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Exploring the Challenges and Opportunities for Africa in the Information Economy

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EXPLORING THE CHALLENGES AND OPPORTUNITIES FOR AFRICA IN THE INFORMATION ECONOMY¹

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ABSTRACT

Two of the key characteristics defining this historical period are the twin concepts of globalization and the information economy. This transformation – which embodies social, economic, political, technical and cultural processes – is affecting nearly all of the world's people and economies and creating tremendous challenges and opportunities in its wake. An African-driven agenda is needed to confront these challenges and to develop effective strategies to exploit the opportunities presented by these revolutionary developments. This paper used data from published reports, mostly from international organisations. It offers a sweeping overview of the forces contributing to globalization, the transformation of national economies, the potential role of information and communication technologies, and the likely implications and challenges for African countries. It is divided into three parts. In Part I, the paper focuses on an understanding of globalization and the information economy, both defining and critically assessing these terms, and illuminating the depth of the transformation that the global political economy is currently experiencing. Part II, looks specifically at the challenges and opportunities presented by these developments with an understanding of current African realities. Finally, Part III, discusses a way forward for the region, including recommendations for national, sub-regional, regional, and global action and partnerships.

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GLOSSARY OF ACRONYMS AND TERMS

| | |
|---------|-------------------------------------------------------------|
| Term 1 | AISI: African Information Society Initiative |
| Term 2 | ISAD: Information Society and Development Conference |
| Term 3 | GIIC: Global Information Infrastructure Commission |
| Term 4 | GK: Global Knowledge |
| Term 5 | GMPCS: Global Mobile Personal Communications by Satellite |
| Term 6 | MPCICs: Multi-Purpose Community Information Centres |
| Term 7 | NICI: National Information and Communication Infrastructure |
| Term 8 | NII: National Information Infrastructure |
| Term 9 | SMMEs: Small, Medium, and Micro-sized Enterprises |
| Term 10 | SSA: sub-Saharan Africa |

PART I: UNDERSTANDING GLOBALIZATION AND THE INFORMATION ECONOMY

1. Introduction

One of the key by-products of this period of rapid technological development and an on-going information revolution is incessant change. Change is occurring in nearly every area of human existence and affecting the underlying structure of most types of organizations, including non-governmental and specialized organizations. Many organizations are wrestling with their particular direction in this period of globalization.

There are some key limitations to research in this area. The first is that its approach is broad in scope and highly interdisciplinary. It covers a lot of material and includes work in the disciplines of economics, history, sociology, political science, education and international relations. The second major limitation – one engendered by its broad interdisciplinary approach – is that it is addressed more to a general audience than a specific academic community.

Despite these limitations, the findings in this paper should make a contribution to understanding of the opportunities and challenges for Africa in an era shaped by globalization and the information economy.

2. Globalization and the Information Economy

These two terms – Globalization and the Information Economy – have become prevalent in academia, business circles, and even in the popular media. However, they are often ill-defined and may evoke quite different images. Thus, it is important to start by discussing definitions of both globalization and the information economy, to help clarify understanding of the issues and use of the terms.

The Context: Globalization

The term ‘globalization’ has become one of the most contested of recent times. It means very different things to different people. Many people have a narrow definition that focuses primarily on financial integration, or perhaps, going further, see it as a synonym for ‘Americanisation.’ Drawing upon theorists in numerous fields, including psychology, sociology, political science, economics, the paper adopts a much more expansive and inclusive

definition to assist people in seeing the opportunities that emerge within globalization as well as the challenges. Following this argument, globalization is defined as:

- An on-going global phenomenon characterized by the intersection of presence and absence, the interlacing of social events and social relations 'at a distance', all conditioned by local contextualities.
- It is identified through a globally interdependent set of social, economic, political and cultural processes through which events, decisions, and activities in different parts of the world combine to have significant consequences for individuals, communities, enterprises and political structures in distant parts of the globe.
- It is facilitated by a multiplicity of linkages and interconnections that are represented by disembedded institutions linking local practices with globalised social relations that continue to transcend the nation-states (and by implication societies) which make up the modern world-system.²

Thus, globalization is not just about the deepening of financial markets, but includes a whole range of social, political, economic, and cultural phenomena as well. The process is simultaneously driven and facilitated by radical new developments in information and communications technologies (ICTs). It is not technologically determined. The new technologies are not being developed coincidentally at this particular period in history. In fact, they are the result of a significant increase in investment in research and development of new information and communications technologies and in the sciences that support them. Many companies are exploring a global option for their processes of development, production, distribution, management, marketing and finance.

In addition, the development of a Global Information Infrastructure (GII) is even more important because of digitalization and convergence. Convergence can be defined as the continued integration, *inter alia*, of communications, computing and content which is now capable of being delivered using the same medium of the GII. Thus, it becomes possible for us to look at what might be called "spheres and spaces" of globalization, which includes the globalization of production, distribution, finance and culture.³

Spheres and Spaces of Globalization

The Globalization of production is illustrated by network enterprises and global strategic webs. These are networks of knowledge-based enterprises that can collaborate with team members around the world in research and development, management information systems, and global

² This definition is synthesized and constructed from several theorists, including Giddens, etc.

³ For more discussion on the "spaces" of globalization, please see, *inter alia*, Cox (1997) and Sassen (1999).

computer-aided manufacturing. One result of this practice is the emergence of what some call the “world factory phenomenon.”

Closely related to the ‘Globalization of production’ is the ‘Globalization of distribution’. By seeing the world as a source of potential niche markets, electronic commerce could support the global distribution of both tangible and intangible products, but this is easier with knowledge-based products and services. Intangible goods, such as e-books, software, and music can easily be transported using the Internet and other global communications networks. Global marketing is another by-product of the ‘Globalization of distribution’. A major advance in physical transportation systems has facilitated a global system of transportation as well.

Both of these spheres of globalization would hardly be possible without the addition of the Globalization of finance. New currency instruments are emerging, and trading takes place on a global level at the speed of light. The impact of this rapid-fire “casino economy” is the movement of finances around the world.

Finally, the ‘Globalization of culture’ is represented by some of the most famous cultural icons and superstars imaginable. The widespread distribution of cultural commodities leads to the production of global dreams. The Globalization of culture is promoting a certain perception of reality and the “dream” of participating actively in a global consumerist society. While it is critical for countries around the world to begin to confront the challenge of creating content for global audiences, there is the on-going challenge of the simple commodification of culture, without any real indigenous content development to contribute to sustainable, socio-economic development.

While these four areas represent the spheres of Globalization and appear to be overly theoretically determined, the processes of Globalization must touch ground somewhere in “spaces of Globalization.” Nearly any place can become a “space of Globalization,” with the proper strategic direction and support⁴, however, it is noteworthy that globalization is an uncertain process that is far from complete and which has very uncertain outcomes. Some cities/countries are already fully integrated into the spaces of flows (Castells, 1998), while, for others, the potential exists for currently isolated spaces to become “spaces of Globalization”.

To some extent, globalization spurs technology by intensifying competition and speeding up technological diffusion through foreign direct investment. Inexpensive and efficient communications networks allow companies to locate different parts of their production process in different countries whilst maintaining close contact. For example, with a World Bank loan,

the Mauritian government set up a 'Technology Diffusion Scheme' to encourage enterprises to locate in Mauritius and an informatics park with the appropriate physical infrastructure facilities and high-speed satellite link for international data transmission. Currently several foreign firms operate from the park offering a major call centre, data entry and transmission. A similar example exists in Malaysia, where the government has established a Multimedia Super Corridor (MSC) project to "help companies of the world test the limits of technology and prepare themselves for the future."⁵ Thus economic agents come to view interconnected regions in their totality: ultimately a whole world market as a single, unified information system which some call "the Global Option." This global option is spatially disarticulated; each of its components can easily occur within a different geographical space. All of the components of the production and distribution process (including R&D, testing, manufacturing, advertising, and management information systems) can take place on multiple continents simultaneously.

One of the reasons that the Information Economy offers such promise to Africa is that each of these areas of Globalization is supported by the application of electronic commerce. To illustrate this, we have introduced the concept of the "spheres and spaces of Globalization". The spheres of Globalization include the Globalization of production (global workplace), distribution (global shopping mall), finance (global financial network) and culture (global cultural bazaar). Each of these "spheres of Globalization" represents a different aspect of Globalization, and each of them represents an aspect of electronic commerce.

New Development Models: Increased Polarisation

One of the most important areas of impact in this globalising environment is the impact that this transformation is having on national development objectives and paradigms. Many development agencies and donor countries are reassessing what it means to pursue development during this particular period. Trade is being seen increasingly as a more critical component of development than aid. This means that the corresponding importance of the private sector in African countries, especially of Small, Medium and Micro-Sized Enterprises (SMMEs), is increasing.

This also means the potential for radical new developments in equality and in-equality (Wilson 1999; NTIA, 1999; UNDP,1999). Jacques Attali has asserted that the world is perhaps moving to a division, not between the "North" and the "South", but between the "fast" and the "slow." Those who are able to take advantage of these new technologies – the fast – exist in nearly

⁴ Kevin Cox, ed., *Spaces of Globalization: Reasserting the Power of the Local* (New York: The Guilford Press), 1997.

⁵ For further details, see: <http://www.mdc.com.my/>.

every country. The reverse is also true, those who are not able to take advantage of these new technologies – the slow – exist in nearly every country in the world as well, both developed and developing. Thus, as the “fast” begin to work more closely together in global strategic webs and harness the potential of trading in these new knowledge-based services, they will be drawn closer together. There is tremendous potential for inequality within and between countries, the so-called “digital divide” (NTIA, 1999). In terms of identity, many persons are developing life patterns that render their identity as global nomads, elite knowledge workers constantly moving around the world and spending most of their lives on airplanes, in hotel rooms and in temporary offices (Wired, 1998).

Though empirical evidence is slight, informational activities have only begun to impact significantly on national accounts within a relatively small coterie of industrialised nations. However, the lack of empirical evidence must not blind us to the transformative power of this new economic paradigm. Available evidence reveals that most leading industrialised nations are seeing the rapid rise of the information sector as a contributor to national income. According to the 1999 IDC/World Times Information Society Index, which tracks 55 countries that account for 97% of the global GNP and 99% of IT expenditure, the info-gap between rich and poor countries continues to widen. The 150 or so countries not included in the index, only account for 3% of global GNP and less than half a per cent of all information technology expenditures.

The diversity of applications used by the GII is growing exponentially. Many of the leading conferences attempting to analyze the emergence of the information society have identified numerous broad areas for content and applications development.⁶ Table 1.1 below illustrates major Information Society-related applications and their holistic nature. By “Information Society,” we mean a specific form of social organization, where information generation, processing and transmission are the fundamental sources of productivity and power. This term was perhaps first coined in 1980 by Yoneji Masuda, who identified the information society as “Post-Industrial Society.”⁷ It has been expanded on subsequently by many theorists who have helped to flesh out the contours of the concept substantially.

In a knowledge-based global information society, it is possible that new aspects of equality and inequality may emerge. Several conferences have recently been held which raise the issue of inequality in the Information Society (Wilson, 1999; UNDP, 1999; NTIA, 1999). These

⁶ These conferences and strategic frameworks, would include, the G7 Ministerial Meeting on the Information Society; the African Information Society Initiative (AISII); the Information Society and Development Conference; and the EU Information Society Technologies (IST) Conference.

⁷ Yoneji Masuda, *The Information Society as Post-Industrial Society*, (Washington, D.C.: World Futures Society), 1980.

perspectives raise important questions about the impact of the Information Society on world order, identity, gender, and youth.

Table 1.1 Global Information Society Applications

| Developed from Major Conference Debates | | | |
|-----------------------------------------|--------------------|------------------------------------|--------------------|
| Application | Conference | Application | Conference |
| Education, Research and Training | G7, ISAD, GK, AISI | Debt Management | G7, ISAD, GK, AISI |
| Digital Libraries | G7, ISAD, GK, AISI | Tourism | G7, ISAD, GK, AISI |
| Electronic Museums and Galleries | G7, ISAD, GK, AISI | Health Care | G7, ISAD, GK, AISI |
| Environment Management | G7, ISAD, GK, AISI | Legislation and Legal Services | G7, ISAD, GK, AISI |
| Emergency Management | G7, ISAD, GK, AISI | Transportation of Goods and People | G7, ISAD, GK, AISI |
| SMMEs, Employment and E-Commerce | G7, ISAD, GK, AISI | Business Development and Trade | G7, ISAD, GK, AISI |
| Maritime Information | G7, ISAD, GK, AISI | Universal Access | G7, ISAD, GK, AISI |
| Electronic Government Services | G7, ISAD, GK, AISI | Entertainment and Leisure | G7, ISAD, GK, AISI |
| <i>Source: Authors database</i> | | | |

The Information and Knowledge Economy: Towards a Definition

This brief discussion of globalization has helped to shape the overall context within which we will examine the information and knowledge economy. These two terms have initiated a tremendous intellectual debate focusing on the specific meaning of the terms and their value in explaining our particular historical period. The terms 'information economy' and 'knowledge economy' are often used interchangeably. In a very strict sense, the information economy concept could refer to "the economic contributions of a limited number of industries" while the knowledge economy could be seen as including "the entire industrial fabric of the economy."⁸

The authors acknowledge this rich debate, and have decided to use the terms as nearly synonymous. We argue that the term information economy refers to a new global economic

⁸ 'Measuring the Global Information Infrastructure for the Global Information Society, Concepts and Performance Indicators', document submitted by the Delegation of Canada to the ICCP Committee, Sep. 1996

structure, wherein the production of information goods and services dominates wealth and job creation, and is underpinned by the use of information and communications technologies (ICTs) and a global information infrastructure. Defining information very broadly, we follow Shapiro and Varian in arguing that "anything that can be digitized – encoded as a stream of bits – is information."⁹ Using this approach, we argue that football scores, books, databases, magazines, movies, music, stock quotes, and Web pages are all *information goods*.¹⁰ However, when we wish to refer to the specific aggregation of economic enterprises engaged primarily in producing and distributing information goods, we will use the term *Information Industries*.

As a result, this paper encompasses both the narrow definitional concerns of economists, but also takes into account the panoply of technological innovations and structural economic changes that are increasingly affecting Africa in the global economy. While this approach gives some clarity in definition, in order to explore fully the challenges and opportunities presented by this new economy, we must begin with a brief analysis of the underlying structural changes occurring in the techno-economic paradigm of the global economy.

Fundamental Transformation in the Global Economy

A “techno-economic paradigm” can be understood as the generally accepted and applied framework of principles and agreements (both formal and informal) about how technology is to be employed in support of the development objectives of the economy. The old techno-economic paradigm that supported the global economy was called Fordism/Taylorism, and based on the principles articulated by Henry Ford (moving assembly-line) and Frederick Taylor (scientific management). This system reached its peak in the 1950s (the so-called “golden age” of capitalism) and became dominated by the United States. The Fordist-Taylorist development model was based on three pillars.

Mass-production within a factory system was the first pillar. Mass production increased productivity, but it did not offer a great deal of diversity or choice to the consumer. The second pillar was the strict application of Taylor’s management principles, which have become known as scientific management. Within scientific management, there is a strict division in the workforce between mental and physical labour (management and employees). Finally, the third pillar was the moving assembly line, which led to increased alienation within the actual workforce. People who were once craftspersons and able to work on a product from start to

⁹ Carl Shapiro and Hal Varian, *Information Rules: A Strategic Guide to the Network Economy*, (Boston: Harvard Business School Press), 1999, p. 3.

¹⁰ *Ibid.*, emphasis in the original.

finish, were forced to learn one component of a production process – to become human parts in a factory machine.

This techno-economic paradigm characterized industrial economies as they rose to dominate the global economy in the 19th and 20th centuries. During this period, African economies were primarily relegated to the periphery of the world-system (through slavery, colonialism and other mechanisms) and were forced to orient their economies towards the production of mostly commodity products.

However, this current period of globalization has witnessed the emergence of a new techno-economic paradigm. One that is, in fact, still unfolding. The new paradigm is likely to co-exist with elements of existing features of production and, in particular, there is little evidence so far even where new modes of production become predominant, that the new value chains are any less governed by producers (or their intermediaries) in the industrialised countries. Research on 'global production chains' is beginning to show this¹¹. An example of the new modes of production is Innovation-Mediated Production (IMP)¹², which is knowledge intensive. Knowledge is increasingly embedded within the production process itself. New technologies and manufacturing techniques, such as Computer Integrated Manufacturing (CIM) and Numerically Controlled Machines (NCMs), help to create and strengthen this kind of networked economy environment. This new economy thrives on knowledge and continuous innovation. It enhances the role of information within the economic enterprise. It focuses on the manipulation of knowledge and symbolic information that can be incorporated into both tangible and intangible goods and services.

Information is a non-rival good. This means that it can be distributed infinitely without diminishing in any way the original value. An information good is by definition intangible, immaterial. Information goods are not inherently limited by geographical or national boundaries. In an information economy, markets are no longer local or national, but instantaneously global (Quah, 1998). In terms of employment, sustained growth relies on a continuous shift in resources from declining industries in a process famously described by the Austrian economist Joseph Schumpeter as 'creative destruction'.

Table 1.2 is a summary depicting the characteristics of the industrial economy versus the information economy. Within the information economy, informational goods and services become one of the most dynamic and profitable areas of the world economy.

¹¹ There are a number of references available on this area, such as, Dedrick and Kraemer, 1998; Ernst, 1999 and so.

¹² Richard Kenney and Martin Florida, *Beyond Mass Production: The Japanese System and Its Transfer to the United States*, (New York: Oxford University Press), 1993.

Table 1.2 Characteristics of the Industrial Economy and Information Economy

| Characteristics | Industrial Economy | Information Economy |
|---------------------------------|---------------------------------|---------------------------------------------------|
| Source of competitive advantage | Land, labour and capital | Knowledge |
| Production mode | Command and control hierarchies | Innovation-Mediated through Services and networks |
| Scope | Local/regional | Global |
| Industry classification | Distinct; multiple | Diffused; architectures |

It is generally believed that the barriers to entry in the information economy are lower than to the industrial economy. In the industrial economy, the most important factors of production were land, labour and capital. Significant capital investment was required in order to acquire land, build factories, employ expensive labour (mostly organized/unionized), build-up inventories of industrial products, and transport them to their final destination. In the new economy, information and knowledge become the most important factors of production. This is not to assert that the other factors of production are not important, only that they have been displaced as the most important by the primary factor of knowledge. In addition, it is important to note that studies are beginning to show that in the 'knowledge economy' the highest value added seems to flow to those who are able to create innovative designs, for example, for new products. Empirical evidence in various sectors of the economy suggests that many producers in developing countries are not able to compete effectively (notwithstanding their access to information and to information and communication technologies – ICTs) because they are unable to generate sufficient variety and innovation in product designs.

Furthermore, the increasing pace of technological innovation has shortened product life cycles and made speed a crucial competitive weapon. The widespread use of ICTs has extended the global reach of international economic agents and led to a compression of time and space. Whilst the macroeconomic impact of this powerful wave of technology continues to be disputed, it is sensed intuitively as being more important than generally suspected and to have major multiplier effects on economic activity. So much so that it is argued that success in the global economy is predicated on access to ICTs. Underpinning the importance of ICTs is digitalisation. This has enabled the convergence of different media leading to rapid, cost-effective and distortion-free transmission of information. The multiplier and network characteristics of ICTs mean that they are increasingly becoming a foundational technology; more and more they represent the indispensable infrastructure for a whole range of industrial production processes. They enable a multitude of activities to be carried out in different, cheaper and more efficient ways.

The preceding argument does not assert that it is inexpensive to produce information. In fact, Shapiro and Varian argue that "information is costly to *produce* but cheap to *reproduce*."¹³ Examples of such economic reasoning abound. A report that is commissioned for hundreds of thousands of dollars and requires months of research, writing, and editing, can be put onto the Internet and distributed around the world basically for free.

Regardless of the academic debates, one thing that is reasonably clear is that both information and knowledge, in the widest sense, are becoming fundamental components of socio-economic development. Globally, investment in intangible goods and services is growing much more rapidly than investment in physical goods and services. Also, nations endowed with greater information and knowledge resources are becoming more competitive.

Governing the Information Economy: Policy and Regulatory Frameworks

The information economy is disciplinarian. Its interdependent nature ensures that "bad" decisions are punished immediately; and "good" decisions are rewarded with the same speed. With such a global, interdependent economy, it is critical that appropriate mechanisms be developed at a global level to "govern" the global information economy – a new global trading regime.

As with the underlying techno-economic paradigm shift, there were old and new components of the global trade regime. The old global trade regime was based upon the General Agreement on Tariffs and Trade (GATT). Promoting multilateral trade was one of the key principles of the GATT, with a focus on tangible (physical) goods. The GATT was not an international organization in the proper sense of the word. In fact, it was mostly an international secretariat charged with monitoring and implementing the Agreement. It had fairly limited enforcement mechanisms, which allowed "free-riders" to reap many of the benefits of the agreement, without bearing the costs.

The new global trading regime is based upon the GATT's successor, the World Trade Organization (WTO). Market-access is one of the key principles that defines the new trading regime. GATT focused largely on tangible goods while the WTO addresses both tangible goods and the intangible trade in services. However, the Uruguay Round – which led to the establishment of the WTO – dealt with trade in services (telecommunications) albeit for the first time. In essence, the updated GATT lives alongside the new General Agreement on Trade in Services (GATS) and Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). The WTO brings the three together within a single organization, a single set of rules

¹³ Ibid., emphasis in the original.

and a single system for resolving disputes.¹⁴ The WTO has been established as a formal international organization. This new organization has the same international status as the World Bank and the other Bretton Woods institutions.

International harmonization of policy and regulatory frameworks is an important objective to be pursued at global and regional levels. Numerous policy issues have been identified as perhaps the most important to the development of a global information economy and electronic commerce. These issues include:

- a) Information and Communications Infrastructure Development;
- b) Customs and Taxation;
- c) Global Uniform Commercial Code;
- d) Privacy and Consumer Protection;
- e) Security and Encryption;
- f) Content Development and Regulation;
- g) Technical Standards and Interoperability;
- h) Education and Employment;
- i) Electronic Payment Systems and Financial Institutions; and
- j) Intellectual Property Protection.

National and regional strategies designed to promote opportunities within the information economy should include policy analysis and reform in each of these areas.

In summary, the present confusion with definitions and concepts should not blind us to the fact that very real and profound changes are afoot. The discussions above have helped to shape the overall context in which we examine Africa's participation in the global information economy. This provides the impetus for the following section exploring the challenges and opportunities for Africa in the information economy.

¹⁴ http://www.wto.org/english/thewto_e/whatis_e/tif_e/fact6_e.htm

PART II: EXPLORING THE CHALLENGES AND OPPORTUNITIES FOR AFRICA IN THE INFORMATION ECONOMY

With the preceding discussion from Part one conditioning our understanding, we will now explore some of the specific challenges and opportunities for the African region presented by globalization and the information economy. This discussion unfolds in two sections. In section one, we present several key challenges, which may hinder or prevent the region from reaching its full potential in the information economy. Section two looks at some of the key strategic opportunities for Africa in the era of globalization and the information economy.

3. Challenges for Africa in the Information Economy

Globalization and the information economy present unique opportunities for Africa. However, in order to capitalise on these opportunities, tremendous challenges must first be overcome. Some of the key challenges include the following: (1) the development of information and communications infrastructure; (2) human resources development and employment creation; (3) the current African position in the world economy; and (4) insufficient legal and regulatory frameworks and government strategy. Each of these challenges is examined below.

The Imperative for Information and Communications Infrastructure

Many analysts are beginning to lament the problems of the inequality being generated by the Internet, globalization and the information society (Wilson 1999; UNDP 1999). However, while many of the solutions to this challenge may differ, the empirical realities are startling. According to the ITU, in 1997, teledensity (which measures the number of telephones per 100 population) was 34.38 for Europe, and 30.38 for the Americas; while it was only 6.02 for Asia, and a chilling 1.85 for Africa. Cellular density (as a percentage of total telephone lines) is troubling as well. Celldensity for the Americas is 6.92 (18.6%); in Europe it is 4.57 (11.7%), while in Asia it is 1.35 (but surprisingly 18.3%) and Africa sits at 0.17 with (8.4%).

Meanwhile, numerous studies have shown that the benefits of an information age will not accrue to countries with an *inadequate* National Information and Communications Infrastructure (NICI). Since 1992, the tendency has increasingly been to consider all information and communication technologies together and to formulate policy guidelines under the framework

of what U.S. Vice-President A. Gore termed “National Information Infrastructures” (NIIs)¹⁵. The phrase "information infrastructure" has an expansive meaning. Thus, the National “Information Infrastructure” includes more than just the physical facilities used to transmit, store, process, and display voice, data, and images. Arguably, an information infrastructure has existed for a long time, continuously evolving with each new advance in communications technology. What is different is that today we are imagining a future when all the independent infrastructures are combined¹⁶. Countries have different priorities which need to be reflected in their NIIs, therefore those defined for and by African countries must encompass their respective countries information needs. In a number of African countries the NII defining process has already begun, termed the NICI process. NICI strategies are rooted in the following themes: Policy, Applications, Infrastructure and Technologies and the following cross-cutting programmes: Gender, Youth, Research, Community participation and Human resource development (UNECA, 1999). The main building blocks of the Global Information Infrastructure (GII) were adopted at the March 1994 first annual World Telecommunication Development Conference in Buenos Aires; where the participants agreed that the GII should be founded on private investment, competition, open access, universal access, and flexible regulations (CSIS, 1996).

It is expected that NICIs must be connected to and inter-operable with the emerging GII. There are various, and sometimes competing, approaches to developing the NICI. Given that the access to information and communications infrastructure is so abysmal in most African countries, achieving "universal access" to information infrastructure is seen as the, *sine qua non* of widespread socio-economic development in an era of globalization and an information economy.

Since universal access is so critical, many scholars, activist and development agencies have embraced the potential of Multi-Purpose Community Information Centres (MPCICs or telecentres) to help achieve those goals. Community information centres can serve as development vehicles in both developing and developed countries and can contribute to closing the infrastructure gap within developing countries. While still an incomplete definition, MPCICs may be defined as facilities in urban, peri-urban, and rural areas which utilise shared information infrastructure to provide access to a wide variety of public and private information and communication-based goods and services, and which support local economic and social development objectives. These facilities have a range of ownership and business models that

¹⁵ Al Gore’s Feb. 1995 Keynote Address – G7 Conference on the Information Society in Brussels.

¹⁶ A more detailed definition can be found at <http://nii.nist.gov/nii/niiinfo.html>

may stimulate the growth of the local telecommunications market. In these facilities, a focus on replicability, sustainability and community ownership is critical.

Table 2.1 The Universal Service Obligations/Approaches of Selected Countries

| Developed Countries | Developing Countries |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| <p><i>Australia</i></p> <p>“The USO is a legislative requirement designed to ensure that <i>every</i> Australian citizen has access, on an <i>equitable</i> basis, to a standard telephone service, pay-phone and carriage services”</p> | <p><i>Ghana</i></p> <p>“...defined as a telephone in every locality of more than 500 people.”</p> |
| <p><i>Canada</i></p> <p>“...to render reliable and <i>affordable</i> telecommunications services of high quality <i>accessible</i> to Canadians in <i>both urban and rural areas in all regions</i> of Canada...”</p> | <p><i>Burkina Faso</i></p> <p>“...defined as a telephone within every 20 kilometers....”</p> |
| <p><i>France</i></p> <p>“Universal service for telecommunications is the supply to all of a quality telephone service on <i>all the territory</i> at an <i>affordable</i> price.”</p> | <p><i>South Africa</i></p> <p>“...defined as a telephone within a 30 minute traveling time...”</p> |
| <p><i>United States</i></p> <p>“...to make available, so far as possible, <i>to all the people</i> of the United States <i>without discrimination</i> on the basis of race, colour, religion, national origin, or sex a rapid, efficient, nation-wide, and world-wide wire and radio communication service with adequate facilities at <i>reasonable charges</i>...”</p> | <p><u>Funding Strategies</u></p> <p>Cross Subsidisation Access Charge Universal Service Fund Financial Assistance</p> |

Even worse than indicated by the statistics of teledensity and cell density discussed above, is that the infrastructure gap goes beyond telecommunications into other areas critical for the information economy. A natural consequence of the poor telecommunications networks in the majority of African countries is the low level of Internet usage. According to the ITU (1998), “an inhabitant of a high-income country is four times more likely to have access to a television set than an inhabitant of a low-income country; 25 times more likely to have access to a telephone; but almost 8,000 times more likely to have access to an Internet host computer”.

For example, of all Internet hosts (those computers that have a direct connection to the Internet) in 1997, the vast majority of them were in North America (66.5%). Europe is not too far behind (21.9%). Asia, Latin America and Africa are again at the lowest end of the scale (6.3%, 6.0% and 1.0% respectively). And if we turn to the number of Internet hosts per 100 population, we see that the Americas have 138.64 (meaning that for every 100 persons, the Americas have nearly 140 Internet hosts). Europe is about (44.33) and Asia is 2.95. Africa has only 1.3 Internet hosts for every 100. And although these numbers are quite bad, they subtly mask a reality. Distribution of Internet hosts is even more of a gap if you look at the US, where the actual numbers are 380.49 Internet host per 100 persons. South Africa has a distribution somewhat better than the average for the reason 24.4.

Therefore, Africa is characterised by low telephone penetration, slow network growth, antiquated systems, sub-optimal reinvestment of profits, high pricing of private facilities, poorly dimensioned inter-city telephone links and widely varying national network infrastructures (ITU, 1997). In countries such as Mauritius and Madagascar, the prosperous islands that enjoy high tourism, value-added services are an essential part of the infrastructure. By contrast, some countries in the continent's interior have no phone links between capital cities and remote towns. In comparison with other areas of the world, sub-Saharan Africa (SSA) is characterised by chronic under-funding for equipment. Though some progress has been made, the disparity between SSA and other regions in the world continues to grow. Some striking empirical evidence illustrates the relatively poor status of telecommunications capacity and access to non-basic services in SSA. For example, there are more cellular phones in Thailand than in the whole of Africa. There are more Internet hosts in Estonia than in SSA (ITU, 1998). While such statistics perhaps understate the true extent of Africa's communications capacity, they do serve in highlighting the relative decline of Africa in terms of its communications infrastructure¹⁷. The reality is that massive investment is required – in telecommunications alone, for example, investment totalling at least \$50 billion would be required to achieve a minimum teledensity of 5% or 5 lines per 100 inhabitants – in SSA (ITU, 1998). This by far exceeds public sector financing capacity, making large-scale private investment a necessity. Governments will therefore find it increasingly difficult to continue to monopolise ICTs.

Over the past few years, some analysts have begun to distinguish between two categories of information infrastructure – "hard" and "soft." The hard information infrastructure includes the telecommunications and broadcasting facilities, the computing infrastructure and other consumer electronics. It also includes the many forms of "alternative" infrastructure that is

¹⁷ There has been much debate as to the appropriateness of measures such as teledensity in countries where families and communities often share telephones and Internet accounts.

emerging. These include: the new generation of Global Mobile Personal Communications by Satellite (GMPCS) systems; floating and flying platforms, and a multiplicity of local wireless a good example of that often used term. Developing countries, in most cases, do not have the fixed investment in copper cable – for example – and thus can skip laying more of it in favour of going directly to fibre or another broadband solution (Cogburn, et al 1998).

Although individual countries exhibit differing levels of computerisation, the general shortcomings include:

- poor physical facilities and human resources;
- no well-established centres dedicated to developing software;
- poor or non-existent procedures for equipment procurement;
- inadequate maintenance of hardware;
- limited IT industrial base.

These problems are compounded by the high price of equipment relative to the available resources. Many local suppliers are over-priced, which increases the incentive for importing equipment, but obtaining local support often then becomes the outstanding issue. As for the private computer market, it is dominated by multinationals that generally ensure that they carry out the maintenance. The low level of computer literacy evidenced in the majority of African countries means that even though access may be available to users, their lack of experience can tie up the facility for inordinate lengths of time. In addition, as users of the ‘end products of the technology’, developing countries are not in a position either to establish technological control or to engage in competitive R&D. The industrialised nations have developed technologies that accord with the special characteristics of their societies. Many of these information technology applications presuppose an advanced infrastructure, and a highly skilled labour force.

Nevertheless, the authors are not suggesting that access to information/information infrastructure is sufficient to enable the potential of information to be applied to support the goals of developing countries. In reality, access to information (local or global) is meaningless unless it can be converted into relevant knowledge. Therefore, there is an urgent need for investment in human resources and education to the parallel need for investment in infrastructure.

Human Resources Development and Employment Creation

The rapid development of human resources and creating employment are also critical challenges facing Africa in the information age. Low levels of education and literacy are crippling Africa's ability to exploit the information economy. In many countries, the limited use of English has

also been cited as an additional constraining factor. Although increasingly multilingual, the Internet is still largely an English-language medium because of its origins in the United States. However, many African countries have found it impossible to choose an indigenous language for political and tribal reasons coupled with the heritage of colonialism. The multiplicity of languages in Africa is a very complex issue and one that cannot be dealt with adequately in this paper, suffice it to say, there is no easy solution to the language dilemma in Africa. It may be that the long-term deployment and exploitation of the Internet by developing countries will depend less on technology and costs and more on their capacities to educate their young populations.

The educational requirements for the information economy are increasing in complexity. However, some national development programs are still attempting to base their employment creation strategies on the perceived comparative advantage that comes from access to large numbers of cheap unskilled labour. The reality is that national and regional strategies should focus on enhancing and attracting a core of knowledge workers operating within the Africa region. This should be accomplished through both national and regional education and training and through incentives to attract the Africa Diaspora and other skilled knowledge workers into the region. However, in this process, we should take care to develop strategies to minimise the impact on the components of the population whose educational level and technical skills do not fit (and may never fit) the requirements of the new techno-economic paradigm of the information economy.

The impact of the information economy on employment is still unclear. Some economists, such as Schumpeter and Kondratieff¹⁸, argue that technological change drives economic growth through a process of creative destruction, with new technologies inducing novel, more productive investments, but at the same time destroying the economic feasibility of earlier ones. Thus any impact on employment is dependent on the nature of the jobs created, and the extent to which jobs are replaced. In e-commerce, for example, employment has mostly been created in Internet service providers. Service industries such as airlines and insurance that involve labour-intensive tasks are taking advantage of the fact that modern telecommunication networks allow them to locate those activities in lower wage regions. Software is the most dynamic industry in terms of employment growth. Miller & Mitter (1998) note that there are opportunities for growth in developing countries if they participate in the global software market. The current economics of software production, especially its low capital and high labour intensity is particularly attractive from the point of view of low wage, labour surplus economies. Migration

¹⁸ Soete, L and ter Weel, B (1999) Schumpeter and the Knowledge-based Economy: On Technology and Competition Policy. Maastricht: MERIT.

towards higher-value software professional work can be achieved through capitalising on the opportunities for knowledge sharing and learning in existing trading relationships between firms in developing and developed countries.

There is a concern that women will be even more disadvantaged in the emerging information economy due to problems of access to ICTs. However employment generation is predicated on Africa's need to create a comparative advantage of cheap skilled labour. Even if this is achieved regions and firms are increasingly attracting talent from around the world, while leaving aside a significant fraction of their own population whose educational level and cultural/technical skills do not fit the requirements of the new production system. Africa is already suffering from a severe brain drain that begins with inadequately resourced national universities. In a UNECA conference on 'The Challenges of Financing Development in Africa' in Addis Ababa (May 6-8, 1998), Africa finance and economic development ministers expressed their concern about the brain drain. More than 30,000 Africans with PhDs now live outside the continent. African scholars have the capability to contribute to the global knowledge base. If they are provided with the necessary tools, they will make their contribution from Africa and enhance the quality of life within the continent. For example, Mauritius has a highly skilled and educated workforce, and liberalisation of various sectors has been prioritised. So even when the clothing industry was on the decline, Mauritius was able to contribute to the new niche markets enabled by the information economy, for example, in e-commerce.

The key to Mauritius success has been the collaboration between the government and the private sector in IT application. For example, they set up a trade facilitation environment in order to replace manual processes and physical handling of paper by electronic submission of trade related documents. Secondly, they developed and implemented a depository, clearing and settlement system for their stock exchange, ensuring that their operational procedures could match up to international standards (Lim Fat, 1998). Mauritian firms now export skills to the rest of Africa.

The only asset of the poorest parts of the world is the cheapness of their labour in an era in which there is a demand for cheap *and* skilled labour. But to leverage Africa's comparative advantage in labour there is an urgent need to upgrade the skill sets of its workers. At the same time in order to benefit from such lucrative industries as outsourcing, the existence of world class information infrastructures is critical. Arguably, brain drain could be viewed positively because it indicates the value of the local human capital. According to Kim (1999), a liberal policy is needed that allows the local graduates to seek employment overseas. This will enable them to sharpen their skills and keep up-to-date with developments in their areas of interest until their local economies are ready to reabsorb them. This is what happened in Korea, when at one

time 96.7% of their scientists and 87.7% of their engineers were based abroad. When the economy improved and with full government support and incentives they were able to reverse this brain drain (since the mid-1980s), which has now become a major source of new knowledge in the country.

The African Economic Environment

Africa has witnessed a substantial deterioration in its position within the global economy. Moreover the exports on which Africa is so dependent are confined to primary commodities, which account for over 90% of all exports. Traditional exports from Africa are being displaced increasingly by new and relatively efficient products from other regions. The dependence on agriculture, for example, is part of a larger historical phenomenon engineered after the partition of Africa. Ikeme (1999) writes that “a luxury beverage and cocktail economy was thus created”, with Kenya producing coffee and tropical fruit, Ghana cocoa, Senegal groundnuts, Ivory Coast bananas, and Sudan cotton for the European markets. Over the last 25 years the region's world market share in cocoa beans fell from 80% to 67%; in coffee from 26% to 15% and in cotton from 30% to 16%. The loss of Africa's markets in cocoa beans and coffee was mainly to Asian countries and in cotton to Eastern European countries (African Development Report, 1995). Nor has the fall in the revenues traditionally garnered from agriculture been offset by gains in other sectors. In fact the reverse is true. The ratio of manufactured goods to total exports for SSA, fell from 7.8% to 5.9% from 1965 to 1985, while it rose from 28.3% to 58.5% in South Asia¹⁹.

The causes of the poor export performance of African countries are multidimensional and largely attributed to non-price factors on the demand side. Factors include lack of information on markets and prices, poor delivery mechanisms, the extent and efficiency of distribution network, quality of customer service, and the quality and level of product sophistication and reliability. The structural weaknesses of African economies, combined with economic mismanagement and irresponsible lending on the part of industrialised nations has now resulted in a situation where total external debt as a percentage of the value of exports has risen from 97% to 324% from 1980 to 1990 (IBRD, 1996).

Africa in the Global Economy

With the emergence of globalization and the movement towards an information economy heavily dependent on knowledge-based products and services, Africa's current position in the world economy is near the bottom. However, in 1996-97 this position began to change.

¹⁹ Riddle, R (1993) “The Future of the Manufacturing Sector in Sub-Saharan Africa” in Callaghy and Ravenhill (eds) Hemmed In: Responses to Africa’s Economic Decline.

According to the *World Economic and Social Survey, 1997*, African economies experienced a rising GDP per capita, with at least 22 countries reaching a GDP growth rate of 5 percent or higher, and 11 countries reaching a rate of 6 per cent or higher in 1996. Also, inflation has been declining in many countries in the region since 1995. Unfortunately, the global financial crises of 1998-99 produced a global economic slowdown that also affected African economies. Furthermore, even with such impressive growth, even higher rates are required to begin to adequately address the overwhelming poverty and unemployment found in the region.

One of the major repercussions of endemic macro-economic and political instability on the continent has been to worsen the competitive environment for the African private sector. Also, policy and strategy networks for the African private sector are mostly weak and ineffective in influencing the important debates on world trade. These networks will have to be strengthened in order for the African private sector to enhance its competitiveness and place in the world economy.

Existing and new markets are opening up as countries liberalise their trade in goods and services under the auspices of the WTO, and other forms of regional trading blocks and business become globalised. While offering better exporting opportunities, these developments have changed the requirements and rules of competition. It is imperative that African SMMEs adopt a global outlook and form strategic partnerships, both domestically and in foreign markets.

Foreign investment has been, and continues to be the lifeblood of many a developing country and remains an important mechanism for technology transfer and employment generation. Despite a plethora of investment opportunities, African countries continue to have difficulties in attracting foreign investment from more than a handful of countries. The continent is also facing intense competition from a host of developing and transitional economies that, with more reliable information infrastructure's and electronic commerce capabilities, are more attractive to potential investors. As firms strive to create strategic alliances and business-to-business electronic commerce becomes the norm, trading outside such hermetically sealed relationships will be viewed as uneconomical.

Advances in biotechnology, the next major revolution, and material science are leading to synthetic substitutes for primary products such as vanilla and sugar. Products such as cocoa and palm oil are also under attack as Western firms undertake genetic research to develop outright synthetic substitutes or varieties that can be produced in their laboratories or non-traditional environments. The concern, therefore, should be how African farmers and firms can take advantage of global opportunities and develop the necessary skills to compete. Similarly, optical fibre could virtually eliminate copper from trunk systems in the future

telecommunications market. With several times the carrying capacity of conventional copper wires, greater bandwidth and invulnerability to electromagnetic interference, optical fibre poses a significant threat to copper exports. However, as new technologies, new production systems, and the organisation of international trade eliminate traditional agriculture, rural people are destined to be painfully absorbed into the informal economy of already overcrowded urban centres.

In addition to the substitution effect, technological innovation is also leading to efficiency improvements in the use of raw materials. The result is a long-term trend of dematerialisation in industrial production. This declining material intensity in production represents a new barrier to Africa's full participation in the world economy, as most African countries are exporters of primary commodities. In the current era of globalization and international trade agreements, the policy space has been severely limited, as African countries must comply with new rules. Unlike the East Asian tigers in the 1970s and 1980s, African countries cannot implement strategic trade policy, which promotes export while protecting domestic firms from intense foreign competition in the local market.

National and Regional, Legal and Regulatory Frameworks

With no real national boundaries, the legal implications of the Internet and the World Wide Web are immense. Thorny issues such as intellectual property protection, privacy, security, data protection, electronic payments and currency, and wide-ranging consumer protection issues have to be addressed in national legislation and regional strategies; each with tremendous social and economic implications. On one hand, appropriate legal and regulatory infrastructure will enhance a country's ability to attract investment and can help to stimulate local participation in the information economy. On the other hand, an inappropriate legal and regulatory environment can dis-empower local entrepreneurs and cause international investors to look to other countries.

Africa can not afford wasted efforts. It is critical for Africa to work as collaboratively as possible with a multiplicity of actors at national, regional and global levels. NICI plans, as promoted by UNECA, can serve as vehicles for integrating the efforts of these disparate actors. Obviously, where possible, these NICI plans should be integrated into sub-regional and regional strategic planning. The ability of government to develop effective policies depends on their capacity to interpret information relevant to the economic, social, cultural and political environment. A strong information infrastructure would allow access to information, planning and decision-making. However such infrastructures are vestigial in SSA. The state in the majority of SSA countries has witnessed an unprecedented reduction in its ability to act. Most infrastructure expenditures in developing countries are publicly financed. But several factors,

namely macroeconomic instability and growing investment requirements, have shown that public finance is volatile at best, and in many countries, rarely meets the minimum required to maintain adequate infrastructure provision. Undermined by the conditionality of structural adjustment programmes, exploited through debt peonage, and weakened by political conflict, the majority of governments are in crisis management mode, prioritising short-term economic and political survival over long-term dynamics. This is especially true of the education sector that is crucial for the human resources needed in the information economy.

In the case of the information infrastructure, international actors and structures play an important role throughout the process. Key players, such as lending institutions, are pressing governments to reform their telecommunications sectors (Moussa and Schwabe, 1992; Newsum, 1994; Roche and Blaine, 1996). In more advanced stages of the process, the external actors are influencing the sector's final regulatory framework and determining the degree of openness of domestic markets. However this raises a number of questions. What is the balance between ownership and control of information infrastructure, and access and impact? Is having a telecommunications infrastructure owned by a foreign company better than having none at all? How does a country with little domestic expertise in software acquire appropriate software?

There is no indication that the current restrictive business practices, constraints on the ownership of knowledge, and rules on intellectual property rights that are adverse to developing country interests, are radically changing. And in this case, there are no realistic prospects that the relations between ICT-rich and ICT-poor countries will change in the near future. Thus, it is an illusion to think that ICT-poor countries can 'catch up' or keep pace with advances in the most technologically advanced societies. In the advanced industrialised countries the rate of technological development is very high and is supported by enormous R&D resources. This is certainly not to say that poor countries should not try to upgrade their ICT systems. But they should not do so in the unrealistic expectation that those who are ahead will wait for them.

If the trend for government indifference and inaction on the issue of Africa in the information economy continues, the constraints mentioned above represent unassailable barriers. In as much as the new information driven global economy presents tremendous opportunities for African countries, in the absence of an effective and consistent public policy, it also poses major challenges.

The Industrial Revolution brought great economic and social benefit, but it also brought about massive dislocations of people, increased industrial pollution, child labour and unsafe work environments. Societies were often slow in responding to these negative side effects. Similarly, the information economy may bring potential invasions of privacy, easier access by children to

pornographic and violent materials, more sophisticated and far-reaching criminal activity and a host of other as-yet unknown problems.

Governments must conform to a narrow set of criteria that are adjudged to increase the likelihood of healthy returns for international investors. Thus countries are discouraged from investing in social programmes as these are seen as being inflationary. Unfortunately these neoliberal economic principles are often discordant with the achievement of national development objectives and the straightjacket of international finance criteria reduces the economic manoeuvrability of the developmental state.

The best placed to reap the benefits of the information economy are invariably those multinational corporations that can invest in high cost research and who have access to global distribution channels. This has serious implications for government control over their economic behaviour. One of Africa's continuing problems is that it does not know what it does not know. Ignorance over the continent's natural resource endowments combined with the increasing sophistication of such technologies as remote sensing mean that better informed players could profit from Africa's ignorance.

The global intellectual property rights regime is at the behest of such corporations and only serves to undermine the efforts of developing countries to safeguard their heritage. In the information economy, Intellectual Property Rights (IPR), such as patents and copyrights are the primary unit of value (Brown, 1998). There is a need to balance strong protection for IPR holders with low cost, certain and ready access to protected materials for potential users and content developers (ITT, 1997). The high cost of intellectual property works render African countries unable to afford access.

With no national boundaries, the legal implications of the Internet are immense. Copyright, privacy and accountability have to be weighed against the speed, access and freedom of expression; because monitoring and enforcement has proved difficult. There are many examples of copyright infringement on the Internet, especially evident in the economies where e-commerce has taken root. Africa may not have reached this stage but it is important to highlight the problems so they can be addressed by developers and policymakers, who may make decisions out of ignorance or under the guidance of archaic laws. WIPO²⁰ is concerned that knowledge of copyright and intellectual property law is built into policies of the developing world; so that the concept and utilisation of intellectual property is entrenched in their economies and the inequalities that have been manifested in the international knowledge system may either be reduced or addressed.

²⁰ World Intellectual Property Organisation

4. Opportunities for Africa in the Information Economy

Without a doubt, the challenges facing Africa in the information economy are daunting. However, given the fundamental shift in the nature of the global economy, it is critical that strategies for African development be shaped within this reality of globalization and the information economy. Perez (1983) suggests that the shift to the information economy opens new 'windows of opportunity' for latecomers. The transition of the global economy to one based on knowledge and information presents numerous opportunities for developing countries that are willing to address them strategically. African and other developing countries can move to strategically develop competitive advantages within this new economy, based on their own specific histories and material conditions.

This is partly because the new technologies allow 'leapfrogging' for some countries that do not carry the inertia of the previous industrial structure. It is argued that African countries are uniquely placed to benefit from the falling costs and increasing utility of cutting edge technologies without having to bear the high costs of discarding older legacy systems.

In order for these opportunities to be realised, it is clear that parts of Africa need to move to become "spaces" of globalization (Cox, 1997; Sassen and Appiah, 1999). To become spaces of globalization, specific geographic areas must be re-oriented to be able to more fully take advantage of the information economy through the development of information infrastructure and knowledge workers in their countries. This re-orientation includes developing a comprehensive strategic vision that harnesses the potential of globalization and the information economy within that geographic space. Of the numerous potential applications emerging from the global information economy, some have greater strategic importance for Africa than others, and may have a significant impact on the socio-economic development of our people. Applications of potential strategic importance include the following: (1) content development; (2) electronic commerce and SMMEs (3) education, learning and research; (4) rural development. In each of these areas, very specific opportunities and niche markets exist for Africa and the developing countries. Each of these areas will now be reviewed in turn.

Creating Content: The Strategic Importance of Information Industries

The information economy is first and foremost about information. A wide range of new technologies and new techniques engendered by the information revolution allow for the production and distribution of new knowledge and the dissemination of data, information and knowledge. Some of these technologies include the Internet, the World Wide Web, CD-ROM, digital audio, video and other forms of new media.

The information economy provides African countries with a historic opportunity to create new information industries and to participate in global strategic partnerships of other information enterprises. Given the richness and diversity of African culture, specific information industries built around strategies to harness these technologies and capitalise on this cultural richness could prove to be quite economically beneficial. Africa can excel in the commercial exploitation of its rich traditional or tacit knowledge. "Africans need to have the confidence to recognise and build upon the fact that they are the world's experts in a wide variety of knowledge domains" (Wilson, 1999). The fact that in most cases this knowledge has not been codified, and is largely informal and regional in its application has undermined its perceived value and legitimacy. Aspects include ecology, wildlife behaviour and traditional healing methods.

Competitive distribution of content will require technical and creative staff and direct marketing positions. Africans must participate in the production of information because their contribution is critical to maintaining the quality and relevance of information from the region. For example, Ghanaians world-wide have established marketable websites selling a variety of products and promoting their culture in the process. This has indirectly contributed to their tourist industry and opened up opportunities for investment and partnerships from world-wide sources. Therefore, the information economy could enable Africans to use their knowledge-based skills and culture to create new employment opportunities, and to rely less on a development model based on resource exploitation. Information that could be useful in Africa can be divided in three general areas:

- *Supply*: availability of sources of finance, labour, raw materials and technology;
- *Demand*: market opportunities, prices, size of the markets, quality
- *Environmental factors*: Competitors, legislation etc.

[Adapted from Heeks, 1999:6]

The above section has looked at the putative opportunities that exist for Africa within the new, globalised information economy. However, the ability of African countries to reap the benefits outlined above are predicated on the pre-existence of host of capabilities, ranging from the infrastructural to the human. At the same time applications such as electronic commerce have meant that the game of international trade just got a lot faster and therefore demands more from its players. If electronic commerce were a drug, the marketing blurb would say electronic commerce speeds things up, makes things clearer, brings things nearer. But a closer look at the health warning on the back would say, "detrimental to those without an effective information infrastructure, without an active and aware private sector, without an environment conducive to private sector development and without skilled human resources".

Electronic Commerce and SMMEs

One of the most important aspects of the information economy is the rise and incredible growth of electronic commerce (e-commerce). E-commerce is transforming the global marketplace, and its impact is being felt in diverse areas such as production, distribution, finance, culture and the reengineering of government. Through the development of the complex mix of skills required for e-commerce, there are possibilities for African entrepreneurs and businesses to participate in global value chains for knowledge-based enterprises. These forms of "business-to-business" e-commerce will provide opportunities for competent African businesses to increase their markets as well, far beyond their national borders.

The African private sector, which consists in large part of small, medium, and micro-sized (SMMEs) and the informal sector, is widely regarded as a possible engine of growth in the economy. SMMEs are widely regarded as a primary means of strengthening the local African economies and as an engine of the emerging information economy. SMMEs in developed countries tend to be homogenous, varying mainly in terms of firm size and technology, while in developing countries they are generally heterogeneous, firms characterised by coexistence of very small enterprises in the informal economy and small and medium businesses in the organised sectors (Bhalla, 1992). Their importance in Africa is also attributed to their potential for transforming local economies into dynamic innovation systems. The other benefits include employment creation, ease of adaptation to market changes, strengthening forward and backward linkages among socially, economically and geographically diverse sectors of the economy. It has been argued that SMMEs usually have a greater ability to produce new products, while large firms tend only to diversify the existing range of products. Compared to larger firms, they tend to use less capital per worker and have the capacity to use that capital more productively. The success of their efforts to broaden their markets depends on the ability of locally based trade and professional associations, chambers of commerce and grass roots organisations to develop demand-driven mechanisms for delivering these services. Potential opportunities within the information economy include the formation of strategic alliances with strong foreign distributors as a way of accessing new markets, while at the same time improving the quality of their products.

Given the richness and diversity of African culture, specific information industries built around strategies to capitalise on this culture could prove to be quite economically beneficial. This content development is critical, especially as the issue of bandwidth availability becomes less of an issue. These forms of "business-to-consumer" e-commerce will be perhaps more critical, albeit different, to the developing economies than in the developed world. Very small entrepreneurs, particularly in the cultural industries, will be able to take advantage of much

larger niche markets globally. Providing new ways to stimulate the creation of content, including promoting an enabling environment for African enterprises and SMMEs operating in and supporting the information economy hinges on the development of human resources which is critical, and will be discussed further in the subsequent section. In South Africa and Egypt, e-commerce is a serious consideration as there is a desire to enhance the attractiveness of their firms in the international markets. Recently in Kenya, a 'National Task Force' (NTF) was set up to address the support systems needed for the development of e-commerce. The NTF plans to organise activities to create awareness, confidence building and establish pilot projects. Similar initiatives are taking place in some African countries but still at embryonic stages.

In addition, employment creation in most developing countries is seen as a critical development issue. For example, in South Africa, unemployment amongst young people is around 40%. Through promoting the development of these types of e-businesses and supporting the requisite educational and information infrastructure, governments may make significant strides towards addressing this pressing issue. The primary challenges to taking advantage of this new information economy are along these lines as well. Investment in telecommunications and the development of NICIs must be accelerated but in parallel with investment in human resources and education.

It is also imperative that the re-alignment of the country's strategy occurs from the highest political and strategic levels (AISI 1996; Wilson 1999). A number of African countries have started developing NICI policy plans and frameworks. These NICI plans must include a reassessment of the countries legal and regulatory regime, not only to ensure that it is in line with the countries global commitments (e.g. to the WTO), but that they also encourage the investment of private resources in to NICI development.

Knowledge, Education and Learning

Given the increasing globalization and restructuring in the world's social, political and economic systems, the requirements for knowledge, education and learning have changed dramatically. A new educational paradigm for the information age is required (in terms of structure, function, curriculum, and approach) at all levels. This is not unique to Africa.

In the age of globalization and an information economy, the objective of education is no longer simply to convey a recognised body of knowledge, but to enhance the ability of each learner to generate, access, assess, adopt, and apply knowledge and information to complex problems. Information age learners should not be presented with "ready-made" problems, but should be required to make major contributions to problem identification. A new educational paradigm should teach students how to think critically and independently, exercise appropriate judgement;

collaborate with others; adapt to new and uncertain situations; identify problems and then solve them; and to synthesise old information with new.

These educational requirements for the information economy workforce are critical. However, the systems developed for informal learning, specifically for adult learners to engage in life-long learning, are equally important. Using new ICTs, there is the potential for expansion of educational opportunities through the use of technology-enhanced learning and other distance learning techniques. These approaches increase the learning opportunities for scattered student bodies common in Africa. In many African countries, students are already benefiting from online courses and technology-enhanced learning approaches. The motivation behind the decisions to investigate and adapt elements of new technology in the delivery of distance learning courses from/to Africa is primarily an attempt to improve learner support and promote reflection, feedback and interaction. However, it is learning methods not technology that influence learning gains especially as teachers are being 'seen' more as facilitators of learning.

The lack of educational resources in many African countries enhances the advantages of this type of learning. Many academic libraries have stopped their subscriptions to international journals due to budgetary constraints. Some of these journals are very expensive and only one or two articles may be relevant to the users. Considering that access to academic journals has become a stumbling block for many scholars in Africa, there is great potential for digital libraries and electronic publishing. For instance, if the table of contents and abstracts are provided freely then subscribers/buyers can pay for specific full-text copies. Libraries can therefore subscribe on behalf of clients at a lower fee than full-text traditional print journals.

As with the other applications within the Information Society, education presents both opportunities and challenges for the developing world. Primarily what is required is a restructuring of the paradigm of education, both in developing and developed countries (Cogburn 1998; Haddad 1998; Charles 1998). On one hand, in most instances educational institutions are isolated from communities. Also in the old paradigm, teachers and lecturers are often seen as a font of wisdom and the initiator of all learning that occurs within the classroom. In this method, teachers are expected to be teaching to the entire classroom at the same time, very little room was allowed for individual instruction. Students operating under this environment are seen as passive, learning mostly at school and answering only questions that are posed to them.

On the other hand, in restructuring the educational paradigm, educational institutions should be integrated into society. Their functioning should be as transparent as possible to the surrounding community and interested stakeholders. Especially at post-secondary level,

teachers should be seen not as "sages on the stage," but as "guides on the side." Thus, instructors should be guiding their students into an ability to access, and critically understand information and in developing knowledge and wisdom. This means that students have to be active, not passive, learners. Learning must occur everywhere and not just in the schools. Students should be encouraged to identify problems, and not just solve the ones given to them, and to ask as many questions as are asked of them. The ability to work in teams is also another critical component of what preparing a student for the information age means. In this model of education, parents themselves should serve as models for life-long learning. Educational needs, especially at the tertiary level, have changed. These educational requirements for the workforce of the future are extremely important. However, the systems developed for informal learning, specifically for adult learners to engage in life-long learning, are important as well.

There are significant contrasts between knowledge, education and learning. 'Education is generally seen as a formal process of instruction, based on a theory of teaching, to impart formal knowledge (to one or more students).' However, the process of learning can occur with or without formal institutional education. Knowledge accumulation and the accumulation of skills for using ICTs will occur increasingly outside the traditional institutions of formal education. Learning in the workplace, and through collaborations that sometimes span the globe and at other times involve tightly knit local communities with similar interests, will become more commonplace.

However, knowledge should not be limited to a select few. As the store of knowledge expands throughout the world, all of the world's people should have as much access as possible. However, the 'formal institutions of education that exist today, and even many of these in the planning stages in developing countries, are becoming less relevant to the requirements of emergent "knowledge societies"' (Mansell and Wehn, 1998:67). The latter argue that these countries must actively reshape their educational systems in ways that are consistent with their [national] development priorities. However, these national priorities must now take into consideration the fundamental changes occurring in the underlying structures of the global economy and new strategies for achieving competitive national advantage.

Components of the new framework

The increased role of knowledge within the economy and the rise in the trade in global services is leading to a whole range of new industries and economic development opportunities in areas as diverse as biotechnology, new materials science, informatics, and computer science. To take advantage of these new opportunities, countries must embrace a new framework for knowledge,

education and learning. Within this new framework, there are some components that should be included and or enhanced.

A holistic, as opposed to discrete, approach: Much of the education and learning environment today is divided into very rigid academic disciplines, focused on discrete units of research. However, the emerging information society and global economy requires a holistic understanding of systems thinking, including the world system and business eco-systems. Thus interdisciplinary research approaches are seen as critical to achieving a more comprehensive understanding of the complex reality currently facing the world system.

A focus on abstract concepts: Some of the challenges for knowledge, education and learning will hinge on learners' greater familiarity with abstract concepts and uncertain situations. Much of the academic environment today presents students with ready-made problems and then asks them to solve them. The reality of the rapid-fire global economy, based on information and knowledge, is that problems are rarely that clearly defined. This requires those seeking valuable employment to seek out problems, gather the necessary information, and make decisions and choices based on complex uncertain realities.

The student's ability to manipulate symbols: Symbols are highly abstracted manifestations of some concrete form of reality. Highly productive employment in new economy will require the learner to constantly manipulate symbols, such as political, legal and business terms and concepts (such as intellectual property rights), and digital money (in financial systems and accounting concepts). Former US Secretary of Labour calls these persons 'symbolic analysts', and includes "all the problem-solving, problem-identifying, and strategic-brokering activities," which are in high demand in the information economy (Reich, 1992:177).

The student's ability to acquire and utilise knowledge: In the past, academic practitioners often saw themselves as wise 'sages on the stage', delivering data, information, knowledge and wisdom to the eagerly awaiting students, whose minds were empty vessels waiting to be filled. However, if that reality were ever true, the world's store of knowledge is increasing at such a monumental rate that no single person can hope to adequately convey as comprehensive an understanding of a subject as is possible, or as could be absorbed by most students. The Global Information Infrastructure Commission (GIIC), an international, independent, non-governmental private sector organisation argues that:

'The globalisation of the economy and its concomitant demands on the workforce requires a different education that enhances the ability of learners to access, assess, adopt, and apply knowledge, to think independently, to exercise appropriate judgement and to collaborate with others to make sense of new situations. The objective of education is no longer simply to

convey a body of knowledge, but to teach how to learn, problem-solve and synthesise the old with the new.’

As discussed above, the emerging economy is based on knowledge as a key factor of production, perhaps a factor more important than any other traditional factors of production. The kinds of industries emerging in the age of globalization, such as biotechnology, new materials science, human genetics, advanced computing, artificial intelligence, and human/computer interfaces, demand that employees remain highly trained in science and technology. Research and development is a critical component, and many countries are trying to develop National Systems of Innovation (NSIs) that attempt to harness the combined resources of national academic institutions with the research enterprises within the public and private sectors. In these countries, universities will have to quickly adapt to the needs and provide a key component of such national systems. By way of definition, Lundvall (1992) has defined a system of innovation to include all parts and aspects of the economic structure and institutional set-up affecting learning as well as searching and exploring, such as, universities. The focus on ‘national’ systems reflects the fact that national economies differ regarding the structure of the production system and general institutional set-up. Therefore, within a ‘national system of innovation (NSI)’ are sub-systems, for example, the development of NICIs. This includes institutions, processes and mechanisms to facilitate the production and utilisation of ICTs.

Blurring of the distinction between mental and physical labour. As discussed above, the Fordist-Taylorist development model made strict separations between mental and physical labour. However, the new Innovation-Mediated paradigm, for example, requires a much more holistic approach to the business enterprise and places value on the intellectual contributions of all employees. In fact, most observers would find it very difficult to make concrete distinctions between many information age-oriented manufacturing facilities and computer laboratories.

Encouraging students to work in teams: Closely related to the last point, is the need for employees in globalised enterprises to be able to work closely in teams. Working in teams requires students to develop skills in group dynamics, compromise, debate, persuasion, organisation, leadership and management skills. Most academic institutions and programmes are set up to do the opposite, to force students to think only of themselves and their own personal development, perhaps with some very limited group work. This should be easy to embrace in Africa as the African culture has [traditionally] been defined more by communality than individuality.

Virtual teams around the world: Again, closely related to the last point, is the need for enhanced virtual and networked activity. Not only should students learn to work in teams; but they should

also learn to work in globally networked, virtual teams. These global virtual teams are being used increasingly in industry and international organisations for R&D activities. Chris Dede argues that ‘Computer-supported collaborative learning (CSCL) enhances team performance through tools for communicating each person’s ideas, structuring group dialogue and decision making, recording the rationales for choices, and facilitating collective activities.’

A new system of education and learning: Using advanced ICTs, a new system of knowledge, education and learning should apply a wide range of synchronous and asynchronous activities that aid the professor and student in breaking the boundaries of space and time. Synchronous activities can include real-time lectures (featuring audio, presentations, websites, and even video), quizzes and group discussions; all of which can occur with the instructor being at the same location or even at a different location from the learner. Asynchronous activities can include archived lectures (in audio and video), and other archived course material that can be accessed at nearly any time, anywhere.

To meet the knowledge, education and learning challenges and opportunities of the Information Economy, the GIIC argues:

‘It is not, however, sufficient anymore to raise the efficiency of the existing systems of education and improve the quality of their components. Even the best of them have served another set of demands for another age. Graduates of these systems, to varying degrees, now find themselves deficient in knowledge as well as cognitive skills that are necessary for the increasingly sophisticated living environment and for the ever-evolving labour market. More importantly, knowledge-based businesses often complain that graduates lack the capacity to learn new skills and assimilate new knowledge.’

Developing countries are behind significantly in the information infrastructure required to generate and disseminate knowledge. One concept that could address these concerns is the emerging vehicle of Multimedia, Multipurpose Community Information Centres (MPCICs or Telecentres). Current research indicates that these centres could serve as effective vehicles for enhancing the knowledge, education and learning opportunities for communities in emerging economies. However, it is important to note that these are simply one of many possible means of enabling improved access but access must be accompanied by improved absorption capacity.

Rural development

Given that the majority of people in African countries live in rural areas, any attempt to meet the challenges of globalization and the information economy must include rural development strategies. By setting up access points to ICTs in rural locations, information on micro finance, marketing, practical tips on business formation, agricultural expertise, health and sanitation

knowledge-based development, can be disseminated at low cost. These centres can serve as incubators for the development of SMMEs and help to stem the tide of migration from rural to urban areas (and the concomitant overcrowding and other socio-economic problems) that plagues nearly every major city in Africa.

The widespread adoption of ICTs holds considerable promise for African countries in their quest to improve their agricultural production and marketing practices. African economies continue to be heavily dependent on agricultural production and the export of natural resources. Thus approaches to leveraging economic value from the information economy must target this area. It provides opportunities for the development of information systems to monitor water and land resources, food transportation and storage and crop-diseases control.

There are many new and exciting opportunities for Africa in the information economy. However, in order for Africa to reap the benefits discussed above, strategic planning and collaborative approaches are required at national, sub-region, regional and global levels. This final section presents recommendations that should enhance Africa's ability to confront the challenges of globalization and the Information Economy.

PART III: A WAY FORWARD FOR THE REGION

5. Recommendations: National, Sub-Regional, Regional and Global

Dzidonou (1999) asked: "What must Africa do to move from its current orientation towards PACE (Predominately Agricultural and Commodity Economies) to PIKE (Predominately Information and Knowledge Economies) orientation?" As a partial response, this penultimate section presents some recommendations and a way forward for the region. It argues that the best approach to meeting the challenges to Africa of globalization and the information economy is strategic planning and implementation that involves public, private and voluntary sector participation and partnerships, at national, sub-regional, regional and global levels.

National Planning and Implementation

Strategic planning and implementation to confront these challenges has to begin at the national levels. There are critical roles for every societal actor to play in this process. Leaving key stakeholders out of this process will hinder the development of an effective vision and national plan that will meet the needs and objectives of all relevant parties.

The African Information Society Initiative (AISI) advocates the creation of National Information and Communications Infrastructure (NICI) plans, and many countries in the region have initiated such a process. In most countries, the NICI plans are being designed to work in conjunction with regional and global frameworks, such as the AISI. These NICI plans can also enhance educational initiatives, giving them the national imperative needed, and work to create an enabling environment for the private sector. It is important for these NICI plans to provide support for existing sub-regional, regional and global partnerships and collaborative frameworks. In addition, the NICI plans should include the active involvement of the private sector in creating a predictable, market-driven legal and regulatory framework to facilitate global electronic commerce. Some of the issues that this framework should address/is addressing are as follows:

- Customs and Taxation
- Global Uniform Commercial Code
- Privacy and Consumer Protection;
- Security and Encryption;
- Content Development and Regulation;

- Technical Standards and Interoperability;
- Education and Employment;
- Electronic Payment Systems and Financial Institutions; and
- Intellectual Property Protection.

Governments must provide an enabling environment to foster the growth of technology and technology related industries in the economies of Africa. It is clear that there is no "one-size-fits-all" solution to the problems facing African countries. National policy formulation must be specifically tailored to meet clearly defined national objectives, based upon local realities, constraints and needs. However there are some identifiable common principles, and African decision-makers should actively pursue the vigorous debate around these principles at all levels. Any efforts to prepare the continent for an era of accelerated structural change must encompass policies to address basic needs and ensure an environment that is conducive to creating the necessary conditions for the information economy to flourish. These conditions include: good governance; respect for human rights and the rule of law; ensuring transparency and accountability in public administration.

Access to information and communications technologies is critical for effective participation in the global information economy. Government policy should focus on reducing the cost of information technology to the end user as rapidly as possible. Import duties and sales tax should be immediately removed from computer hardware and software (this is already the case in some countries, e.g. Mauritius). Special corporate and personal income tax deductions should be introduced to allow individuals and companies to offset the purchase of computer equipment against earnings, at perhaps two times the purchase price. Soft loans should also be made available to individuals to purchase computer equipment. Governments can also fuel demand for ITs by being a visible user of the technology. This can lead to increased government efficiency and have a powerful demonstration effect to those reluctant to invest in the requisite infrastructure. Further, liberalisation and privatisation in the telecommunications industry in Africa should be accomplished as rapidly as possible. Liberalisation and privatisation are not the end goals, but if effective regulation is in place, then it may be possible to achieve the lowest possible prices, most advanced services, and network expansion to meet universal access objectives.

Sub-Regional Co-operation

Many of the sub-regional economic and political groupings have started developing strategic plans for aspects of the information economy. These sub-regional strategies are critical as the first line of regional and global collaboration. Countries should pursue active, high-level participation in these sub-regional processes. In addition, these sub-regional institutions should

quickly develop clear mechanisms for substantive and representative private sector and civil society participation in these strategic planning processes.

Regional Co-ordination

At the regional level, the leading initiative is the African Information Society Initiative (AISI) being co-ordinated by the UNECA. The AISI was adopted in 1996 by all 53 African ministers of social, economic development and planning, and endorsed by the African ministers of communications meeting in Abidjan, Cote d'Ivoire to develop the *African Green Paper on Telecommunications*. It was launched publicly at the *G7/Developing World Information Society and Development Conference (ISAD)*. The AISI outlines key roles for national governments, as well as for civil society, media and the private sector. Implementation of the AISI is supported by a consortium of donor and executing agencies working together in an informal network called the Partnership for ICTs in Africa.

Also at the regional level, the *African Connection* is an initiative of the South African Department of Communications, supported by many African ministers of communications and the World Bank. The *African Connection* aims to promote a more rapid development of the information and communications infrastructure necessary for Africa's entry into the Information Age. The African Connection is partnering with ICO Global Communications and the Global Information Infrastructure Commission (GIIC) in an *InfoDev* sponsored programme to develop a regional regulatory policy for GMPCS.

Finally, the GIIC launched GIIC-Africa; a regional initiative developed to support the African private sector active in the knowledge and information industries. During the ADF, GIIC-Africa co-ordinated the private sector focus group which led to the formation the Alliance for African Business (AAB) as a broad informal umbrella coalition of private sector organisations and interest groups from the region and around the world.

For African SMMEs to succeed in the current economic environment, they will have to network and build alliances. Governments should also encourage innovation in the private sector by creating technology funds for start-ups, and giving such companies fiscal breaks. It may be beneficial to employ an advisory committee of experts whose designated role would be to aid in policy implementation by ensuring effective co-ordination in all sectors concerned and propose a mechanism for on-going review.

In addition, governments can upgrade national technological capabilities by the establishment of information-intensive institutions that can provide extensive extension services on a wide scale and deliver comprehensive packages of assistance comprising technical know-how, finance,

management skills, training and sales information. The promotion of science and technology is a cornerstone of the kind of economic progress that Africa needs if it is to compete in the twenty-first century. From the information industry to the biotechnology field, scientific innovation is the driving force of growth and development. Africa's share in the world's scientific output fell from 0.5% to 0.3% between 1985-1995; Africa as a whole counts only 0.36% scientists of the world total, while African scholars continually contribute to scientific development through brain drain. African countries should pool expertise in regional centres of excellence and where economies of scale permit, pursue regional strategies. A regional centre could also be promoted in the field of R&D into design of appropriate technologies for Africa. Governments may need to ensure that companies/firms invest more in training by having 'hard-hitting' policies, such as a tax on companies that do not invest in training, refundable if they do.

There is also a need to promote the economic integration (Intra-African trade and co-operation) of the African continent by adopting measures for the development of transport, communications and tourism. The development of national and regional capital markets can be facilitated by widespread adoption of information technology.

A key objective of these regional initiatives should be to develop regional strategic policy responses to the numerous issues that are emerging in the governance of the global information economy. These issues include Internet governance and the International Corporation for Assigned Names and Numbers (ICANN), and the World Trade Organisation (WTO) negotiations and electronic commerce developments.

Global Collaboration

At a global level, some of the most important strategic responses are emerging from the Global Knowledge Partnership (GKP) facilitated by the World Bank, and the Alliance for Global Business (AGB) facilitated by the GIIC.

The Global Knowledge Partnership is an evolving, informal partnership of organisations – public, private and not-for-profit – committed to sharing information, experiences and resources to promote broad access to, and effective use of, knowledge and information as tools of sustainable, equitable development. It emerged from the co-operation of several dozen organisations in sponsoring the Global Knowledge '97 conference, "Knowledge for Development in the Information Age" in Toronto, Canada in June 1997. The follow-up meeting was the GKP conference in Malaysia in March 2000²¹. This meeting addressed the challenges facing communities and nations in the rapidly changing information and communications

²¹ More information can be found in <http://www.globalknowledge.org.my/>

environment. It also focused on identifying practical means to harness information, knowledge and new technologies to promote equity, fairness, social justice, empowerment and informed decision-making.

The Alliance for Global Business (AGB) is a co-ordinating mechanism of leading international trade associations created to provide business leadership on information society issues and electronic commerce. Jointly, these organisations represent the bulk of electronic commerce in almost all countries in the world. The coalition represents a diverse cross section of business in over 140 countries. Membership includes providers and users of information technology, large multinational enterprises and small start-ups, and companies in developing as well as developed economies. The AGB was created in response to the need for a coherent and unified, global industry voice to international organisations and governments around the world. The Alliance represents a broad range of industry with a focus on high-tech manufacturers, service providers and information technology users from nearly every sector of the global economy. Also, the WTO is engaged in a "Work Program" on electronic commerce that has particular relevance to developing countries, and the OECD research program on the Information Economy and Electronic Commerce are critical to developing the intellectual base for understanding this period.

6. Conclusion

This paper has covered a lot of theoretical and empirical ground. It has involved interdisciplinary approaches. In this new millennium we expect to see the emergence of a new global information economy that is underpinned by revolutionary changes in science and technology. Technological innovation in such diverse domains as ICTS, transportation, material science (alloys, ceramics, fibre optics, composites) and biotechnology are fundamentally restructuring the global economy. Underpinning all these advances are a host of ICTs that are helping to unleash the potential of other technologies and creating revolutions in other areas. In this new global economic environment, information and the knowledge it provides has become a key factor in economic competitiveness.

This paper has focused on the implications for Africa of globalization and the emergence of the information economy, the challenges that it poses and the promise that it holds. It has argued that whether African countries benefit or lose out from the structural shift to an information economy is predicated on the existence of a host of competencies ranging from designing and implementing information infrastructure to the creation of an enabling environment by government.

The first conclusion of this paper is that globalization is a reality and a process. The information revolution is leading to the development of an information economy and information society. With this information society emerges additional challenges. Many nations are working to address these challenges, both in collaboration and independently. It is also important to note that there is also substantial amount of activity in Africa. However, the outcomes of globalization are uncertain. Therefore, the goal should not be the development of an information economy or society *per se*, but rather the emergence of a variety of societies or economies that are increasingly dependent on new combinations of local and global knowledge and uses of ICTs. The key issue for African countries is not necessarily to put in place policies that will enable them to replicate the globalizing process experienced by the wealthy industrialised countries. Instead, there may be a host of alternative ways in which globalizing processes can be combined with innovative applications of new technologies to produce improved social and economic outcomes for the continent.

A second, and somewhat obvious, conclusion is that there is a widening gap between the developed and developing countries. There is also a growing gap within countries between their digital elite and the unconnected. This gap may affect the ability for the developing countries to be able to take advantage of these opportunities. In order to address these issues, it is critical for development initiatives to address the science and technology capabilities of African countries. In addition, there are new and innovative approaches that may begin to close this infrastructure gap. There are many possible means of enabling improved access; one innovative approach might be multi-purposes community information centres (MPCICs). These facilities can serve as shared infrastructure for a wide-variety of Information Economy/Information Society applications. The business models for these centres range from fully-owned public sector centres operated on a "utility" model, to fully-owned private sector centres operated by African entrepreneurs. However, access must be accompanied by improved absorption capacity.

Globalization and the information economy presents African countries with an array of opportunities for increasing economic development in such areas as the creation of new industries, rural development and tourism promotion. Countries that do not facilitate this information revolution will likely fall further behind, both relative to the rest of the world and relative to other countries in the African continent. Countries that confront these challenges through strategic planning and public/private partnerships could reap benefits in terms of economic growth and socio-economic development. This means that the African private sector must pursue a more active voice in the formulation of public policy and national strategies to promote the information economy.

Finally, an important conclusion of this paper is that education – and life-long learning – must be prioritised. An African infusion of technical knowledge is needed in order for the development of the information industry. This also requires more synergy between the key people in the information economy. This includes government, the private sector, academia, labour and community organisations. Access to information (local or global) is meaningless unless it can be converted into relevant knowledge. Therefore, there is an urgent need for investment in human resources and education to the parallel need for investment in infrastructure.

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