knowledge Management requires a synergy of PEOPLE and TECHNOLOGY.*
The recent sci-fi blockbuster movie, "The Matrix", implanted fear in our subconscious that future artificial intelligence - thinking machines would one day take over and enslave the human specie. But the fact is, people and technology are best in doing different complementary tasks. Humans are best in analyzing and synthesizing seemingly unrelated forms of knowledge. We easily draw from our knowledge and experience

to paint a broader perspective of any particular subject. On one hand, current technologies such as e-mail, Internet, Intranet, and Extranet facilitate the seemingly arduous task of data mining, distribution, collaboration and communication of the knowledge base. Moreover, with recent developments in converging communication technologies, distance and language barrier will soon be non-issues. Therefore, the right combination of knowledge, skills and technology will result in an effective management of the company's valued resources.

4. *Knowledge Management is an INVESTMENT in HUMAN CAPITAL.*

Apart from investing in technology, a firm should also invest in training and enhancing the skills of Knowledge workers. Knowledge workers are known as symbolic analysts. They manipulate symbols instead of machines. This eventually becomes a continuous cycle of discovery, innovation, and distribution. Retaining knowledge workers does not always involve addressing their financial needs, but also making their work more interesting.

Knowledge Management is about managing PEOPLE and the KNOWLEDGE they bring to the workplace.

Knowledge Management is an INVESTMENT in HUMAN CAPITAL.

Knowledge Management is about COLLABORATION, TEAMWORK, and nurturing the CULTURE of SHARING.

Knowledge Management requires a synergy of PEOPLE AND TECHNOLOGY.

Figure 1. Four Principles of Knowledge Management

Three Steps to an Effective Knowledge Management

If fully implemented within the company, Knowledge Management solutions and strategies entail a change in the organizational structure and objectives.

At the onset, there should be the long-term commitment of the top management to be a learning organization because corporate resources are allocated in the implementation of KM solutions and strategies. Once this commitment is made, specific goals should be set to measure the effectiveness of the KM solutions. Since the implementation of KM solution requires resources, it should necessarily affect the bottomline, either directly or indirectly. Therefore, KM strategies should constantly be reviewed, measured and updated to ensure its effectiveness.

At the end of the day, what we want to achieve is to make KM solutions an integral part of corporate life. This can only be done once knowledge workers realize and appreciate its value, that the practice of the core principles of Knowledge Management improves them both personally and professionally.

The following is a brief discussion on how to proceed in implementing a successful Knowledge Management program within the organization.

1. *Commitment by Top Management to be a Learning Organization*
In order to survive in today's ever changing market environment, top management should be committed to transform their firm into a learning organization, one that is pro-active and can easily adapt to the changes in the market. A learning organization is also characterized with a strong culture of sharing and collaboration among its members, starting from the top.

The CEO transforms himself to be a Chief Learning Officer (CLO), one who champions the implementation of the culture of learning. As such, he should encourage everyone to take the initiative to learn new skills and knowledge relevant to their type of work. He should be valued more as a coach than a tyrant leader.

2. *New performance measures ensure effectiveness of KM strategies*
Apart from the development of new products or services, the creation of ideas that improve processes should be aptly rewarded. In order to spur and sustain the culture of learning and innovation in an organization, a formal reward system should be in place. Collaboration and teamwork are also enhanced if the reward is given to the team in recognition for their specific contribution to a particular project.

Increased productivity is balanced by a more demanding reward system. In today's pace of work where every customer is expected to be served 24 hours x 365 days, companies are forced to squeeze much from their smart workers in order to justify the hefty salary these workers are being paid. Moreover, K-workers demand more rewards - longer paid-vacation leaves, flexible work schedule, and other non-monetary benefits. When the company fails to reward and appreciate their efforts or even make use of their full potential, K-workers will seek other jobs that are more challenging and fulfilling.

3. *Knowledge Workers should feel part of a family*
Knowledge workers would appreciate their work when they see that there is no dichotomy between their values in their family and in their work, and when they are made part owners of the firm. These translate to a worker's concern for the well-being of the organization and, in effect, better delivery of products and services to customers.

Improving the quality of life of Knowledge workers - extending more benefits to family members, providing day care centers for working mothers, health club memberships, etc., are just some of the means that reduce staff turnover and increase the company's return on investment in training.

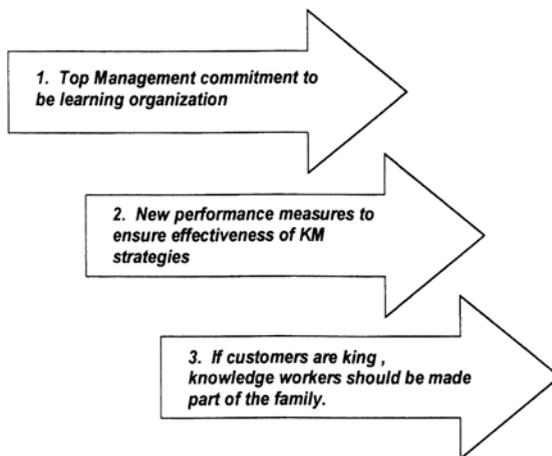


Figure 2. Three Steps to an Effective Knowledge Management

Three P's of Knowledge Management - Values of a Learning Organization

There are distinctly three core work values that should be lived by everyone in an organization, not only by the CLO to ensure the successful implementation of Knowledge Management. These core values are the 3 P's of Knowledge Management.

1. *Passion for Learning*

Nothing is so difficult that it cannot be learned. A Knowledge Worker should have the personal initiative to find ways to improve his skills and add more value to his work. He should constantly be updated with current issues, especially those that are relevant to his field of expertise.

2. *Patience to Listen*

Skills and knowledge are learned by listening to new ideas of co-workers and by mere observations of best practices in other departments that can be applicable to one's nature of work. Normally, tons of resources are wasted because of failure in communication, concerned parties simply refuse to pause and listen. However, no matter how difficult things are, or how immediate decisions have to be made, it is worthwhile to always recognize opinions other than our own. It takes a lot of humility and strength of character to have the patience to listen.

3. *Power to convince others*

The effectiveness of a knowledge worker is likewise measured in his interpersonal skills and how good he is as a team player. Knowledge management is also political by nature because a knowledge worker should possess an amiable character to convince others:

- To share information
- To create and learn new ideas
- To innovate existing processes

Companies should be willing to foster the development of their employees as Knowledge workers as well as individual persons. In return, Knowledge workers should be willing to participate and learn from the companies' various initiatives. Excellence and dedication to work are expected of them.

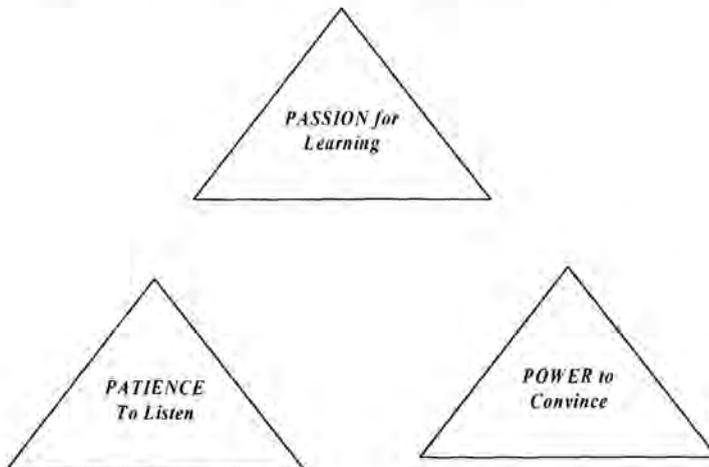


Figure 3. Three P's of Knowledge Management

Entrepreneurial Drive of Knowledge Workers

With all 3 P's in place, we should expect a more efficient knowledge worker. Moreover, these are the same qualities that make a successful entrepreneur. Every Knowledge worker in an organization should have that entrepreneurial mindset – always concerned with the well being of the company, seeking ways to improve the business process as well as the bottom line. In the end, these are the same values essential in making each individual a better person.

Where Do We Start? AT HOME

In brief, the point is that successful implementation of Knowledge Management requires deep understanding of not only the people, processes and technology issues, but the changing nature of business as well as the changing business of IT. CLOs who wish to better understand IT or knowledge management should familiarize themselves with the very assets they have in their hands—their values bred at heart and home on how to share, learn, inspire and create with people. The knowledge worker is not an office animal—he is a person who brings his sense of family and friendship to the workplace.

PLENARY SESSION V

ELCOM IN THE KNOWLEDGE ECONOMY: LEVERAGING THE ISRAELI-PHILIPPINE PARTNERSHIP

Marianne B. Montiveros

Chairman and CEO, TeleMessage Philippines, Inc.

On behalf of

Garry Olivar

Executive Vice President, ELCOM International Resources, Limited

I. **The commercial challenge of the K-economy**

"Knowledge and information tend to be abundant. What is scarce is the capacity to use them in meaningful ways. Nor is knowledge easily transformed into the object of standard economic transactions." (OECD, 1996)

II. **Key functions in the K-economy**

- Knowledge production – developing and providing new knowledge
- Knowledge transfer – disseminating knowledge and providing inputs to problem solving
- Knowledge transmission – educating and developing human resources

III. **Elcom's contribution to building the local K-economy**

- Knowledge transfer: Combine our local market experience and presence with the technology platforms primarily (but not exclusively) of our Israeli partners in order to integrate, implement, and distribute knowledge-based products and services.
- Knowledge transmission: Innovate and provide leading-edge service offerings in educational technologies and network-based distance learning.

IV. **Israel's technology vision**

"Scientific research and its achievements are no longer merely an abstract intellectual pursuit...but a central factor...in the life of every civilized people..." (David Ben-Gurion, 1962)

V. **Fifty years after Israel was established**

- The 21st highest GDP in the world, growing by 5-6% p.a.
- The 23rd highest standard of living in the world, based on per capita income, life expectancy, and educational standards
- Worldwide IT expenditures of about \$100 Billion, growing by 10% p.a.

VI. **A national knowledge-based economy**

- Seventy percent of total exports contain high-tech components
- Over a hundred companies traded on Wall Street, more than any other foreign country except Canada
- More start-up companies (1,500-2,000) than any other country except the U.S.
- More high-tech start-ups than all of Western Europe combined

VII. **Major reasons for technology success**

- Scarcity of natural resources (necessity breeds invention)
- Highly-skilled immigrants especially from Russia; 135 engineers per 10,000 population vs. 70 in U.S., 65 in Japan
- Commercialization of military technology and increase in foreign investments due to the peace process

VIII. Centers of local excellence

- World leadership in software development, medical equipment, communications, and biotechnology
- Near-monopoly in some areas like Internet policy-based management and security and inspection equipment for manufacture of semiconductor wafers

IX. Commitment to R&D

- National R&D network of seven universities, dozens of government and public research institutes, hundreds of civilian and military enterprises
- World's highest percentage of publishing authors in natural sciences, engineering, agriculture and medicine
- More than twice as many patents granted to Israeli universities than the U.S.

X. High-tech, high value-added

- Industrial policy concentration on high value-added areas like medical electronics, agro-technology, telecommunications, computer hardware and software, solar energy, food processing, fine chemicals
- High-tech exports driven by military R&D in electronics, optics, electro-optics, lasers, computer-based equipment, robotics, and aeronautics

XI. Advances in telecommunications

- State of the art products for wireless communications and encryption, video compression over cable, inter-urban PDX's digital PABX's, mobile rural exchanges, ISDN terminals
- Defense-related innovations, e.g. frequency-hopping, multiple-access technology (originally used to avoid hostile detection)

XII. Educational software

- One of the newest and fastest-growing fields of S/W development
- Kindergarten programs to develop visual and reflective thinking, sense of color, optical orientation, basic math concepts
- Computer-aided language and math training for elementary and secondary schools

XIII. Medical and biotech "firsts"

- State of the art surgical lasers
- Intelligent sensors to guide surgical instruments via real-time 3-D virtual imaging
- Fully computerized no-radiation diagnostic instrumentation for breast cancer
- Fully flexible wave guide for endoscopic surgery
- Computerized monitoring systems for critical care patients
- Pain-relieving transcutaneous devices
- Revolutionary autoclave design to combat AIDS and other infectious diseases

XIV. Bright outlook for biotech, biomedicine

- Fastest growing sector in the late 1990s
- Nearly half of all start-ups are in medical and life sciences arena
- Projections of six-fold increase in revenues, three-fold increase in employment, annual investment of nearly a billion dollars within five years

THE KNOWLEDGE ECONOMY

Ramon L. Jocson

Director, e-Business and
General Manager, Services ASEAN/SA

METCALFE's LAW

Bob Metcalfe, former CEO of 3Com and the inventor of "Ethernet" networking technology is credited with this idea, commonly referred to as Metcalfe's Law.

"The power of a network increases exponentially with each additional node."

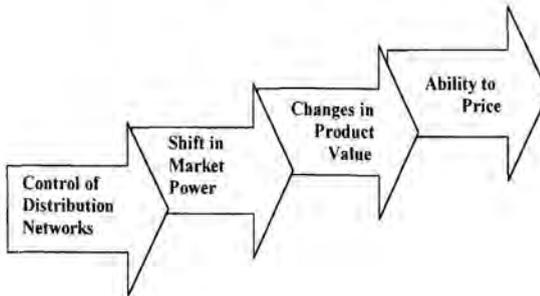
"Printing made us all readers. Xeroxing made us all publishers.
Television made us all viewers. Digitization made us all broadcasters."

- NBC News President Lawrence Grossman

The Emerging Network Economy

Characteristics	Nomadic	Agriculture	Industrial	Network
Asset Exchange	Capture	Trade	Sell	Connect
Labor Group	Tribe	Farm	Asm Line	Workgroup
Management	Strength	Husbandry	Productivity	Knowledge
Growth	Members	Acreage	Capacity	Bandwidth
Goal of War	Tools	Lan	Raw Mat'ls	Information
Value Chain	Trade	Metals	Paper Notes	Records
Allegiance	Tribe	Nation	Corporation	Self

**In the New Economy, Business Models
Can Open Up Opportunities or Threats**



**Putting 1999 US consumer e-commerce into
perspective**

Nalgreens

\$17.5 B

eCommerce

\$18.6 B

Wal-Mart
\$162.8 B

Source: eMarketer

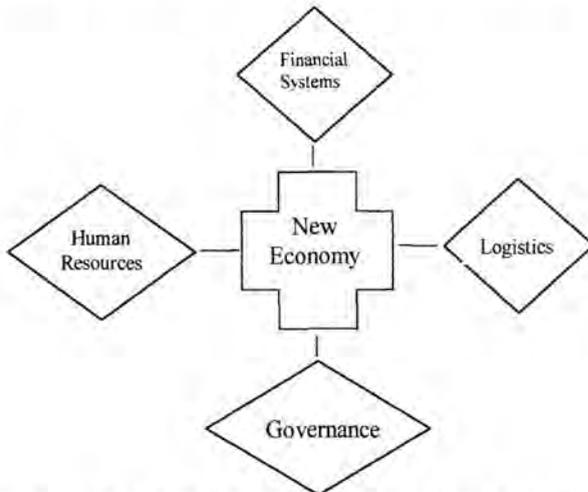
A CAUTIONARY TALE

Encyclopedia Britannica

- Founded 1768
- Acquired 1920 by Sears, Roebuck & Co.
- Willed to the Benton Foundation in 1970
- 1990 Gross Revenues of \$650 million
- by 1998, Revenues down 80%

WHY?

How we participate in the New Economy is dependent on Four Factors

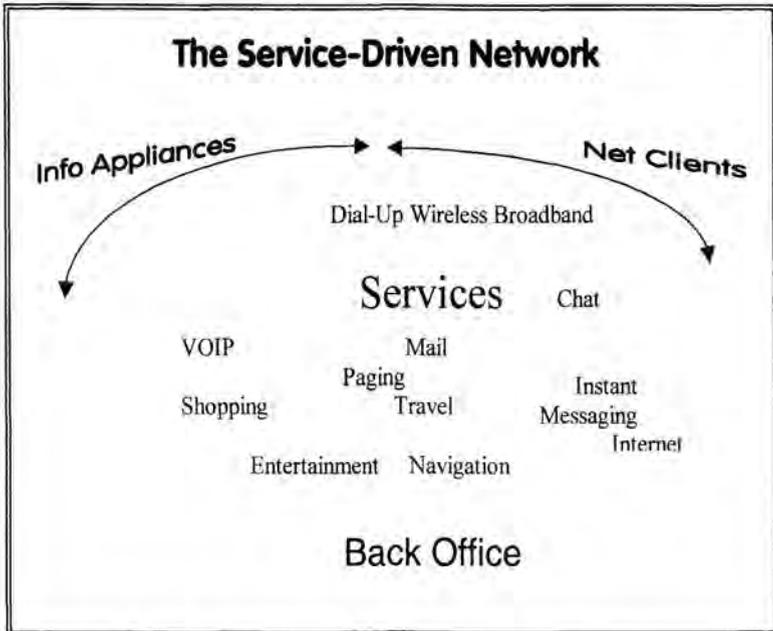


Competitive advantage in the new world stems from knowing when and how to build business ecosystems
- James Moore, "The Death of Competition"

PROTOCOLS AND PLATFORMS IN THE K-ECONOMY

Antonio Z. Pio de Roda

Chief Operating Officer, Sun Microsystems Philippines, Inc.



If you believe the
.com age is real,
you have two
choices.

Option 1

Do Nothing and Fall Behind



Option 2

Seize the Initiative

The .com/ready
Enterprise

Sales	Marketing	Finance/ Admin.	Operations	Service
Stimulating the intent to buy with e-commerce	Using the Web to create customer loyalty	Operational purchasing bill payment and presentment	Integrating and maximizing the supply chain	Extending support via integrated customer services

.com Your Business!

What does “dot-coming” the business mean?

Moving business functions to the Web

- Web-enabled transactions
- Automated bill paying and presentment
- Integration with suppliers and customers

Changing the business model

- E-everything: the entire company
- Competing in a portal-oriented world
- Customer focused, not product focused

Changing your view of technology

- Business enabler
- Strategic weapon

Impact on business platforms

- IT platform
 - hardware
 - software
 - communication protocols
- Business Model
 - outsourcing
 - portals

Internet

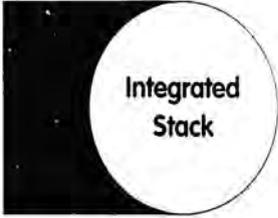
JAVA

Bandwidth

3 New Bets in 2000



Massive
Scale



Integrated
Stack



Continuous
Real-time

Scaling Pressures

Σ Computational + Storage demand =

of devices (users)

X duty cycle

X bandwidth

**A Service Provider Sees as Increasing Numbers
of Higher Bandwidth Connections**

Hardware

- Requirements
 - flexibility
 - scalability
 - reliability
 - availability
 - security
- Servers and Storage

Software

- Operating System
- Database
- E-commerce infrastructure
 - directory
 - security / firewall
 - services
- Integration / middleware
- Front-end applications (Java, Jini, Jiro)

Protocols

- TCP/IP
- HTML
- XML
- HTTP
- WAP

Impact on the business model

- Outsourcing
 - service provider model
- Portals
 - emergence of auction model and hosted marketplaces

Outsourcing

- **Business drivers:**
 - time-to-market
 - minimize up-front costs
 - scarce IT resources
- **Various forms**
 - IDC
 - ASP, CSP, NSP, FSP

Portals

- **Vertical**
 - Industry-specific/common interests
 - Electronic exchange/marketplace
- **Horizontal**
 - Yahoo, Excite
 - Corporate portals/intranet
 - StartPortal

In Summary

- The K-economy represents “the largest legal creation of wealth in the history of the planet”
- We all have two choices

Manuel F. Rivera

Country Manager, CISCO Systems Philippines

Cisco Systems, Inc.

**“There are two fundamental equalizers
in life, the Internet & education.”**

**John Chambers
CEO
Cisco Systems, Inc.**

The Internet & Education

- **70 million people are getting an education on the Internet**
- **there are 800,000 Internet-related job openings this year**
- **. . . . 3 million more in the next five years**
- **by 2013, Internet-related job openings will reach 1 billion.**

The Solution

E-Learning

- **E-Learning refers to Internet-enabled learning.**
- **it empowers the person to know more, learn faster, at less cost.**

Elements & Benefits of E-Learning

- **Instruction & Information**
- **Collaborative learning**
- **Online mentoring**
- **Internet media**
- **Assessment & validation**
- **Learning Management systems**

Cisco's E-Learning Initiative

The Field E-Learning Connection

A comprehensive online central resource for planning, managing, measuring, and tracking the skills and knowledge development of Cisco's sales and support staff.

E-Learning At Cisco

- **realized 40% to 60% cost-savings vs. instructor-led training**
- **80% of sales and technical training are done online**
- **100% of Cisco sales staff to use e-learning this year.**

Cisco's E-Learning Initiative

The Cisco Networking Academy Program

- **a four-semester course that teaches students to design, build and maintain computer networks.**
- **Total of 3,695 worldwide in 64 countries**

Cisco's E-Learning Initiative

The Cisco Networking Academy Program in the Philippines

- **in the Philippines, there are 8 regional academies (6 Metro Manila and two provincial) and 34 local academies.**
- **over 1,000 students enrolled in the CNAP program with the first batch graduating March 2001.**

E-Learning Implications

- **Benefits for Business**
 - **Greater productivity**
 - **Increased profitability**
 - **Enhanced employee loyalty**
- **Benefits for Education**
 - **Information from a greater variety of sources**
 - **Increased access for lifelong learners'**
 - **Improved quality**
 - **Rapid adoption of new information and new programs**

PLENARY SESSION VI

ENHANCING ENTREPRENEURSHIP IN THE NEW ECONOMY

Jaime Augusto Zobel de Ayala II

President and Chief Executive Officer, Ayala Corporation

I would like to commend the Department of Science and Technology, the National Academy of Science and Technology, the Advanced Science and Technology Institute, and the Philippine Council for Advanced Science and Technology Research and Development for joining together in organizing this conference on information technology and the New Economy.

For me, it is both an honor and a pleasure to address this conference because its subject is important, timely and critical—for companies as well as nations.

I am asked to speak here on the topic, "Entrepreneurial Opportunities in the Knowledge-Driven Economy." Whether we use the term "Knowledge economy" or "New Economy" or "Network Economy" to describe the tidal changes taking place in economic life today, we are all speaking about the same thing. And the role of enterprise is central, for at the end of the day it is private entrepreneurs above all—their vision, their energy, their competitiveness—who will transform the vision to reality.

I am also convinced that we have entered an era that will bring changes we still cannot imagine—changes in how we work, how we live, how we are governed, how our enterprises operate. The period of great change has just begun, and I believe the next decade will be one of the most interesting and challenging in the history of mankind. So it is imperative for us Filipinos to empower ourselves to meet this challenging time, so that we can become a full participant and not just a mere spectator of the New Economy.

New Technology, Entrepreneurial Virtues

When the media reports that the New Economy works in the U.S., Japan and Europe, it is not talking about the advanced state of research or the new gadgets of information technology. It is reporting about how new companies have mushroomed using IT, how venture-capital spending is lubricating the information engine, and how entrepreneurs—both old and new—are taking stakes in the New Economy. In a word, an entrepreneurial culture is driving the New Economy.

The same holds true for us in the Philippines. While Government must open the gates to the new technology, and scientists and engineers must understand and adapt it, it is finally our entrepreneurs who must harness the internet space for the purpose of business—it is they who must take the risk of investing, it is they who must produce and market, and it is they who must compete in the New Economy.

This is so because the worldwide proliferation of Internet links and mobile phones will not by themselves bring about a vibrant global economy. Equally important and necessary are the companies and enterprises that will translate the new technology into faster productivity and business growth.

As US Treasury Secretary Lawrence Summers has succinctly put it: "The New Economy is built on old virtues: thrift, investment, and letting market forces operate."

As we strive to enter this New Economy, I believe one of our country's greatest opportunities and biggest challenges is to create an environment that encourages and nurtures entrepreneurship throughout the whole of society. I believe that we will only fully prosper as a nation, we will only create the opportunities that our young deserve, and we will only overcome the many challenges in areas such as health and education, if we can become more entrepreneurial as a nation.

Before discussing the specific ways whereby we can foster entrepreneurship in the New Economy, however, let's take a quick look at what exactly this new wave has wrought and why it is so imperative for the Philippines to get on board.

Understanding the New Economy

We are bombarded daily with the latest hype on the "New Economy". But what is really going on? We, at Ayala, have tried to understand the underlying forces at work.

Indeed, a revolution is taking place and the best way to understand it is to come to terms with a massive, very basic change in the costs of doing business. This is our first core belief.

Let me explain. In the "old" economy, about 50% of the cost of doing business has been what can be considered 'interaction costs'—the cost of collecting data, transacting and monitoring performance.

Now, with new technology and the expansion of the internet, research is showing that interaction costs are collapsing. Eventually—as the costs of communication, data storage and processing shrink—many interaction costs will get close to zero.

What does this mean? Actually, the implications are mind-boggling. Imagine what happens to an industry when suddenly costs are cut by 20 to 40%! What happens when companies can suddenly coordinate complex supply chains across multiple suppliers? What happens when companies can suddenly reach consumers anywhere in the world?

What happens is this: we have, in essence, an economic revolution. And that is precisely what is happening today. We see evidence of this revolution wherever we look. We see new companies emerging from nowhere—Yahoo, Amazon, Charles Schwab, Ariba—to create whole new businesses and earn multi-billion dollar market values.

We are now seeing industry after industry restructuring in unimaginable ways. Just look for example, at how arch-rivals in the auto, chemicals, airlines, forest products and health industries are forming industry consortia to build new businesses. Just look at how smaller industries, like local travel agents and bookstores, are threatened by internet-based service centers. Let me predict for you that we are at the end of the beginning, not the beginning of the end, of this revolution. We will see massive, ongoing changes as the full power of lower interaction costs totally reshapes the way we can do business and serve customers.

The Philippines is not—and cannot be—immune from these trends. Philippine businesses will face new global competitors.

Our second core belief is that Asia will evolve differently than the US and Europe in meeting the challenge of the New Economy. This we base on the following factors:

Asian consumers and businesses are not as wired as the U.S. and Europe at this time, as PC penetration is still low and net access is even lower. On the other hand, wireless penetration is high. Asians love their mobile phones. The success of I-mode in Japan and GSM in the Philippines underlines this.

Our third core belief is that me-too strategies will not win. The recent volatility of the NASDAQ shows that the rest of the world cannot just copy what US companies have been doing. Those who win are the companies who have a distinctive business model, who start early, and who understand the power of partnerships and networks to build critical mass quickly. Filipino entrepreneurs therefore would be wise not to build generic, "me-too" businesses; they should strive rather to build distinctive businesses that exploit assets and strengths.

Finally, our fourth core belief is that partnerships are essential. Interconnected networks are a feature of many of the most successful New Economy business models—companies like Amazon, AOL and eBay. Winners in this new era understand the power of networks and the role of communities.

These insights suggest the way for us to go here in our country. We must move into the New Economy today not tomorrow. We should craft strategy to fit unique Asian conditions. We should build e-businesses based on strengths and assets, both tangible and intangible. And we must recognize the value of partners, communities and networks in the new economy.

The Challenge to Entrepreneurship

Let me turn again now to the role of the entrepreneur. In a changing world, the winners are those who adapt, those who see the opportunities that emerge as the world changes, and turn those opportunities to their advantage.

Those people are entrepreneurs. Entrepreneurs are the catalysts that will help our society adapt and embrace the countless opportunities ahead.

At a regional level, the same is true. Those countries that adapt to changes quickly will be huge winners in this new world. We are already seeing this. Look at the Silicon Valley in California. Look at Bangalore in India –which has emerged as a software development powerhouse in less than a decade. Look at Finland with its wireless technology, and at Ireland with its electronics industry. As this economic revolution continues, the winners are pulling away from the ‘also-rans’ in leaps and bounds.

What does this mean for the Philippines, and for each of us in this room? As I see it, the huge changes going on around us—the discontinuities—provide a window of opportunity for us, individually and as a nation.

If we embrace the changing world, and if we adapt faster than others, then we can make great progress – economically, socially, environmentally. We can imagine a future in which we too, have created knowledge centers like Bangalore, and in which we, too, have created a cadre of young entrepreneurs who build new, globally competitive businesses. We can imagine a future in which we have harnessed the full power of new technologies to educate our people, and to deliver better health outcomes.

Conversely, if we resist change, we risk being left behind, trading only on our traditional strengths, such as our low labor cost.

The key is entrepreneurship. We must create a cadre of entrepreneurs in our country, and we must do whatever we can to create vitality and creativity. We must create vibrant communities and networks to support, enrich and nurture entrepreneurial activity.

Encouraging Entrepreneurship

Can we succeed? Well, I am an optimist! I believe that this combination of opportunities and challenges constitutes a great opportunity for the Philippines to leapfrog and catch up with the industrializing and advanced nations.

The discontinuities in the world create a level playing field—a fresh start, if you like—where motivated people from any country, or any background, have new opportunities to get ahead. I believe we Filipinos have what it takes to succeed in the New Economy. We have a young population. We love technology—just look at how we have embraced the mobile phone. We have produced, and continue to produce, the best engineers and artists. We have the added edge of innate ingenuity and creativity that our culture nurtures and encourages. We have a great wealth of human resources that can excel given the right incentives.

Around me, I can see examples where this potential is starting to bloom. Let me give you an example. Just two weeks ago, Ayala co-sponsored, together with PhilWAP, a Wireless Application Protocol (WAP) symposium for applications developers. Although about 300 people registered, over 700 people showed up. In addition, about 30 companies submitted their business plans to be incubated through iAyala. The dynamism and energy of these people was extraordinary—it is the beginning of a vibrant and thriving WAP development community in the Philippines that has every chance of becoming a leader in Asia.

So how can we encourage entrepreneurship in the Philippines? There are many things we can do. I would like to think all of us—both in private enterprise and in government—can play our role.

I see four priorities.

First, let us ensure we have the infrastructure we need to support new economy entrepreneurs in this country. This includes making sure we can provide:

- world-class telecommunications infrastructure,
- a well founded legal framework for new economy businesses, and
- well developed financial markets, including a Filipino venture capital community and a supporting environment to list new businesses when they are ready.

Second, we need to encourage the creation of networks and communities of entrepreneurs. We know from the experience of other countries that it is these communities that become the hotbeds for creativity and invention. Within communities, ideas are shared and improved. Suppliers and service providers amass. Nearby universities adapt their courses to meet new skill demands. Critical mass builds and new communities start to form around adjacent business arenas. This is how the knowledge economy will start to develop. Personally, I believe that companies like Ayala can play a role, by 'convening' networks around our business interests. This is of mutual interest, because no company will succeed in the new economy if it does not embrace partners.

To cite one example, DoCoMo, who launched the hugely successful I-mode wireless phone in Japan, has entered into more than 300 applications partnerships in the past 18 months, many of which are with smaller, local Japanese companies.

Third, we need to encourage individual Filipinos to be more entrepreneurial. How?

Well, in other countries we see initiatives to encourage entrepreneurship everywhere – business competitions, school and university training programs, entrepreneur forums and support groups and so forth. In the end, we cannot expect the government to lead all of these efforts. We need individuals and private sector companies to play a role.

Fourth, and finally, let's pinpoint areas where new technology can bring benefits to society. Let me give you an example. Imagine that tomorrow we could deliver broadband to every village in the Philippines – perhaps to community internet kiosks. And then imagine that we developed applications that leveraged the latest thinking in remote education, and in health delivery. With tools available today, we could deliver elements of world class education and health care at a fraction of the cost of traditional methods, and in a way that empowers the student, or the patient, to manage their own lives, at their own pace. If the Philippines is thoughtful about where and how we leverage this new technology, we have the opportunity to leapfrog the development path that other countries have been forced to march.

Ayala in the New Economy

Before I close, let me say a few words about what we are doing at Ayala, so you can get some perspective on how enterprises—both new and traditional—can get on board the New Economy. As I said earlier, I believe we are in the midst of an economic revolution. Hence, at Ayala, we are reinventing our company to meet this tidal change in business and economic life.

All our existing businesses in the Ayala Group must change, and we are rapidly building new e-businesses to utilize the new technologies that are now becoming available. For example, we aim to lead the development of wireless data applications, we are leading the development of net-enabled financial services offerings, and we are about to launch myAyala, our living and entertainment portal. Indeed, our aspiration is to be a prime architect of the New Economy in the Philippines, providing new offerings to consumers and businesses alike.

As we developed our new economy strategy, we have also come to recognize the central importance of partnerships and communities. Ayala will only succeed in the new economy if we work with others, and if we help to create and sustain thriving communities of entrepreneurs – just like the communities that exist in places like Bangalore and Silicon Valley.

Therefore, Ayala believes that it is our role to help encourage entrepreneurs and their communities. We are deeply committed to being a catalyst in creating these communities and we have a rich and ever-expanding program to achieve this. Let me give you some examples:

First, as I noted earlier, we are helping to create communities for application development. I mentioned the example of the WAP symposium that we co-sponsored, and its outstanding success. I fully expect this to grow into an industry that will export Filipino WAP expertise to other countries.

Second, we are starting to help form new content communities. For example we have recently secured rights to the music.com portal. Over time, we hope that a growing network of Filipino musicians and entertainers will be sustained by this new channel. We are actively looking at other areas of content where we can help to take an aggregator role to help content creators to thrive.

Third, we will help others to build their e-business ventures. We will provide a full range of world-class internet support services in the Philippines, including call centers, data centers and application service provision.

Finally, we have set up a new investment vehicle. The vehicle, called Ayala Internet Venture Partners, is Ayala's investment arm to support technology start-ups with a unique focus on data communications and the internet. AIVP also plays an incubator role for these start-ups. Moreover, AIVP will help the Group in originating new technologies and establish strategic partnerships.

All this signifies our resolve to be a player, not a spectator, in the unfolding saga of the New Economy. I want to see an Ayala that is a catalyst to help the Philippines develop the entrepreneurial communities that will provide the foundation for our country to embrace the New Economy.

Closing

In closing, I will only emphasize that we are facing an economic revolution that we can only dodge to our sorrow. If we do not get on board the New Economy, we will fall even farther behind than we are already. If we embrace the New Economy, the risks are high but the rewards are great. And we could make the leap to economic dynamism that we Filipinos have long been dreaming of.

The New Economy is a fact, not a fad. And the real question is what are we going to do as a nation and as entrepreneurs to make this revolution take root in our economy and our country. How do we achieve the critical mass needed for the New Economy to take off in our midst? How do we build in our country the strong capital markets, the venture-capital networks, the world-class universities, the risk-taking entrepreneurial culture, the restructuring ethos, and the high-tech talent pool that set the amazing growth run of the US economy?

I see this conference as an admirable effort to supply some of the answers. And I thank you for inviting me to participate in the discussions. We need many more days like today. All of us need to understand the importance and urgency that exists, for now is the time of opportunity.

It is the responsibility of our government, and of companies like Ayala, to create the right conditions for entrepreneurship to flourish. But equally, it is the responsibility of each of us to seize the window of opportunity and venture into the heartland of the New Economy.

Together let us face the challenge. Together let us share the risks and the burdens. And together let us reap—for our companies and for our country—the bright and exciting promise of the New Economy. Thank you.

ENTREPRENEURIAL OPPORTUNITIES IN THE K-ECONOMY

Emma V. Teodoro

President, SoffTech Advantage, Inc.

I. K-Economy Entrepreneurs

- Bill Gates
- Larry Ellison
- Steve Jobs
- Michael Dell
- Jerry Yang
- Jeff Bezos
- Disodado Banatao

II. Characteristics of K-Economy

- Young
- Unformed
- Dynamic
- Virtual
- Intangible
- Technology driven
- No need for real money

III. Characteristics of K-Company

- Young - low start up cost
- Agility - network
 - Internet, Extranet and Intranet
- Immediacy
- Techno - savvy Innovation
- Beyond boundaries of space

IV. K-Economy Opportunities

Almost unlimited opportunities to people or organizations without money but may have, create, access, market or distribute knowledge!!!

V. Knowledge about what?

- Technology
- Marketing
- Distribution
- Anything
- How to look for knowledge

VI. Technology

- Hardware
- Software
- Networking
- Telecommunication

VII. Technology Opportunities and Threats

- Product distributionship

- Low Margin
- Highly competitive
- Product research and development
 - Technology change
 - High cost of development
 - Free software
- Provision of various types of software consultancy services
 - ◊ Partial or complete software development life cycle
 - ◊ Customization or enhancement
 - ◊ Installation
 - ◊ Training
 - Price competition
 - Skills development
 - High turnover rate of staff
- Data conversion
 - Escalating manpower costs
 - High costs of telecommunications
- Entertainment
 - High development costs
 - Pirates
 - Big players
- Convergence
 - ◊ Voice over IP
 - ◊ Value added services
 - Legal impediments
 - Telcos

VIII. Challenge to Technology Providers

- Early to market can yield long-term competitive advantage
- But timing may dictate acceptability of the market

IX. Content Creators

These are the .com E-services, E-infrastructure companies

- Stocks
- Weather
- Travel
- News
- Recipes
- Culture
- Government
- Sources/Suppliers
- Etc.

X. Challenge to Content Creators

- The trend is to give information for free
- How to attract viewers to increase traffic
- Static pages serve a certain type of market
- Active pages provide actual transactions and n-way

XI. How to Look for Knowledge

- Search engines
- Data warehousing
- Data mining

XII. Artificial Intelligence

Speed in searching and getting the right hits us All

XIII. Marketing

- Promotions and co-marketing
- 800-numbers
- Advertising
- Sales
- One-on-one

XIV. Reality Check in K-economy

- People have realized the importance of actually generating revenues!
- Physical goods are actually part of k-economy!

XV. Distribution

- Warehousing
- Logistics
- Shipping
- Tracking and monitoring
- Security and control

XVI. Choices

- Technology or content driven
- Creation or innovation
- Long-term growth versus make money run

XVII. Sources of Revenues

- Licensing or royalty
- Subscription
- Usage
- Advertisements
- Market database sale

XVIII. K-Economy Economics

- What is being sold?
- Who is selling?
- Who is buying?

PLENARY VII

INTELLECTUAL PROPERTY AND LEGAL ISSUES OF THE KNOWLEDGE ECONOMY

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Chief, Hematology and Oncology and Director, Cancer Center
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Evolution of Applications in the Internet

- **Scientific Research – University,
Defense, Energy**
- **Biomedical Databases**
- **Commercial**
- **Legal**

Laws and Methods of Control

Laws - are often thought of as:

- **Sets of commands**
- **Backed by punishments**

CRIMINAL ACTS

- **Hacker Laws**
- **Trespass**
- **Misappropriation**
- **Child Pornography and Obscenity**

HACKER LAW

- U.S., Computer Fraud and Abuse Act of 1986, 18 USC 1030 – makes it a felony for anyone to “knowingly cause the transmission of a program, information, code, or command, and as a result of such conduct, intentionally cause damage without authorization, to a protected computer.”
- Wire Fraud Act, 18 USC 1343
- Criminal mischief by interruption of public communication, state law, e.g. NJSA 2C: 17-3.
- Theft of computer service, wrongful access to computer systems, state law, e.g. NJSA 2C:20-25
- Conspiracy to commit Wire Fraud
- Up to 40 years prison, \$480,000 fine

FBI – COMPUTER CRIME

FBI National Computer Crime Squad’s (NCSS)

Intrusions of the Public Switched Network (the telephone company)

Major computer network intrusions

Network integrity violations

Privacy violations

Industrial espionage

Pirated computer software

Other crimes where the computer is a major factor in committing the criminal offense

LAW AS ENABLER

- expresses the values of the community (sets aside days to commemorate events, individuals)
- regulates the structures of government (balancing branches of government)
- protects individual rights (Civil law, Bill of Rights)
- enables flow of commerce (enforcement of trade laws and contracts)

AREAS OF LAW

- Intellectual Property
 - Copyright
 - Patents
 - Trademark
- Individual rights
 - Privacy
 - Free Speech
 - Defamation

AREAS OF LAW

- Trade and Commercial Law
- Regulatory Law
 - Communications
 - Professional Services
 - Environment
- Criminal Law

AREAS OF MAJOR CONTENTION

- Intellectual Property
- Individual rights
- Antitrust
- Criminal Acts
- Jurisdiction

COPYRIGHT LAW

➤ **Sec. 102. Subject matter of copyright: In general**

- (a) Copyright protection subsists, in accordance with this title, in original works of authorship fixed in any tangible medium of expression, now known or later developed, from which they can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine or device.

COPYRIGHT LAW

➤ **Sec. 102. Subject matter of copyright: In general**

- (b) In no case does copyright protection for an original work of authorship extend to any idea, procedure, process, system, method of operation, concept, principle, or discovery, regardless of the form in which it is described, explained, illustrated or embodied in such work.

COPYRIGHT - DURATION

- **Sonny Bono Copyright Extension Act of 1998 – extended from 50 to 70 years.**
- **Sec. 302. Duration of copyright: Works created on or after January 1, 1978**
 - (a) In General – life of the author and **70** years after the author's death.
 - (b) Joint Works – **70** years after such last surviving author's death.
 - (c) Anonymous Works, Pseudonymous Works, and Works Made for Hire – **95** years from the year of its first publication, or a term of **120** years from the year of its creation, whichever expires first.

COPYRIGHT - SUMMARY

- Works are under cpr as soon as written or "fixed"
- No cpr notice is required
- Infringe cpr whether you charged money or not
- Internet postings not public domain
- No permission to copy xc ordinary net use
- Fair use – allowed for social purposes; not mean free copying
- Cpr not lost bc not defended unlike tm law
- Names not cpr, under tm
- Cpr mainly civil law – show damages
- Increasingly under criminal law
- Net posting of E-mail - a violation
- Describing facts from E-mail - not violation

CPR – FAIR USE

Sec. 107. Limitations on exclusive rights: Fair use

criticism, comment, news reporting, teaching (including multiple copies for classroom use), scholarship, or research

Factors:

- Purpose and character of the use – commercial or nonprofit-educational
- Nature of the copyrighted work;
- Amount and substantiality - % of whole
- Effect on potential market or value
- Fair use may apply to unpublished work

TRADEMARK – domain names

- Trademark – Words, symbols and designs, sounds, distinctive colors, something that can be used to identify specific goods or services and distinguish them in the market from other similar goods or services.
- Service Mark – Word, phrase, picture, symbol, or shape which identifies and distinguishes your services from other services in the marketplace. A service mark is the same as a trademark except it's used to identify services, not goods.
- Laws and procedures governing service marks and trademarks are the same.
- Domain name can infringe other marks used in everyday commerce. Research if proposed domain name infringes upon another's mark.

TRADEMARK – protectability

To be protectable is a trademark the word or symbol or whatever must:

- be in actual "use" as an identifier of particular goods or services
- be distinctive, not "merely descriptive" or "generic"
- not be "confusingly similar" to anyone else's trademark that is already in use. "Confusingly similar" – when "reasonable consumers" would be confused as to the identity of the goods or services being labeled, would associate products or services together that in fact have no association.

CONFUSINGLY SIMILAR TRADEMARKS

Eight Factors:

- Strength of the mark – Arbitrary or fanciful marks (Canon) v. suggestive or descriptive marks (Ant-Kill)
- Proximity of the goods or services v. unrelated
- Similarity of the marks – different pronunciation v. sounds identical (Kwell and Quell)
- Evidence of actual consumer confusion – actual customer asked about the other company's goods or services?

CONFUSINGLY SIMILAR TRADEMARKS

- Marketing channels – marketed or sold through the same stores or channels
- Degree of purchasing care a consumer uses in selecting the good or services – inexpensive consumer items v. high priced, deliberated items
- Intent of user of new mark – scheme to infringe – U.S.A. made v. USA (deer) brand
- Likelihood of market expansion by the first user of the mark into product or service areas of new user.

PATENT LAW – Subject Matter

▪ Sec. 101. Inventions patentable

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefore, subject to the conditions and requirements of this title.

Patentable subject matter – living matter

U.S. Supreme Court - § 101 to extend to “anything under the sun that is made by man.” (Diamond v. Chakrabarty, 1980, patenting microorganism).

Unpatentable subject matter and the algorithm exception

Unpatentable subject matter: "laws of nature, natural phenomena, and abstract ideas."

The "Mathematical Algorithm" Exception – not patentable subject matter to the extent that they are merely abstract ideas

To be patentable an algorithm must be applied in a "useful" way.

Patentable – algorithms in waveforms

"Data transformed by a machine through a series of mathematical calculations to produce a smooth waveform display on a rasterizer monitor, constituted a practical application of an abstract idea (a mathematical algorithm, formula, or calculation), because it produced "a useful, concrete and tangible result" –the smooth waveform." (Alapat).

Patentable – algorithms to analyze cardiac rhythms

"Transformation of electrocardiograph signals from a patient's heartbeat by a machine through a series of mathematical calculations constituted a practical application of an abstract idea (a mathematical algorithm, formula, or calculation), because it corresponded to a useful, concrete or tangible thing – the condition of a patient's heart" (Arrhythmia Research Technology, 1992).

Patentable – algorithms in Business processes

“Transformation of data, representing discrete dollar amounts, by a machine through a series of mathematical calculations into a final share price, constitutes a practical application of a mathematical algorithm, formula, or calculation, because it produces “a useful, concrete and tangible result” –a final share price momentarily fixed for recording and reporting purposes and even accepted and relied upon by regulatory authorities and in subsequent trades.” (State St. Bank, 1998)

Patents – Novelty a,b,c

Section 102. Conditions for patentability; novelty and loss of right to patent

- (a) known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before invention by applicant
- (b) in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application in U.S.
- (c) he has abandoned the invention, or

Patents – Novelty d,e

- (d) first patented or inventor's certificate in foreign country prior to the date of the application in U.S. for patent – where application for patent or inventor's certificate filed more than twelve months before the filing in U.S.
- (e) described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another

Patents – Novelty f,g

- (f) did not himself invent the subject matter
- (g) before the applicant's invention – the invention was made in this country by another who had not abandoned, suppressed, or concealed it. Priority – dates of conception and reduction to practice of the invention, diligence of one first to conceive and last to reduce to practice, from a time prior to conception by the other.

Patents – obviousness, 103a

Section 103. Conditions for patentability; non-obvious subject matter

(a) (not patentable) if the differences between the subject matter and prior art obvious at time invention made to person having ordinary skill in the art

Patents – obviousness in biotechnology, 103(l) A,B

Section 103. Conditions for patentability; non-obvious subject matter

- (l) Notwithstanding subsection (a), . . . a biotechnological process using or resulting in a composition of matter . . . shall be considered non-obvious if:
- (A) claims to the process and the composition of matter are contained in either the same application for patent or in separate applications having the same effective filing date; and
 - (B) the composition of matter, and the process at the time it was invented, were owned by the same person or subject to an obligation of assignment to the same person.

Patents – obviousness in biotechnology, 103(3)

(3) “biotechnological process” means –

(A) a process of genetically altering or otherwise inducing a single – or multi-celled organism to –

- (i) express an exogenous nucleotide sequence,
- (ii) inhibit, eliminate, augment, or alter expression of an endogenous nucleotide sequence, or
- (iii) express a specific physiological characteristic not naturally associated with said organism;

(B) cell fusion procedures yielding a cell line that expresses a specific protein, such as a monoclonal antibody;

Patents – obviousness in biotechnology, 103(C)

(C) Subject matter developed by another person, which qualifies as prior art only under subsection (f) or (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.

Patents – Policy and objective

Sec. 200. **Policy and objective of U.S. Congress to** use the patent system to:

Promote utilization of inventions arising from federally supported research or development;
Encourage maximum participation of small business firms in federally supported research and development efforts;

Promote collaboration between commercial concerns and nonprofit organizations, including universities;

Ensure that inventions made by nonprofit organizations and small business firms are used in a manner to promote free competition and enterprise;

Promote the commercialization and public availability of inventions made in the United States by United States industry and labor;

Ensure that the Government obtains sufficient rights in federally supported inventions to meet the needs of the Government and protect the public against nonuse or unreasonable use of inventions;

Minimize the costs of administering policies in this area.

Software – TRADE SECRET PROTECTION

- Important means of protecting computer software.
- If the source code contains trade secret information, the Copyright Office protects this trade secret information by special deposit requirements.
- Both source code and object code can be registered although a “rule of doubt” registration will be issued for object code.
- Software sold or licensed, use contracts to maintain the “trade secret” status of the software.
- And not to disclose or use the software except in accordance with the express terms of the license or contract.
- Do not sell the source code. Access to the source code on “need-to-know” basis with an obligation of confidentiality.

Software – COPYRIGHT PROTECTION

- Single registration for computer program, visual and audio.
- Copyright notice to eliminate the “innocent infringer” defense.
- “Shrink wrap” licenses – transfer possession as “license” rather than a “sale”. Maintains trade secret status, prohibits decompilation of software.
- Copyright law only protects the “originality of expression” not “the underlying idea” or “function.” By itself, often inadequate to protect commercial value of computer software.

Software – PATENT PROTECTION

- *Diamond v. Diehr*, 450 U.S. 175 (1981), program for curing synthetic rubber using a mathematical formula in digital computer was proper subject matter for a patent.
- Cons – takes 2-3 y to issue, destroys trade secret status.
- In 1994, Stac won a \$120 million verdict *v. MS Dos 6*, in infringement of Stac’s data compression software patents. MS settled to pay \$43 million and buy \$40 million in Stac stock.

Software – TRADEMARK PROTECTION

- Photograph of a computer screen – evidence of trademark use.
- U.S. Patent & Trademark Office, Trademark Manual of Examining Procedure § 905.04 (d)

SOFTWARE PUBLISHERS ASSOCIATION

- Software Publishers Association (PSA), Washington, D.C.,
- Has more than 1,000 companies as members,
- Enforces copyrights against the unauthorized copying of software.
- Proceeds from each lawsuit are used to fund future litigation.
- Operates an “antipiracy” hotline.

FOUNDATIONS OF LEGAL FRAMEWORK

- Human Values
- Synergies - local, global
- Environmental Impact

ELEMENTS OF CONTROL

- Legal Code
- Societal Norms
- Industry Standards
- Market Forces
- Computer Code

BALANCING FRAMEWORK

- Interests
- Protections
- Access
- Controls

MODELS OF CONFLICT AND RESOLUTION

- Liability Model - wait for infringement, then sue
- Transactional Model - negotiate allowable uses of technology

FRAMES OF REFERENCE

- Historical Precedent
- Analogies
- New Circumstances
- Increased Breadth
- Slippery Slope

GLOBALIZATION OF COMMUNICATIONS

- Limits reach of individual governments
- Multinational governing bodies
- Self regulation

DILEMMAS IN KNOWLEDGE ECONOMY

- Credibility of information
- Reliability of services
- Interference with intellectual property
- Encroachment on privacy rights
- Access to information

SHIFTS IN KNOWLEDGE ECONOMY

- From glut of information to selectivity – criteria of credibility
- From accumulation to synthesis
- From facts to meaning and context

LEGAL ISSUES IN EMERGING TECHNOLOGIES

- New age of biomaterials
- Patenting of life
- Patenting of DNA sequences v. applications
- DNA profiles and databases – disease risk and insurance coverage
- Bio-monitoring and bio-identification

AN ASIA PACIFIC INFORMATION NETWORK FOR AGRICULTURAL RESEARCH AND EDUCATIONAL COLLABORATION

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Abstract

The Asia Pacific Advanced Network (APAN) and its activities especially in agricultural areas are introduced. APAN is an NGO consortium with two aims. One is the provision of high performance network links for research and education throughout the Asia-Pacific area. The other is to accelerate research and educational activities in the area, utilizing the APAN infrastructure. There are two activity areas under the APAN committee, the highest decision-maker of the consortium. These are the Technology Area and the User Community Area. The Agriculture Working Group of APAN (APAN/AG) is one of the most active working group in the User Community Area.

What is APAN?

APAN (<http://apan.net>) is an abbreviation for the Asia Pacific Advanced Network, which is an NGO non-profit international consortium established in June 1997. It has two main aims. One is the provision of high performance network links for research and education throughout the Asia-Pacific region. The other is to accelerate research and educational activities in the region, utilizing the APAN high performance network link infrastructure.

APAN members voluntarily offer the high performance network. In order to establish an APAN international link between two countries, a link point on each side and an international connection such as a seabed lease line or a communication satellite must be provided. Primary members provide both link points and international connections while regular members or associate members provide only link points. For example, the MAFFIN (Ministry of Agriculture, Forestry and Fishery Research Network, MAFF, Japan, <http://www.affrc.go.jp/>) voluntarily provides the Japan-Philippines link and the link point to it in Japan while PH-Net (Philippine Network Foundation Inc.) voluntarily provides the link point in Philippines.

Table 1 shows the members of APAN. The names of the countries in the table do not signify any national or governmental participation by those countries in APAN but do indicate that at least one link owner in each of those countries is offering at least one link point to the APAN international connection. A national institute, a university, a semi-governmental organization, a foundation or a private sector can be a link owner provided they can offer the above-mentioned facilities. In APAN member countries, there are usually APAN Project Institutes (API) where some research or educational project to utilize the high performance APAN international links is being undertaken.

Figure 1 shows the status of APAN network topology and the exchange points as of February 2000. The Vietnam link is also under consideration. The link performance varies from 0.75 (JP-PH) - 73 (JP-US) Mbps, depending on the connections.

Primary Members	Members	Associate Members	Liaison Members	Affiliated Member
Australia	Hong Kong	China	Canada	CGIAR
Japan	Indonesia	Malaysia	EU	
Korea	Thailand	(Vietnam)		
Singapore	Philippines			
USA				

APAN Organization and Its Activities

Figure 2 shows the APAN organization. In APAN, the APAN committee composed of the APAN link owners is the highest decision-maker. Under the committee, there are two activity areas. These are the Technology Area and the User Community Area. Each area is composed of several working groups. The former areas is mainly for network researcher and engineers who are involved in basic network technologies and basic applications of the network, while the latter area is open to researchers, administrators, educators etc. from wide range of different research and educational fields. Their interest is in how to apply APAN's high performance international network to their own fields.

APAN meetings are held regularly twice a year, once in Japan and once in another country. When it is held in Japan, IWS (Internet Workshop, <http://iws2000.jp.apan.net/>) hosts the APAN meeting as a part of its international workshop, providing some special sessions for APAN as well as for the APAN committee meeting. Those special sessions are chaired by some of the working groups. The working groups usually cooperate closely with each other. IWS2000 (<http://iws2000.jp.apan.net/>) was held in Tsukuba-Science City of Japan in February 2000, gathering 300 people from about twenty countries with about 150 presentations. The next APAN meeting will be held in Beijing, China in August 2000 (<http://www.apan2000.edu.cn/>).

How to Join APAN

There are several steps required for an institute or organization to connect to APAN. First, there must be a link point to APAN in their country. Then, a network connection must be established from the institute to the link point. Because of the strict routing and allocation policy of APAN, this physical connection does not in itself secure the APAN connection. To achieve this, the institute has to be an APAN Project Institute (API). To become an API, one has to find start a research or educational project that utilizes the APAN connection, with some partner(s) in an API or APIs in other APAN countries.

APAN Agriculture Working Group

The APAN Agricultural Working Group (APAN/AG, <http://agri-wg.jp.apan.net/>) started at the APAN Tsukuba meeting held in March 1998. A sub-group of APAN/AG became an independent WG as the Earth Monitoring Group (<http://ss.cc.affrc.go.jp/~emonitor/>) at the Seoul APAN meeting in June 1998. The aim of APAN/AG is to accelerate agricultural information research, utilizing the APAN network. It promotes research or educational projects in agricultural fields and attempts to bridge institutes to start up new collaborations.

The Agriculture Working Group of APAN (APAN/AG) has been one of the most active working groups in the User Community Area since its establishment. It has been maintain close relationships with other working groups of APAN such as the Earth Monitoring WG, the Education WG, the Digital Library WG and Bioinformatics, having overlapping membership with these groups.

In addition to the projects being either undertaken or planned under APAN/AG, some of which are introduced in the next section, APAN/AG has been trying to establish a local APAN/AG group in each APAN country. Missions to Korea, Thailand, Malaysia, Indonesia China and Philippines were sent in 1999. In most of the countries, a local meeting with the mission was held, gathering many people from fields related to agricultural information.

Since the APAN/AG meeting held during IWS2000, APAN/AG has been co-chaired by Mr. Akira Mizushima (goddila@maffin.ad.jp) of Japan and Dr. Ronnie S. Natawidjaja (ronnien@unpad.ac.id) of Indonesia.

APAN/AG Projects

Table 2 shows the authorized projects under APAN/AG. In this section, some of the APAN-related projects are introduced.

Mirror Sites

Bio-mirror (<http://bio-mirror.jp.apan.net/>) is a project to promote the mirroring of DNA sequence databases, protein biosequence databases etc. It covers GenBank, EMBL, DDBJ, SWISS-PROT*, TrEMBL, PIR, BLOCKS, ENZYME, PROSITE*,

REBASE. The total size of the databases mirrored was 23GB in May 2000 with monthly increment of about 1GB. The update frequency varies from one day to a month, depending on sites. Bio-mirror is now served in Australia, China, Japan, Korea, Singapore and USA (November 1999) and is planned to start in Indonesia and Malaysia.

A mirror of FAO's WEICENT is also being planned. WEICENT (<http://www.fao.org/>) is a popular database open to public, which provides world-wide information about agriculture. The database is currently located on a FAO server in Rome but connectivity to WAICENT from the Asia-Pacific countries is usually very slow because of the narrow bandwidth connection. In June 1999, FAO and MAFFIN agreed to mirror WEICENT at a MAFFIN site as an APAN project, and the mirror is expected to start in early 2000. Additional WEICENT mirrors at other APAN sites are also being planned.

The mirroring of the databases of IRRI (International Rice Research Institute, <http://www.cgiar.org/irri/>), one of the CGIAR institutes (Consultative Group on International Agricultural Research, <http://www.cgiar.org/>), is also being discussed between IRRI and MAFFIN for the higher utilization of these valuable databases. This discussion seems to be expanding to other CGIAR institutes. Mirrors for the databases of all the CGIAR institutes would be a valuable resource not only for the APAN countries but also for the world.

Table2 Authorized APAN/AGProjects

Nick Name	Project Targets	Contact
Bio-mirror	Biotechnology Database Mirroring in Asia and Pacific	Y. Ugawa/MAFFIN
WAICENT mirror	FAO Database Mirroring in Asia and Pacific	H. Aoki/AFFRIC
Wild Turkey	Digital Asset Mobilization Project of the CGIAR	P. O'Nolan/IRRI
Agro-pedia	Agricultural Digital Library on High Performance Network	Hiroko AOKI/AFFRIC
ANDES	Asia Pacific Network for Disaster mitigation using Earth observation Satellite	H. Sawada/FFPRI
Pisces	Supply of DMSP Data For Asian Pacific Earth Monitoring Applications in APAN	C. Elvidge/NOAA-NGDC
Agro-Met	Collaboration in AgroInformatics for the establishment of Regional AgroMeteorological Information Network System in Asia	B. Lee/KMA
Eco-DB	Development of Interchange Platform "Eco-DB" for Observed Data in Agro- Ecosystem Dstudy through WWW	Y. Harazono/NIAES
Agri-JP/CN	Japan-China Agricultural Technology Research and Development Center Project	T. Kiura/NARC
*	Development of Internet-based Crop Production Decision Support System for Agricultural Resources Planning and Management	Roberto G. VILLA/DA-ITCA

Distance Learning

Distance learning is one of the obvious applications of the APAN high performance network. Figure 3 and 4 show an example of a distance learning exercise conducted between IRRI and the Department of Agriculture in Thailand. The availability of APAN's fast network infrastructure made the video conference possible. This distant learning project is not listed on Table 2, because it is applied as a temporal project for each performance.

Wild Fire Detection

Figure 5 shows a wild fire detection project that is a part of the ANDES project and utilizes the APAN network. Wild fire in tropical forests occurs unexpectedly and often it is quite difficult to detect from land. This project is to detect such wild fire, utilizing satellite images acquired by NASA and NOAA in USA. These images are sent to a super computer in MAFFIN via APAN so as to analyze them and to extract information regarding fires in tropical forest areas in the south-east Asian countries. The results of the analyses are sent through the APAN network to places where fire is detected. This project is being undertaken by the APAN Earth Monitoring WG in cooperation with APAN/AG.

Digital Library

An agricultural digital library project called Agro-pedia is planned to commence in November 1999. This project aims to share digital libraries shared among people in the APAN countries. Almost all the countries in this region use different languages and in order for these documents to be utilized they must be translated from their original languages. The first step of this project is to create a thesaurus for the different languages using English as a universal intermediary. The second step will be to create automated machine translators, which are becoming practical between certain languages, e.g. Japanese and Korean.

APAN/AG Friends

APAN/AG has several friend organizations. International organizations such as FAO and CGIAR belong to the first group of its friends. CGIAR became an affiliated member of APAN after the APAN Osaka meeting held under IWS99 (<http://www.itrc.net/workshop/IWS99/>). APAN/AG has also close relationship with national associations for agricultural information such as Indonesian Society for Agriinformatics, Japanese Society for Agricultural Information (<http://www.jsai.or.jp>) and Korean Association for Agricultural Information Research (<http://www.ksais.or.kr/>).

In 1998, AFITA (the Asian Federation for Information Technology in Agriculture, <http://www.jsai.or.jp/afita/>) was founded, holding the first international conference in Wakayama City located closed to Osaka, just before APAN/AG was started in the APAN Tsukuba meeting in March, 1998. APAN/AG and AFITA have been mutually supporting each other since then and many are members of both APAN/AG and AFITA.

Discussion

In this article, I have summarized the present status and the future plans of APAN and APAN/AG. At this moment, the APAN and APAN/AG activities seem to proceed and grow well. But, because APAN is an NGO volunteer-based consortium and it has no own funding or budget, we cannot be too optimistic. In fact, APAN has to be always hosted by someone when it needs to act, e.g. to hold a conference. That is, APAN's existence can not be taken for granted.

APAN basically considers only the international links between countries. But, when an organization intends to connect to APAN, a network connection to an existing APAN link point must be prepared by the organization. Often, this can be a high hurdle for organizations, because of comparatively high cost for domestic lease lines in many of the APAN countries. This kind of poor internal network infrastructure often limits APAN's activities at this moment.

In spite of some issues APAN is facing, the policy and philosophy of APAN are clear and sublime, and help us to achieve real international peaceful co-operation for human happiness through the acceleration of research and educational activities.

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INNOVATION SYSTEMS FOR THE K-ECONOMY

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Abstract

Information and communications technology serve as a backbone of the knowledge economy. However, information and communications infrastructure by themselves have little value. People, while utilizing information resources and communications infrastructure, are the catalysts that innovate. It is this innovation that creates value in the K-Economy.

"Innovation Systems" provide access to the right information at the right time and in the right context to empower researchers to innovate. Research accessed within the context of an innovation system is more valuable than a discrete piece of information or a single article used outside of the network of research that created it.

The process of scholarly communication is evolving in ways that will impact the role that information and communications technology play in innovation in the future.

With the communications technology available today, researchers can have access to scientific and technical information in ways never before possible. This access provides researchers with the tools they need to have an equal opportunity to innovate.

Slide 1:

My talk today will focus on the importance of Information, or content, in the information and communications technology equation. I will speak primarily about research and scholarly literature, why it is important to have access to, and how it is produced and then consumed. I will speak about one type of innovation system, which I define here as an information system that supports innovation.

This paper will not discuss National Innovation systems, which some of you may know to be regulatory environments and national research policies.

We have heard about information infrastructure as the wires and networks that connect computers. I submit to you that at least as important as the wires and networks and protocols is the information, or content, that is accessed from these wires. Information and communications technology together serve as the backbone of the knowledge economy. Each is less valuable without the other.

The highway analogy is often used to describe the internet. If the internet is a highway, then the information on the internet is like cars and trucks. They are carrying things. But these things only become valuable when they arrive at their destination - this is information on the internet. Without information, there is little point in having the internet. And it is this information that, when applied, can support innovation.

Slide 2:

A great deal of research has been done about the positive affects of innovation for economic growth. This research centers around the explanations for the growth of productivity. Economists from Adam Smith to Karl Marx described economic output as a function of its inputs. To explain growth beyond simple increases in the inputs to create increases in the outputs, economists came up with various explanations, including innovation. Today, core to the knowledge economy is deriving economic value out of ideas.

Assets in the knowledge economy are based on intellectual capital. This intellectual capital might be in the forms of superior processes and procedures and the individuals who created them. It might be in the regulatory structure of patents, providing the inventor with a period of time during which they have no competition to exploit an innovation. The assets also might be knowledge and information that an organization has accumulated over a period of time. In this case it is important to keep in mind that information assets are only valuable when they are retrievable or accessible.

Looking back at the last 100 years, the last 50 years, or even the last 10 years, we see evidence that discovery and innovation has proceeded at an ever increasing rate, driving economic growth. Brad DeLong, of UC Berkeley, recently wrote in a working paper for the US Natl Bureau of Economic Research that "Compared to the pace of economic growth in the 20th century, all other centuries were standing still." This rapid change makes it challenging for the researcher, the entrepreneur and the policy maker to keep track of relevant changes and react to them.

Slide 3:

Mike Vance, a consultant and trainer in the US, wrote that "Innovation is the creation of the new, or the re-arranging of the old in a new way".

When innovating, it is often useful to refer to the current state of the art to critically evaluate and use as a base from which to build upon or destroy and create a new state of the art. No one wants to have to re-invent the wheel, unless they choose to.

Information about the current state of the art might be tied up in many forms and media: including journal articles, pre-prints, patents and standards, conference proceedings, gene sequences and clinical evidence. This information might be in print, CD-ROM or available through the web.

Providing this information, and convenient access to it, is critical to facilitate innovation. However, its sources and the methods used to utilize it are changing. This change is being driven by changes in technology.

Slide 4:

A primary source of scientific information is from scholarly communication. Scholarly communication, usually in the unit form of an article or paper, is information that information consumers access and refer back to. The process of scholarly communication is evolving due to changes in information technology and changes in communication technology.

Technology today facilitates research with quick and convenient communication to allow people to share ideas.

I will talk more about the scholarly communication process shortly.

The effects of changing communication technology means that the unit of scholarly communication is changing and scholarly communication is appearing in new places. Today, researchers have their own web pages, posting research results. Using this medium, Collaboration between researchers no longer requires close physical proximity.

Also, changes in information access technology are affecting the way that information is consumed. Changes in indexing technology mean that a unit of information can be a discrete fact extracted from other research.

Almost as a result of all of this, the needs and expectations of the researchers for their information systems is changing. Researchers want to save time when trying to access the information they need. They want to use information tools to help them stay aware of the rapid changes in their own disciplines.

ICT changes all of this.

Slide 5:

A closer look at the chain of scholarly communication makes this more clear.

Here, you see six links in a circular chain. Changes in the role of ICT put pressure on all parts of this chain to evolve. The two parts that I believe can not change are the information source and the information consumer - the author and the researcher. Interestingly, these two positions in the chain are sometimes occupied by one person - the authors themselves are frequently the heaviest end users of research.

The **author** produces scientific research.

The **editor** manages the peer review process which is critical to evaluate the research,

The **primary publisher**, or full text publisher, disseminates the research. Primary publishers have a vested interest in publishing only high quality research in order to maintain the value of the journal brand which they built, often over many years. The primary publisher is most comfortable working with the journal article, the traditional unit of research.

The **secondary publisher** adds value to this chain by packaging information in different ways, often spanning multiple publishers. Sometimes the packaging involves breaking down the journal article into smaller bits of information. Less frequently the secondary publisher links this information in creative ways to facilitate research. One key role of the secondary publisher is making information accessible.

The **library** plays a role by aggregating the needs of many researchers to provide them all with information that none would have the resources to have on his or her own.

And that brings us back to the **end user or researcher** who is researching in order to publish and grow the body of knowledge in the discipline.

Slide 6:

When put in context of real life, the single chain of research that we just saw is one piece in a larger chain of research and discovery through time and between researchers.

A key characteristic of knowledge is that it is systemic and cumulative. The opportunity to create new knowledge advances is dependent in many ways on the pre-existing knowledge stock.

When scientists do research, they are standing on the shoulders of those that preceded them.

The information flow diagrammed here links knowledge through the references, or citations, which the researchers themselves put into place. These references do more than acknowledge the work of another researcher; when the links are assembled and indexed, these references, or citations, provide a means of tracking and linking significant research developments forward and backward in time.

This information flow almost always crosses publisher lines and frequently crosses disciplines.

Slide 7:

I believe that information systems which do not limit a researcher, but actually provide tools to illuminate links between research that are not otherwise obvious to the researcher become creativity tools - or Innovation Systems.

What are some characteristics of this innovation system?

- **Single Working environment:** or portal - provides the researcher with a single system from which to search.
- **Multi-** media: print, microform, e-journals, etc.
- **Multi-**disciplinary: comprehensive in coverage
- **Multi-**source: journals from many publishers, patents, proceedings, etc.

When a researcher is working, he or she is interested in the universe of knowledge that exists, not information restricted to a particular publisher or type of source. Multi-disciplinary coverage is important in an innovation system because we are seeing convergence in the disciplines in ways never before considered. Developments in life sciences and material sciences are driving much of this. Last night several people were discussing the overlap between mathematics and biology. (Geometric and log progressions can be used to model reproduction of organisms.)

- **Illuminates subtle links and relationships**

An innovation systems illuminates subtle links and relationships between literature. An electronic system can find links and patterns that humans can not do quickly.

- **Accessible with multiple virtual entry points**

An innovation system is physically accessible at the researcher's desktop and provides many virtual entry points to the data.

- **Current and Comprehensive**

An innovation system is current and comprehensive to keep researchers aware of the most recent work in their disciplines.

- **Intuitive**

An innovation system is intuitive - it is easy to use and links the information in a meaningful way, often providing **context** for the information.

All of this is valuable because the quality of the information input influences the quality of the research output.

Slide 8:

An example of the information system that I am discussing is built by the company that I work for. It is truly unique as an innovation system.

The Institute for Scientific Information released the Web of Science about 2 1/2 years ago. The database has been phenomenally well received, in large part due to its nature as an innovation system.

Briefly, ISI is a global leader in the publishing of scientific, technical and medical information databases. For almost 40 years, ISI has been publishing Current Contents and the Science Citation Index.

Today, we are very well known for these two products.

As a vendor, ISI has tried to listen carefully to researcher needs and build a very usable and accessible information tool.

Web of Science provides:

- citation index core
- coverage which is multi-disciplinary and multi-publisher
- seamless links to other relevant datasets
- links to full text
- high quality data
- integrated and accessible system

Slide 9:

To create a true "system" and not simply a database, ISI has linked information to make it more valuable. ISI includes many types of links from and within the Web of Science.

The next slide demonstrates these.

Slide 10:

This is the ISI Vision for access to scholarly literature.

Core: Citation index.

Primary publisher full text

Links to related databases:

- Chemical information, making the database structure and sub-structure searchable through Chemistry Server
- Patent Information in Derwent Innovations Index
- Biological Information in Biosis Previews
- DNA and protein sequence information in GenBank

This system provides information to support innovation

Slide 11:

Citation indexing gets exciting when you see its applications. By analyzing the citation links between papers, you can

- Measure scholarly output
- Measure a journal's relative "impact" within its discipline
- Measure the relative "impact" of a scholarly paper
- Identify "hot" papers and "hot" researchers

Web of Science can provide a rough measure of the research output of the Philippines.

Over the 5 year period from 96 - 00, ISI indexed 1660 papers written or co-authored by researchers from organizations in the Philippines.

Over the 10 year period back to 1991, ISI includes 3094 papers. If you compare this to the output from 1971 - 1980 in the Philippines, there is substantial growth in research output. There were only 1216 papers during the earlier period.

The database includes research from ICT steering committee co-chair Raul Fabella. He has 16 papers on the ISI database, the most highly cited of which is called "Uncertain monopoly rent and the social cost of rent seeking". The database can reveal that one of the top chemists in the Philippines in the 1990s was LI Cruz of the Institute of Marine Science.

At a very macro level, users of the citation index can track directions in research world wide by tracking which disciplines are "hot", or have a lot of research being conducted. This can help scientists, research organizations, or even governments to choose where to deploy resources for research.

Slide 12:

What is the future direction of innovation systems? You can be sure that the future will follow the needs of the information consumers.

Databases will follow the changing methods and processes of scholarly communication.

New technologies will help to make information more accessible: intelligent agents will retrieve relevant information, natural language searching will permit complex search strings. New search methods will take searching well beyond keyword searching - full text searching and contextual searching will continue to improve.

Research and innovation mapping will be used more in the future to identify areas of hot research and identify gaps in research that can be filled.

Challenges for innovation systems in the future will include being able to get the groups involved with scholarly communication to standardize formats and technologies. Also, As an increasing amount of data becomes available, identifying the highest quality and most relevant information for researchers will also be a major challenge.

Slide 13:

Here are examples of coordinated efforts to provide infrastructure, both communications and information, to support research. At some time, all of the examples cited received government funding. The governments might have justified the investment with the expectation for positive externalities from supporting R&D in academia.

- CHEST in the UK - a pioneer in the adoption of web technology and consortium subscription models.
- CALIS in China was established to concentrate resources to quickly create world class research institutes in China.

Slide 14:

A national approach to innovation systems can help to support the K-economy.

Information is an important input into R&D; world class information systems support world class researchers.

The Philippines has the opportunity to acquire these innovation systems and should consider doing so.

Advanced ICT systems can create fertile ground from which innovations can blossom. Comprehensively explaining what creates innovations is difficult, but ICT is a necessary input.

One final thought:

The value of information is derived from what can be done with it. What is done with it is the domain of the researchers themselves.

RESOLUTIONS, RECOMMENDATIONS, AND IMPLICATIONS

Acad. Apolinario D. Nazarea

Member, National Academy of Science and Technology

Synthesis of Lessons Learned

- The most important consideration that came out in our Conference revolves around the need to manage rapid change in the emerging global economy.
- How do we contextualize information technology and its knowledge base as a resource? Very recent research by Isiel de Sola Pool has estimated that the total store of information is growing exponentially – with a doubling time of approx. 5 years. More knowledge/ information has in fact been generated in the past 30 years than in the last 5000 years previous to that period.
 - Both the need and rapidity of such changes was amply shown in the keynote address of President Estrada in which he stated that Executive Order No. 125 promulgated in July 1999 already is in need of changes in light of recent ICT developments. This implies that IT21 (our National Information Technology Plan for the 21st Century) would have to be updated within a period of less than one year of its promulgation.
 - It is also shown in de Sola Pool's research that while information is growing exponentially, the rate of utilization of new information is growing only linearly. There is, therefore, many windows of opportunity in the exploitation of the knowledge base.
- How do we approach ICT and its resource base?
 - Effective strategic thinking, [for example, the optimal re-configuration of the inter-agency and NITC and the intra-agency ASTI] requires an appropriate conceptual framework as well as the appropriate infrastructure – it would not be enough to have merely the infrastructure in place without the accompanying changes in conceptual framework that should go with it.
- Critical intra- and inter-industry relationships exist in the "supply chain" which we now recognize to be strategy-driven and knowledge-driven – as well as being market-driven.
 - This was well expressed in the contribution by Dr. Hokoon Park and the contribution by Mr. Jaime Augusto Zobel de Ayala II.
- The government, the chief national strategic architect must thoroughly understand the strategic nature and current and future potential of ICT if the government is to give the "optimal regulatory cues," including regulatory cues in public education.
 - The former aspect was well discussed by Asec. Toby Monsod
 - The latter aspect was thoroughly discussed by Sec. Bro. Andrew Gonzales and Mr. D.J. Rushworth, both of whom recommend universal access to information sources.➤
- Since ICT creates strategic opportunities, it cannot be embarked on just in order to support present initiatives.
 - This was well-discussed in the contribution of Dr. Hokoon Park.
- Future applications of ICT may alter the present core of the cognized model that we have of the optimal path of evolution as new sub-technologies wax, wane, supplanted, become obsolete, and finally, replaced.
 - Hence, it has become a truism that the core competency required of workers is to be able to learn, unlearn, and relearn throughout their lives.
- The government must translate strategic decisions into effective regulatory instruments of policy.

- In practical terms, Asec. Toby Monsod observed, there is advantage to be had from merging ECPC and NITC, with DTI as the lead agency
- How should the government leverage our human resources in the future? In the long term, it may be that the use of computerized "expert systems" would eventually free our society from dependence on a specialized few in training future workforce.
- In sum, it seemed clear from our conference that the greatest pitfalls/ complexities posed by ICT **concerns people, not technology**—and hence, we are faced with a socio-technical problem of creating a proper culture that fully incorporates knowledge at all levels of social organization and productive endeavor.

Principal Resolution

Resolved that the initiatives announced by President Estrada, principally:

1. The updating of the Executive Order No. 125 issued in July 1999 (Endorsing the National Information Technology Plan for the 21st Century or IT21);
2. The consolidation of the number of now dispersed initiatives of the government in e-commerce be undertaken under a reactivated and expanded E-Commerce Promotion Council;
3. Further enhanced development of other IT Parks through fiscal and non-fiscal initiatives;
4. The creation of an ICT Innovation and Development Fund to provide venture capital for ICT business start-ups;
5. The recent amendments to the Omnibus Incentives Act and the E-Commerce Bill of Senators Magsaysay, Ople, Flavier, and Sotto

be supported by this conference.

Driving Forces

Three emerging and interlocking driving forces are changing the rules of business and national competitiveness:

- **Globalization** – markets and products are more global and many companies outsource manufacturing and software development to distant locations.
- **Information/Knowledge Intensification** – efficient production relies on information and know-how; over 70% of workers in developed economies (e.g. OECD countries) are information workers; many factory workers in OECD countries use their heads more than their hands.
- **Networking and connectivity** – developments such as the Internet bring the 'global village' ever nearer.

The net result is that goods and services can be developed, bought, sold, and in many cases, even delivered over electronic networks. Electronic commerce offers many advantages in terms of cost savings, efficiencies and market reach over traditional methods.

Characteristics

The knowledge economy differs from traditional economy in several key respects:

- The economics is not of scarcity but rather of zero marginal cost. Unlike most resources that deplete when used, information and knowledge can be shared, and actually grow through application.
- The effect of location is erased using appropriated technology and methods, virtual marketplaces and virtual organizations can be created that offer benefits of round the clock operation and of global reach.

- Laws, barriers, and taxes are difficult to apply on solely a national basis. Knowledge and information “leak” to where demand is highest and the barriers are lowest.
- Knowledge enhanced products or services can command price premiums over comparable products with low embodied knowledge or knowledge intensity.
- Pricing and value depends heavily on context. Thus, the same information or knowledge can have vastly different value to different people at different times.
- Human capitals – competencies – are a key component of value in a knowledge-based company.

These characteristics, so different from those of the traditional economy, require new thinking and approaches by policy makers, entrepreneur executives and knowledge workers. To do so, though, requires leadership and risk taking against the *prevailing and slow changing attitudes and practices of existing institutions and traditional business pragmatics*.

Policy Implications

Implications for policy makers and local, regional, and national government as well as international agencies and institutions:

- Traditional measures of economic success must be replaced or at least supplemented by new ones. Such measures must be put together by governmental and private stakeholders.
- Economic development policy should focus not on the “jobs created” but rather, looking into the future, on infrastructure or sustainable “knowledge enhancement” that attracts knowledge-based companies.
- Develop regulations and taxation for information and knowledge trading and embodiment at a level compatible with international practices looking more and more to future knowledge-based industries rather than traditional industries.

Example: WIPO is seeking harmonization of copyright legislation particularly for online markets (see also the discussion of Dr. Bernal).

- Stimulate market development through new forms of informational collaboration.

Example: Encouraging participation by collaboration across national boundaries using electronic knowledge sharing methods.

- The main challenges facing policy makers and business leaders are the following:
 - It is difficult to ‘go it alone’. Stakeholders, especially employees and business partners must share similar views for initiatives to succeed
 - Organizational recognition and reward systems usually do not sufficiently recognize knowledge contributions. This is because they are still linked to performance measure of the traditional economy.
 - Measures of return on investment are done using traditional accounting methods. Thus, investments in knowledge activities need strong advocates at all levels of government, the business sector and the rank and file of workers

Policy Implications

Many businesses are only now realizing the role of knowledge and are creating knowledge management programs. Such responses should be part of a coordinated effort that:

- Recognizes the importance of knowledge to their business bottom line.

- Develops new measures of corporate performance based on knowledge and, eventually, annual corporate reports that contain intellectual capital acquisitions.
- Systematically enhances organizational learning and knowledge, through new organizational arrangements and processes.
- Provides a technology infrastructure to enhance knowledge creation and sharing.
- Encourages the sharing of knowledge through effective organizational settings and business practices.

CLOSING REMARKS

Flemon A. Uriarte, Jr.

Secretary, Department of Science and Technology

In closing this conference, this group of people that I should like to thank—I should like to thank the National Academy of Science and Technology for taking up the challenge to organize this conference. When I was conceiving the idea of organizing this conference, I had no reservation in requesting the Academy to be the primary agency to organize and lead the preparation for this conference. The success of the conference which we held yesterday and today proved that I was right in making that decision. So as we close this two-day conference, I should like to recognize, first of all, the President of the Academy, Dr. Perla Santos Ocampo; the Secretary of the Academy, Dr. Peping Juliano; Academician Nario Nazarea; and of course, the untiring effort of the Executive Director of the Academy, Ningning Samarita; and all of the Academicians that I see—are no longer here, but I saw them stayed for the past two days, and I think some are still here at the back. And so may I once again ask all of you to that we give them a round of applause.

Next in line for me to thank are our guests—some of them are still here—I will not go through their names anymore. You know them because you have the program. I had wanted to attend all of the sessions yesterday and today but unfortunately my other engagements prevented me from doing so. That is the sad part because I was really interested in listening to all of them. But as you know I have no more voice. Last night after the dinner that I hosted, and I had the chance to talk with our invited speakers last night. After that I left and I had a meeting with the Speaker of the House of Congress, Speaker Manny Villar. Our meeting lasted until one o'clock in the morning. And so I was not home until two o'clock. And then we had a Cabinet meeting this morning at 7:30. So you know I only had about three hours of sleep after attending to the preparations for this conference. That is why you can see I have no more voice. But I cannot end this conference without thanking all of them. The papers have been very excellent. I have received feedback already from the President; and the President is very pleased at the conference—at the number of people at the Opening. He was very happy. Jaime Augusto Zobel de Ayala also congratulated me personally for the excellent papers that have been presented. He felt that it was really a top-class conference with top-class speakers. So if we can have a round of applause to all our invited speakers, particularly those from outside the Philippines.

The last that I should like to congratulate are of course all of you, for staying up to the closing. You know many years ago, I was attending an international conference in Regina, Saskatchewan. I don't know if you have been there. It's the flattest land that I have ever seen in Saskatchewan. And it was a very large conference. There were about 800 to a thousand participants on the opening day; and there were ten simultaneous sessions. I was accompanied by a young director from our department to present a paper. And being young, and this was his first international conference, he was scared and he was very apprehensive, and he was always flipping through his charts and through the transparencies he was going to show. And so I asked him, "When are you presenting your paper?" He said, "Well actually, I'm presenting it on the last day, in the afternoon." And so I told him, "Don't worry about it". I said, "I'm sure you'll be able to take care of it." At the end of the conference, when I saw him, I said, "How was your session—one of the ten break out sessions—how did it go?" And he said, "Well there were five of us." He said, "Myself, the moderator, and the rapporteur, plus two people in the crowd." Now I'm sure we can count that there are more than two people in the crowd this afternoon. That shows the interest of all the people in as far as the subject matter is concerned. So my applause to all of you. Let's all applaud ourselves.

Now the substantive part of my closing remarks. Yesterday the President gave a lot of instructions. Many of these instructions were directed specifically to the Department of Trade and Industry. But four of those instructions are relevant to the Department of Science and Technology; and I have noted them down.

The first one is the creation of an ICT Innovation and Development Fund. This will involve both the DOST—our department—and also the trade and industry department. What I should like to do is this afternoon I should like to already to initiate the process of us in the department already starting working on this. Because the ICT Innovation and Development Fund, while the portion that will go into the venture capital will be the responsibility of the DTI, the portion that will go into innovation and research should be our responsibility; and therefore it will require coordination with DTI. And accordingly, I should like to assign Assistant Secretary Mel Rodríguez—she is not here—and the Financial Management Service of the Department of Science and Technology to work with NCC, PCASTRD, and ASTI in order to link up with DTI to see to it that this ICT Innovation and Development Fund, as directed by the President, is actually created and that our department, the Department of Science and Technology, will be able to play its mandated role.

The second instruction of the President is the reorganization of the Advanced Science and Technology Institute. For this particular instruction, I should like to assign Undersecretary Roger Panlasigui to be the point person to see to it that this instruction of the President is carried out. He should coordinate the work of ASTI, PCASTRD, and the National Computer Center—plus any other—in order that ASTI can actually be reorganized into what the President said, “a world-class research and development institute for information and communications technology.”

The third instruction of the President is to strengthen the NITC—the National Information and Technology Council that I am chairing right now. There are now a number of discussions that I had in as far as the relationship between NITC and the E-Commerce Promotion Council. This has to be considered. Nevertheless, what I should like to do is to assign PCASTRD as the focal agency to follow up on this instruction of the President. Director Ida Dalmacio is now in Laos, but I believe, I don’t know, whether Deputy Director Alex is still here.

The fourth instruction of the President is to update and revise IT21. And for this I should like to assign Undersecretary Jun Lirag—I think he has also left already. But I am assigning him to coordinate this effort to update and revise IT21. This cannot be updated and revised only by DOST—it will also have to be coordinated with all the other agencies. But within the department that I head, Undersecretary Lirag should seek the support of the National Computer Center, PCASTRD, ASTI, and of course all the members of the NITC in order to carry out this instruction of the President.

And then I mentioned in my paper that there are going to be certain strategies that we have to follow. And just following the strategy the six elements of the Singapore strategy. We may have to modify this, but because they are simple and direct, let me go through that. Because they cover all the areas that we would like to cover.

The first strategy is to create an IT or an ICT culture. As we are all aware of, we need this. And for this task I should like to request the National Academy of Science and Technology to spearhead this strategy of creating an ICT culture. Of course they have to work with any other agency that they need. For instance STII and NRCP within the department; and also others like DECS. But I should like the National Academy of Science and Technology to be the lead focal agency in as far as creating an ICT culture in the country.

The second one is to plan the ICT human development. This is very important. We would need also the private sector here. Here I should like PCASTRD and SEI to be the lead agencies. They should start working with our other agencies like the Philippine Science High School and STII. More importantly, they should start working with the private agencies such as Cisco, Oracle, Sun Microsystems, and others—including maybe the Ayala Group in order that we may have a workable IT human resource development. Certainly they should be working with DECS and with CHED. But within the department, they will be the focal point. Ultimately of course, DECS and CHED, overall for the entire country, they should be the lead agency—but I’m talking only who will be the lead within the department.

The third is to nurture the IT industry. For this, I am assigning the Philippine Council for Industry and Energy Research and Development (PCIERD) and PCASTRD to work together in order to prepare the detail activities so that we can nurture our ICT industry in as far as the Department of Science and Technology is concerned. But certainly, in as far as the entire Philippine government is concerned, the lead agency here should be DTI.

Fourth, evolve an information infrastructure. Here I should like to assign the National Computer Center. Certainly they should be the lead agency for us to study how we can evolve an information infrastructure and they should be ably assisted by ASTI on this matter, and of course plus other agency within the department. And certainly within the entire Philippine government, DOTC should be the lead. But in as far as the Department of Science and Technology is concerned, the National Computer Center should lead this effort.

Number five, deploy Flagships Programs. For this, I should like to assign Undersecretary Jun Lirag supported by the Project Director for the Flagship Program of the Department of Science and Technology, Professor Glen Sipin, should be the one to conceptualize what should be the flagship programs that we should be deploying. It should be of course the efforts of all the instrumentalities of the government, but whatever the Department of Science and Technology can conceptualize, then these will be the recommendations that we will be presenting to the entire government.

And then finally, to exploit the ICT in the government, I believe that this is exactly the mandate of the National Computer Center. And the National Computer Center was established, they were primarily formed, in order to catalyze the utilization on the information and communications technology in the government. And NCC should lead this and should seek the assistance of all the government agencies within the department in order that we will be able to exploit the use on information and communications technology in government.

So with that, I think now I can rest because I have assigned all of the work to everybody else. Fortunately, the Cabinet Caravan has been—which is supposed to start tomorrow morning, we are supposed to be on a four-day Cabinet Caravan to start at Luneta, the Rizal Park, at seven o'clock—but fortunately, the President postponed it indefinitely. So I should be able to rest at least a half-day tomorrow in order to recover my voice. And since I'm really losing my voice, finally I should really like to thank all of you for coming here—for supporting the efforts of the Department of Science and Technology; for supporting the National Academy of Science and Technology; and all our efforts—and for staying all the way to the end. And that is what I like. When you start something, you should not just start it—you should stay all the way to the end. And for that I really appreciate your gesture.

Thank you and good afternoon.

APPENDICES

THE ORGANIZERS

DEPARTMENT OF SCIENCE AND TECHNOLOGY (DOST)

The Department of Science and Technology (DOST) is the premiere science and technology body in the country charged with the twin mandate of providing central direction, leadership and coordination of all scientific and technological activities, and of formulating policies, programs and projects to support national development.

Originally established as the National Science Development Board (NSDB) on June 13, 1958, it was later reorganized on March 17, 1982 to become National Science and Technology Authority (NSTA) vested with broader policy-making and program implementing functions in order to be more effective and responsive to the scientific and technological needs of the country.

On January 30, 1987, NSTA was elevated to the Department of Science and Technology (DOST) under Executive Order No. 128. DOST's functions and responsibilities were expanded to enable it to effectively pursue the declared state policy of supporting local scientific and technological efforts, developing local capability to achieve technological self-reliance, promoting public and private sector partnership in S&T activities and encouraging the private sector to take greater role in research and development activities.

NATIONAL ACADEMY OF SCIENCE AND TECHNOLOGY (NAST) PHILIPPINES

The National Academy of Science and Technology (NAST) Philippines was created in 1976 through Presidential Decree No. 1003-A to give recognition to outstanding achievements in science and technology, and to serve as a reservoir of competent scientific and technological manpower in the country.

In 1982, through Executive Order 818, the Academy was also formally charged with the function of advisory body to the President of the Republic of the Philippines and the Cabinet on policies concerning science and technology in the country.

The Academy is composed of outstanding members of the scientific community in the country. Members are called Academicians. They are Filipino scientists with doctoral degrees in any field of science from an accredited university and who have demonstrated and earned distinction in independent research or significant innovative achievements in the basic and applied sciences. The doctoral degree is waived in highly meritorious and exceptional cases. The sciences include agricultural, biological, medical, mathematical, physical, engineering and social sciences.

PHILIPPINE COUNCIL FOR ADVANCED SCIENCE AND TECHNOLOGY RESEARCH AND DEVELOPMENT (PCASTRD)

The Philippine Council for Advanced Science and Technology Research and Development (PCASTRD) is a sectoral planning council within the Department of Science and Technology (DOST) created by virtue of Executive Order 128, and is tasked primarily with the development, integration and coordination of the national research system for advanced science and technology and related fields. In order to carry out its mandate the Council has set for itself the following long-term goals:

- ❑ Develop an effective national mechanism for S&T forecasting, planning, policy-making, financing, management and assessment in the sector for advanced science and technology;
- ❑ Develop a national self-reliant mastery of strategic areas of advanced science and technology through integrated programs of research, development and innovation;
- ❑ Develop a self-generating critical mass of R&D manpower in selected areas of advanced science and technology; and
- ❑ Develop a national system of high standard institutions in the advanced science and technology sector.

ADVANCED SCIENCE AND TECHNOLOGY INSTITUTE (ASTI)

The Advanced Science and Technology Institute (ASTI) was established within the Department of Science and Technology (DOST) under Executive Order 128 on January 30, 1987. ASTI as mandated to contribute to the overall national objectives by:

- Undertaking long-term research to strengthen and modernize the science and technology (S&T) infrastructure;
- Conducting research and development (R&D) work in advanced fields including microelectronics; and
- Complementing the overall endeavor in the scientific fields with intensive activities in computer and information technologies.

ASTI initially focused its limited resources on Information Technology (IT) to answer the needs of industry and other concerned sectors. Besides this main concentration, ASTI also started R&D work on IT-applied Microelectronics as necessary support tools to fully harness the potentials of IT.

THE COMMITTEES

STEERING COMMITTEE

Acad. Apolinario D. Nazarea	-	NAST	-	Chair
Acad. Raul V. Fabella	-	NAST/UPD	-	Co-Chair
Dr. Ida F. Dalmacio	-	PCASTRD	-	Member
Dr. Delfin Jay M. Sabido	-	ASTI	-	Member
Dr. Eleizer A. Albacea	-	UPLB	-	Member
Dr. Felino P. Lansigan	-	UPLB	-	Member
Mr. Glenn L. Sipin	-	DOST	-	Member
Ms. Luningning E. Samarita	-	NAST	-	Member

PROGRAM AND INVITATION

Dr. Ida F. Dalmacio	-	PCASTRD	-	Chair
Dr. Alexander A. Lim	-	PCASTRD	-	Member
Mr. Peter Antonio B. Banzon	-	ASTI	-	Member
Mr. Gerry S. Doroja	-	STII	-	Member
Ms. Ernie M. Bacarra	-	PCASTRD	-	Member
Ms. Maridon Sahagun	-	PCASTRD	-	Member
Ms. Victoria Bartilet	-	STII	-	Member
Ms. Rowena V. Briones	-	NAST	-	Member

REGISTRATION

Mr. Gerry S. Doroja	-	STII	-	Chair
Ms. Reena Atienza	-	PCASTRD	-	Member
Ms. Christie Santos	-	PCASTRD	-	Member
Ms. Janine Tan	-	STII	-	Member
Ms. Evelyn Mojica	-	PICO	-	Member
Ms. Zenaida T. Mapua	-	NAST	-	Member
Ms. Maribel Palafox	-	STII	-	Member
Ms. Rosie Almocera	-	STII	-	Member
Ms. Cora G. Daulat	-	STII	-	Member
Ms. Flor Bautista	-	STII	-	Member
Ms. Imelda Casal	-	STII	-	Member
Mr. Aristotle P. Carandang	-	STII	-	Member

FINANCE

Ms. Carmelita A. Llamas	-	DOST	-	Chair
Ms. Maridon Sahagun	-	PCASTRD	-	Member
Ms. Rosemarie S. Espino	-	NAST	-	Member

DOCUMENTATION AND PROCEEDINGS

Dr. Eliezer A. Albacea	-	UPLB	-	Chair
Ms. Virginia N. Enriquez	-	PCASTRD	-	Member
Dr. Carmelita F. Nobleza	-	STII	-	Member
Mr. Carlo B. Castillo	-	NAST	-	Member

RECEPTION

Dr. Catherine Q. Castañeda	-	FNRI	-	Chair
Ms. Carlota Sancho	-	PCASTRD	-	Member
Ms. Ma. Luisa A. Flores	-	PTRI	-	Member
Ms. Lilibeth Padilla	-	STII	-	Member
Mr. Richard G. Apuyan	-	NAST	-	Member
Ms. Emmia I. Bildan	-	FNRI	-	Member
Ms. Josefina T. Gonzales	-	FNRI	-	Member
Ms. Mary Ann P. Ballesteros	-	FNRI	-	Member
Ms. Gemma P. Yuchingat	-	FNRI	-	Member
Ms. Milflor S. Gonzales	-	FNRI	-	Member
Ms. Leonora E. Villanueva	-	FNRI	-	Member
Ms. Elsie R. Navarro	-	FNRI	-	Member
Ms. Cynthia T. Gayya	-	FNRI	-	Member
Ms. Teresa S. Mendoza	-	FNRI	-	Member
Ms. Felicidad V. Velandria	-	FNRI	-	Member
Ms. Marnie B. Dones	-	PTRI	-	Member

PUBLIC RELATIONS AND PUBLICITY

Ms. Victoria Bartilet	-	STII	-	Chair
Ms. Malu Tanyag	-	STII	-	Member
Ms. Ruby Cristobal	-	SEI	-	Member
Ms. Mona Montevirgen	-	STII	-	Member
Mr. Ferdinand C. Gutlay	-	NAST	-	Member

PHYSICAL ARRANGEMENTS

Ms. Lunyngning E. Samarita	-	NAST	-	Chair
Ms. Mila Sicam	-	DOST	-	Member
Ms. Chona S. Santos	-	NAST	-	Member

THE SPEAKERS

HON. MANUEL A. ROXAS II

The public service career of Mar Roxas has taken another dimension as he moves on from Majority Leader of the 11th Congress to Secretary of the Department of Trade and Industry. A move that he describes as *"simply a call to serve in a different way but for the same end"*.

Mar's educational background (Wharton School of Economics and the Kennedy School of Government) and career as a businessman and investment banker have prepared him for this new role as DTI Secretary. Furthermore, the priorities in his legislative agenda highlight his focus on strengthening the country's economic foundations and enhancing its competitiveness.

DR. HOKOON PARK

Dr. Hokoan Park is President of the Korea Institute of Science and Technology. He is also a member of the Committee of National Drug Policy, the Ministry of Health and Welfare of Korea, the board of the Korea Institute of Ginseng and Tobacco Research, and the Committee of Medicinal Affairs, Korean Olympic Committee. Dr. Park served as International Advisor on the editorial board of "Heterocycles", an international journal in Japan, President of the Korean Chemical Society, and as a board member of the Pharmaceutical Society of Korean Chemical Society.

HON. ANDREW GONZALEZ, FSC

Brother Andrew Gonzalez is the Secretary of the Department of Education, Culture and Sports (DECS) and formerly, President of the De La Salle University Systems. He is also a member of the National Academy of Science and Technology (NAST) Philippines, the highest recognition and advisory body of the government on science and technology. His research interests are in sociolinguistics, language planning, applied linguistics, higher education in the Philippines, and philosophy of education.

His studies on higher education in the Philippines have been cited in various reports such as the World Bank's and other international cultural agencies examining the state of higher education in the Philippines.

MR. DARREN JOHN RUSHWORTH

Darren Rushworth is the Director for the Asia Pacific Division of the Oracle Global Learning Initiatives (GLI), a US\$250 million global initiative to address the critical I.T. skills shortage. He has been based in Manila, Philippines for the last four years. Mr. Rushworth manages the development, revenue generation, strategic partnerships, implementation of GLI activities in the region, which geographic reach includes 26 countries bordered by New Zealand, Pakistan, and Japan.

Mr. Rushworth is currently a representative of Universiti Tun Abdul Razak (UNITAR) Malaysia's, International Education and Technology Advisory Committee (IETAC), and a member of the advisory board of Dau Colleges and recently Holy Rosary Schools, Pampanga, Philippines.

He has presented many papers on the usage of information technology in higher education and information technology resource issues.

MS. RAMESH RAMACHANDRA

Ms. Ramesh Ramachandra is the Managing Director of Technoledge Asia, Singapore.

MR. GARY B. OLIVAR

Mr. Olivar is Executive Vice President of Elcom International Resources Ltd., an Israeli-Filipino business group with diversified interests in interactive voice response systems, telemedicine, computer-assisted instruction and distance learning, smart cards, and voice over IP.

Mr. Olivar earned his BA and MA degrees in economics from the University of the Philippines and an MBA from the Harvard Business School.

MR. RAMON L. JOCSON

Mr. Ramon L. Jocsos is the Director of IBM ASEAN – South Asia.

MS. CYNTHIA R. MAMON

Ms. Cynthia R. Mamon is the Chief Executive Officer of the Sun Microsystems, Inc.

MR. JAIME AUGUSTO ZOBEL DE AYALA II

Mr. Jaime Augusto Zobel de Ayala II is the President and Chief Executive Officer of the Ayala Corporation, the country's largest diversified conglomerate which has an active presence in real estate and hotels, banking and financial services, insurance, food processing and agribusiness, electronics and information technology, and telecommunications. He is also the Chairman of iAyala Company, Inc. a newly formed subsidiary of Ayala Corporation intended to pursue opportunities in information technology.

Mr. Zobel is involved in various information technology related initiatives. He is the co-chairman of the Philippine National Information Technology Council and a member of a number of international advisory councils such as the Global Information Infrastructure Commission, the IBM Asia Pacific Advisory Board, the IFC Regional Business Advisory Council and the JP Morgan International Council. He is also a member of the country's Council of Senior Economic Advisers.

DR. EMMA V. TEODORO

For almost 30 years, Dr. Emma V. Teodoro has combined academic and entrepreneurial career. While actively pursuing her work as an IT professional, she organized and managed the Bachelor of Science in Computer Science degree program at De La Salle University, College of Computer Studies. Simultaneously, she has been promoting the Philippine software industry worldwide, making the country well-known for its world-class IT professionals. As president of SoftTech Advantage (STA), Inc., a leading software company in the Philippines, she has been involved in various Information Technology projects for organizations in the Philippines, Japan, Hong Kong, Malaysia, Belgium, Switzerland, Germany, France, Guam, Australia, and the United States. STA is well known for being awarded the prestigious "Golden Shell Award for Excellence in Software Export" in 1994 and for its year 2000 solution called Fieldex which won the 1997 Best All-Around Full-Featured Year 2000 Tool. Fieldex was also given the Chairman's Commendation Award by Mr. Bill Gates of Microsoft in 1998. With her team of IT professionals and proven software methodology, STA has created innovative packages such as School-online, Ring-A-Web, Integrated Investment Management System, Project Tracking and Issue Tracking Systems. In STA, Dr. Teodoro has expressed her entrepreneurial innovative spirit.

DR. SAMUEL D. BERNAL

Dr. Samuel D. Bernal is a Juris Doctor in the United States, an attorney practicing in California State Court and the U.S. Federal Court. He is, at the same time, Chief of Hematology and Oncology and Director of the Cancer Center at the UCLA San Fernando Valley and Professor of Medicine at UCLA. A graduate of B.S. Chemistry (Synthetic Organic Chemistry), M.B.A. of Finance and Organizational Development and Ph.D. in Biochemistry and Experimental Psychology.

DR. SEISHI NINOMIYA

Dr. Seishi Ninomiya is an Associate Director for Research and Professor from the Department of information science and Technology, National Agriculture Research Center (INARC) and Institute of Agriculture and Forestry, University of Tsukuba, Japan.

He obtained his doctorate from the University of Tokyo on Agrobiology in 1982 and became an assistant professor of biometrics of the university. There, he studied mainly the application of image analysis to biology and agronomy. Then, in 1991, he moved to the Laboratory of Information Analysis to and Systems, National Institute of Agro-Environmental Sciences located in Tsukuba Science City, where he studied and developed several models that could substitute for human visual judgments in agriculture as a laboratory head, until he again moved to Department of Information Science

and Technology, National Agriculture Research Center as the associate director for research. Now, he is managing several research projects for the application of information science to agriculture. He is also the secretary general of Asian Federation for Information Technology in Agriculture and one of the key persons of Agricultural Working Group of Asia Pacific Advanced Network Consortium (APAN).

MR. MARK GARLINGHOUSE

Mr. Mark Garlinghouse is the Director, Sales – Asia of the Institute for Scientific Information. Mr. Garlinghouse has been in the database publishing industry for 8 years, most recently with the Institute for Scientific Information at their Singapore regional headquarters.

Edited by

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