

611872457



Distr.: LIMITED

E/ECA/DMD/PSD/AEGM/WP/99/2  
December 1999

Original: ENGLISH

**UNITED NATIONS  
ECONOMIC AND SOCIAL COUNCIL**

---

**ECONOMIC COMMISSION FOR AFRICA (ECA)**

Development Management Division

Ad-hoc Expert Group meeting (AEGM) on:  
Review of Proposals for Linking Selected Private  
Sectors to Existing Information Networks

Addis Ababa, Ethiopia  
13 - 15 December 1999

**A Systems Approach to Developing Information Systems  
and Networks for the Private Sector in Africa**

## Contents

Overview.....	1
Methodology.....	8
The New Economic Paradigm.....	8
E-Commerce.....	9
Rural Development and the Information Economy.....	13
Observations and Problems Related to the Current Situation.....	15
The role of information industries.....	15
Employment.....	15
Trade deficit.....	15
Africa is not choosing to compete.....	15
Understanding the nature of competition.....	16
The taxation regime impedes growth.....	16
Business environment.....	16
Global scale.....	16
International competition for investment.....	17
Information society initiatives.....	17
Globalisation, Competitiveness and Constraints in the African Context.....	17
Key trends affecting the Information Industries.....	18
Globalisation.....	18
The changing composition and terms of trade.....	18
Convergence and its implications.....	19
Shift in value from hardware to services and software.....	19
What is Required?.....	19
Production Chains.....	20
Path Dependence.....	22
What do opportunity industries look like?.....	23
Fundamental change agents.....	23
Influence and are influenced by the environment.....	23
Display high growth.....	24
Shaped by dynamic attractors.....	25
Scale and learning economies.....	25
Increasing returns.....	25
What policies and plans are appropriate for opportunity industries?.....	26
What is the nature of the challenge?.....	27
Real world industry policies.....	32
Analysis.....	35
Challenges, Development Models and Action Plans.....	35
Challenge 1.....	35
Recognising the strategic importance of the Information Industries.....	35
Impact of the Information Industries on economic growth.....	36
Semiconductors, a high growth industry.....	36
Policy for the semiconductor industry.....	37
Impact of the Information Industries as the providers of key enabling technologies.....	37
Action : Implement a National Information Industries Database.....	37

Challenge 2 Getting on-line to the 21st century.....	38
Action : Get Existing African businesses on-line.....	38
Action : Encourage leading edge users.....	39
Action : Kick start electronic commerce.....	40
Action : Ensure that Africa has a world class information infrastructure .....	42
Action : Establish a model framework for the Information Economy .....	42
Challenge 3 Access to Capital.....	44
Action : Alternative Market on Internet .....	46
Challenge 4 Going global – Exporting to the World.....	47
Action : Networking and consortia among SMEs to warrant more attention by the businesses themselves and within government programs.....	47
Challenge 5 Enhancing skills formation, education and training.....	47
Action : Enhance tertiary information and communication technology education...	48
Action : Enhanced ICT education in schools .....	49
Action : Enhance education in the workforce .....	50
Challenge 6 Enhancing research, development and innovation.....	51
Action : Ensure greater ICT focus.....	51
Action : Provide support for major projects.....	52
Action : Provide support for key infrastructures .....	53
Challenge 7 National leadership.....	54
Leadership .....	54
Action : Appoint a Minister for Information Industries.....	54
Action : Support improved industry statistics and benchmarking.....	55
Leading by example.....	56
Action : Drive the application of information and communication technologies in government.....	56
Action : Maximise industry development benefits from government procurement.	56
Action : Use outsourcing for industry development.....	56
Action : Streamline government procurement processes.....	57
The Role Of the ECA .....	58
Conclusion .....	61
The Importance of Prioritising Initiatives and Sequencing Action Plans.....	61
Recommended Sequence of Identified Actions .....	61
Bibliography.....	1

---

## **A Systems Approach to Developing Information Systems and Networks for the Private Sector in Africa**

### **Overview**

Much has been written and spoken about the problems facing Africa with respect to infrastructure development, Internet connectivity, competitiveness and globalisation. Numerous statistics have been analysed and quoted highlighting the backlog and difficulties in many areas including the provision of essential services. This paper is not meant to regurgitate those observations, facts and figures. Instead it seeks to provide an understanding of some of the key issues facing the continent from a system-theoretic basis. This insight and understanding is then used to develop frameworks and processes that will inform action plans designed to contribute meaningfully to the development of African private sector information systems, networks and relationships with the public sector.

### **Background**

The crucial role of the private sector in growing and developing the economies of African countries has long been recognised by governments, aid agencies, and global institutions. As a consequence numerous projects and programs have been undertaken to promote private sector growth with varying degrees of success or failure. Often these programs have not taken into account the dynamics of the new information economy as it relates to all types of industries, ICT and non-ICT.

Little use has also been made of advances in disciplines such as cybernetics, non-linear dynamic systems, chaos theory, complexity engineering and evolutionary dynamics that can enhance understanding of the dynamic environment in which change is sought.

This paper outlines key features of the socio-economic forces at play in the emerging global information economy and how these affect and are affected by information and resource flows. Based on this understanding actions and programs are recommended that are aimed at improving the macro-economic situation.

Without understanding the nature of the information economy and the dynamics of the global competitive environment that Africa finds itself in, projects and programs of action are bound to be unsustainable and have limited impact.

One of the purposes of this paper is to sketch the context within which private sector information systems and networks must be viewed and understood.

Once this understanding is gained the chain of production must be known in order to develop information systems access strategies and sustainable programs. These programs can then be prioritised and kick-started by means of appropriate pilot projects.

Information by and of itself is not conducive to being push-driven and hence information access strategies that are based on this mode are likely to fail. Instead access strategies must be linked to information demand that can be surfaced as a result of fundamental economic factors. This implies the development of appropriate criteria and knowledge of the conditions required to exploit latent demand for information and access.

### ***The New Economic Paradigm***

The shift from an industrial age economy to an information-based economy requires an understanding of a fundamental shift in the dynamics of competitiveness.

The dynamics of the information age are very different to those of the industrial age. Old paradigms and ways of doing business must change to accommodate the requirements of the information age. Decision makers need to understand the dynamics of the new information economy and how this has altered the traditional value chains.

Just as important as it is to educate decision-makers about the dynamics of the new information economy it is equally important to raise awareness among small and medium sized enterprises (SMME's) about the impact and implications of globalisation.

Similarly policy-makers need to be wary of using models of success from the industrial age to formulate development strategies for the information age. Countries and regions that have been successful in the past are not necessarily role models for success in the future.

### **E-Commerce**

If e-commerce is to have a meaningful economic impact it will be because it represents a more efficient way of doing business.

Some expected opportunities are :

Changes in production costs

Changes in the value added chain

Changes in international competitiveness

New products and ways of doing things

Implications of the greater use of e-commerce and a view of direct changes ahead by industry are summarised for the following sectors - Information Technology, Communications, Health, Education, Banking and Finance, Business Services, Media and entertainment, Manufacturing, Retail, Transport.

### **Rural Development and the Information Economy**

The issue of rural development also needs a complete re-assessment. Policy-makers need to be careful not to confuse age-old problems related to rural development with those of the information age. Some countries have been more successful at this than others and much can be learnt from these experiences, for example in rural Australia.

---

As domestic markets become more accessible to overseas suppliers it is no longer valid for African producers to think in terms of domestic and export markets. The reality is that they are competing with producers all over the world for a share of the global market.

Increasingly, international competition is chain versus chain, rather than company versus company or product versus product. Successful companies will join others to build competitive agri chains.

To be competitive, the co-ordination, sharing of information, co-operative management, goal setting and planning that have traditionally been done within an organisation will now need to be undertaken between chain partners. This requires new skills and knowledge that are often lacking in the African agribusiness sector.

In each of the cases above, access to timeous, relevant information is critical and hence the need for appropriate information networks is imperative.

### ***Observations and Problems Related to the Current Situation***

The information industries play a key enabling role in all Industries

Employment and Skill Problems

Trade deficit problems

Africa is not choosing to compete

Lack of policy appreciation of the nature of competition

Taxation regime impedes growth

A competitive business environment is necessary, but not sufficient

Global scale is required

Strong international competition for investment

Most countries have information society initiatives

### ***Globalisation, Competitiveness and Constraints in the African Context***

One of the notable trends in world trade is the long-term decline in the share of natural resource-based products vis-à-vis engineered products. Moreover, prices fetched on world markets for natural resource-based products are falling vis-à-vis those fetched by Elaborately transformed manufactures (ETMs). As a result, the things Africa is exporting are earning less and less on world markets, while the things we are importing are costing us more and more. The deteriorating trade position is not simply a matter of gradual decline. Africa cannot rely on natural resource-based products forever.

In the long-term Africa will not be able to achieve a developed-world lifestyle unless we shift the structure of the economy towards higher value manufactures and services. The passive acceptance of global forces will not lead it to future prosperity.

---



## Key trends affecting the Information Industries

Globalisation

The changing composition and terms of trade

Convergence and its implications

### What is Required?

If Africa is to prosper in the twenty-first century it will be necessary to pursue industry policies designed to adjust the composition of the economy towards high-growth strategic industries. Above all else, it will be necessary to grasp the fact that the composition of production in the economy *does* matter and that the future prosperity of Africa depends upon managing that composition and facilitating the emergence of a pro-growth industrial structure in Africa.

### Production Chains

Countries with a higher proportion of high-growth industries will tend to gain a growth advantage. Growth of an economy's production base is fed, *inter alia*, by revenue growth and (re)investment.

Virtuous circles need to be pursued. Understanding the nature of transformative technologies, like information and communication technologies, and of the industries that produce them, is an essential part of understanding the need for industry policies and action plans for the opportunity industries.

### Path Dependence

The fact that there are multiple roads to growth, and vicious and virtuous circles reinforces the need for sectoral policies for opportunity industries.

### What do opportunity industries look like?

In making the necessary strategic choices about which industries Africa must develop to support future prosperity it is important to understand what 'opportunity industries' look like. Among the key characteristics of today's opportunity industries are that they:

- are the producers or deliverers of transformative technologies;
  - are high growth;
  - exhibit significant positive externalities;
  - exhibit significant learning economies;
  - often exhibit increasing returns to scale; and
  - are knowledge intensive.
-

### Appropriate policies for opportunity industries

Traditional policies have championed a free market approach with a few exceptions based on compensating for clearly identifiable market failures. These have been called corrective policies. Strategic trade policy goes further in that it seeks to secure economic welfare by providing for the strategic protection, fostering and encouragement of selected industries which may not otherwise achieve the same level of development (Honda et al 1994, p9). 'New growth' policies focus on knowledge, learning and the national innovation system.

### What game are we in?

In an attempt to understand trade and investment patterns, the patterns of specialisation and the composition of economies, Yoffie et al (1993) identified four characteristic industry structures, comparative advantage, oligopolistic competition, regulated competition and political competition. Each of these industry structures implies different sets of information flows. For private sector information systems and networks to be effective an understanding of the relevant industry structure is first required. Based on this information systems and networks can be developed.

The key message of this analysis is the importance of understanding the situation, and knowing whether one is playing a game of comparative advantage, political competition, oligopolistic competition or regulated competition, and how that game is changing.

### ***Challenges, Development Models and Action Plans***

#### CHALLENGE 1

Recognising the size, impact and strategic importance of the Information Industries

Action : Implement a National Information Industries Database

#### CHALLENGE 2

Enabling users – Getting on-line

Action : Get existing African businesses on-line

Action : Encourage leading edge users

Action : Jump-start electronic commerce

Action : Ensure that Africa has a world class information infrastructure

Action : Establish a model framework for the Information Economy

---



### CHALLENGE 3 Access to capital

Action: Establish an Alternative Market on Internet (Based on the Australian Model)

### CHALLENGE 4 Going global – Exporting information and communication technology to the World

Action : Networking and consortia among SMEs to warrant more attention by the businesses themselves and within government programs.

### CHALLENGE 5 Enhancing skills formation, education and training

Investment in, and promotion of, high quality education and training is one of the most important contributions that can be made to Africa's future.

Action : Enhance tertiary information and communication technology education

Action : Enhanced ICT education in schools

Action : Enhance education in the workforce

### CHALLENGE 6 Enhancing research, development and innovation

Action : Ensure greater ICT focus

Action : Provide support for major projects

Supporting Action : Provide support for key infrastructures

### CHALLENGE 7 National leadership

If Africa is to meet the challenge of the on-line revolution there must be commitment and personal involvement from the top. Strong and consistent national leadership is essential. It should come from both government and industry in a policy partnership, and it must come from the highest level.

---

### ***Leading by example***

Action : Drive the application of information and communication technologies in government

Action : Maximise industry development benefits from government procurement

Action : Use outsourcing for industry development

Action : Streamline government procurement processes

### ***The Role of the ECA***

The fundamental challenge to implementing the proposed action plans on a continent-wide basis is one of co-ordination. Numerous studies have recently been conducted (especially by the MIT School of Co-ordination Science and the Stanford School of Decision Analysis) that point to the primary importance of sound co-ordination, decision-making and project management in the context of complex development initiatives.

The quality of co-ordination, decision-making and project management, above all else will determine the success or failure of development initiatives. Most umbrella organisations such as the ECA are active at the policy and planning level, few however have grasped the challenge of superior co-ordination, decision-making and project (and programme) management.

The ECA is clearly in a position to co-ordinate all development and aid initiatives that are focussed on Africa as a continent. Similarly a decision framework that filters projects and initiatives needs to be established and finally these initiatives must be program managed in a sophisticated manner. The adoption of these actions will significantly leverage current developmental initiatives and will align resources toward the common purpose of African private sector development.

In addition to the above the ECA should adopt an action-reflection approach where the premises of projects and expected outcomes are clearly articulated prior to their commencement and then evaluated upon completion. The evaluation should help improve plans and adapt expectations for the next cycle of projects and so a learning cycle can be established. This also implies the ECA would become a central knowledge-repository that can be accessed by all other institutions undertaking development initiatives on the continent and elsewhere.

### ***Conclusion***

The funding requirements and impact of projects differ and it is necessary to prioritise these on the basis of well-defined criteria. Each country needs to understand the nature

---

and dynamics of its industry structures and the stage that it currently is in with respect to its development life cycle and the establishment of an information economy.

Understanding of path dependence and evolutionary behaviour is required and these must be projected for each country's economy.

Only then can suitable projects be defined that will accelerate development and create self-sustaining opportunities.

Finally a recommended sequence of projects is provided as a likely development scenario is sketched. Different countries will adapt this scenario to their own conditions and take appropriate action.

### Methodology

In order to develop appropriate responses to the challenges, opportunities and issues facing the development of Information systems and networks for the private sector in Africa it is necessary to develop a holistic understanding of the underlying dynamics of the environment in which intervention is proposed as opposed to seeking simplistic one-dimensional cause-and-effect explanations. To do this it is necessary to understand the relationships and dynamic behaviour that result from multiple causes and effects and how these impact on development strategies, competitiveness and globalisation.

When dealing with highly complex issues such as those relating to sustainable strategies and plans for developing an information society in Africa it is necessary to employ a methodology and analytical tools that are appropriate to the task. The disciplines of cybernetics, non-linear dynamic systems, chaos theory, complexity engineering and evolutionary dynamics provide the necessary framework to develop a more holistic understanding of the issues and to take meaningful action to improve the situation.

This work relies heavily on previous work done by many contributors in the Asia Pacific region, Australia, MIT School of Co-ordination Science, Stanford School of Decision Analysis, and the Santa Fe Institute. The bases for the arguments presented here are from work done by Professor Ashley Goldsworthy especially identification of the challenges, development models and action plans. In addition the work done by scholars of systems theory such as Gregory Bateson, Norbert Wiener, Heinz von Foerster, Ross Ashby, Stafford Beer, Russell Ackoff, Jay Forrester, Geoffrey Vickers, Peter Checkland, John Warfield, Humberto Maturana and Francisco Varela provides the epistemological base of this work. The presentations made here then, are an integration of these diverse works and the majority of ideas are from these pre-eminent scholars and institutions. The author has used this to synthesise a development plan based on a nine-point criteria presented at ADF 99.

### The New Economic Paradigm

The shift from an industrial age economy to an information-based economy requires an understanding of a fundamental shift in the dynamics of competitiveness.

---

Whereas the industrial age relied on the use of machines to enhance the capability of manual labour, computers in the information age enhance the capability of the mind. Whereas physical goods were the products of the industrial age, intangible knowledge products are the primary outputs of the information age. Whereas competition was the ruling paradigm in the industrial age, co-operation and joint innovation are the dominant modes of interaction in the information age. Whereas access to capital and funding were of paramount importance in the industrial age, access to information and knowledge is of paramount importance in the information age.

These factors make the dynamics of the information age very different to those of the industrial age. Old paradigms and ways of doing business must change to accommodate the requirements of the information age. Policy and regulation must similarly undergo a paradigm shift to be relevant in the information age and to create an environment where growth and development of the information economy is accelerated. Decision makers need to understand the dynamics of the new information economy and how this has altered the traditional value chains.

Just as important as it is to educate decision-makers about the dynamics of the new information economy it is equally important to raise awareness among small and medium sized enterprises (SMME's) about the impact and implications of globalisation. This raised awareness will result in greater understanding among target communities and would be a source of creative solutions to deal with the inevitability of globalisation.

The pitfall of many a well-meaning organisation is the desire to find solutions by itself and to ignore the creativity that could be unleashed by providing appropriate information to target communities and allowing them to develop solutions.

Similarly policy-makers need to be wary of using models of success from the industrial age to formulate development strategies for the information age. Countries and regions that have been successful in the past are not necessarily role models for success in the future. In many ways models of success in the information age are still unfolding and Africa needs to develop its own position with regard to what is a desirable definition and model of success in this age. This becomes more urgent when one considers the current turmoil created in developed countries by the displacement of large numbers of workers, the shortening of the work week and increased volatility in financial markets to name but a few issues.

### ***E-Commerce***

What difference will greater reliance on e-commerce make? Why is it not just an information technology issue?

Huge estimates of the rapid growth in e-commerce sales generally do not impress economists. If US Internet retailers have boosted their sales to US\$38 billion, so what? Economists will assume that this is offset by a US\$38 billion loss by other retailers. Where is the net gain?

---

If e-commerce is to have a meaningful economic impact it will be because it represents a more efficient way of doing business. Initially it was supposed that e-commerce could lead to a 'frictionless' economy'. This would be a perfect world for economists in which transaction costs essentially disappear, barriers to entry fall, geography becomes irrelevant and markets clear instantly. Much of this earlier enthusiasm is likely to prove unfounded. Nevertheless, evidence is emerging that e-commerce does reduce costs and prices. What form will the economic impact of greater use of e-commerce take? Some expected opportunities are summarised in the following table.

**Table 1**  
 Opportunities that e-commerce brings

Opportunity	Brief Description
Changes in production costs	E-commerce will allow firms to extend 'just in time' processes to reduce inventories and other input costs. It may also streamline purchasing and order processing systems, reduce the cost of finding and processing bids, and the cost of after sales service. These improvements should increase productivity.
Changes in the value added chain	E-commerce changes the cost trade-offs between individually tailored and mass-produced goods and permits interaction with customer requirements, and greater interaction within a supply chain, as a result. The value added chain becomes a value added business network, systems are not linear. E-commerce also allows buyers and sellers to cut out margins between producers and consumers, such as retailers and wholesalers, in a process known as disintermediation. Re-intermediation may occur as new types of intermediaries are introduced to the value added chain.
Changes in international competitiveness	Businesses have greater scope to advertise and sell their products into a global market at lower cost. Africa also becomes a market that is more accessible to foreign businesses.
New products and ways of doing things	It is likely that the impact of e-commerce will be magnified many times over when changes in capacity are reflected in completely new products and services. The overall nature and impact of such new products, however, is particularly difficult to assess at this time.

**Implications for industry**

Implications of the greater use of e-commerce by industry are summarised in the table below.



Table 2

Sector	Observations
Information Technology	A key enabler of e-commerce, demand for information technology will grow commensurately. IT products, such as software and hardware, are increasingly bypassing traditional intermediaries. Exponential growth in computing power will unlock further applications of e-commerce.
Communications	Major input sector to e-commerce. New demands will alter inputs required and allow intermediaries to be bypassed. New technologies, such as Wireless Access Protocol (WAP) will have a large impact on the future conduct of e-commerce.
Health	Significant efficiencies stand to be made in pharmaceutical supply chains. New service modes and channels to the consumer will be developed, as will expanding electronic modes of operation, such as telemedicine.
Education	Greater opportunities for distance education and improved efficiencies through online processes to bypass traditional administrative functions.
Banking and Finance	An information-intensive industry with an established IT infrastructure, this sector will be able to extract greater efficiencies and bypass traditional cost structures, such as the branch structure. Banks are looking at ways to expand their value proposition by linking new services to their existing customer base.
Business Services	Range of professional knowledge services will benefit from greater efficiencies in dealing with suppliers and clients through electronic service delivery. Some traditional cost structures will be altered. New products and services will be created, such as legal authorisation of electronic documents or data registry services.
Media and Entertainment	A high profile industry, online forms of media and entertainment will compete with traditional forms for audiences, customers, and advertising revenue. New distribution and recording technologies, such as MP3, will challenge traditional systems.
Manufacturing	Beneficiaries of major productivity gains from previous forms of e-commerce such as EDI, manufacturing may extract further efficiencies made possible through open networks. Companies can build stronger relationships directly with customers including by selling products directly on-line.



Retail	Traditional retail faces increased competition from on-line competitors with more effective product range and cost structures. Bypassed to varying degrees by consumers making on-line purchases directly with producers or new intermediaries, especially in digital products and commodities such as books and CDs.
Transport	Improvements in supply chains will generate efficiencies and possible disintermediation. Greater productivity may also lead to decreased demand for labour. Additional value can be built into customer relationship, such as the 70 percent of tickets sales that are e-tickets.

**Key view of direct changes ahead**

### **Retail and wholesale trade changes**

The main thrust of these changes is that greater use of e-commerce leads to a reduction in retail margins in those goods/industries that are identified as being amenable to sale via e-commerce. This is largely driven by disintermediation effects in business to consumer e-commerce. The reduction in retail margins ranges between 0 and 20 per cent over ten years. Books are viewed as being particularly susceptible to this impact and so margins in that industry fall by 30 per cent.

There will also be a reduction in wholesale margins in some goods/industries. This reflects disintermediation between producers and retailers (ie, business to business e-commerce). A uniform reduction of 5 per cent has been assumed.

It is also expected that consumers will obtain an additional time saving proportional to the reduction in margins costs. This time is freed up for other purposes, including leisure and potentially to offer for employment.

### **Selected sectoral changes**

Some industries would obtain additional cost savings from the more widespread adoption of e-commerce. Those sectors are banking and finance, transport and communications.

### **International trade related changes**

Imports and exports are treated differentially.

E-commerce will allow African businesses to raise global awareness about their products and services. This will be particularly so for manufactured products and some services (tourism). This impact is not expected to benefit Africa's agricultural, mineral and processed food commodities.

It is expected that greater use of e-commerce will increase awareness by African households and industries of foreign products. It will also increase their accessibility. This is reflected as a twist in the demand curve trading off domestic production in favour of imports.

There is also an impact due to the possibility that sophisticated e-commerce applications will assist Africans in getting a better deal on imported products. The approach also recognises that importers will be able to obtain cost savings that are comparable to those that domestic producers enjoy from the greater use of e-commerce.



### **Reintermediation costs**

E-commerce is not costless. The earlier savings are also accompanied by an annual cost to consumers and business.

### ***Rural Development and the Information Economy***

The issue of rural development also needs a complete re-assessment. Policy-makers need to be careful not to confuse age-old problems related to rural development with those of the information age. While problems that have existed in the past are exacerbated by a lack of access or connectivity, they have not been created by them. The underlying causes of rural economic problems need to be acknowledged and addressed in conjunction with the requirements of the information economy. Some countries have been more successful at this than others and much can be learnt from these experiences, for example in rural Africa.

Boundaries between countries and regions are falling away as communications and transport technologies improve and trade barriers are reduced. These developments open up opportunities for Africa to export products to a wider range of markets. But, at the same time, domestic markets become more accessible to overseas suppliers.

Increasingly, it is therefore no longer valid for African producers to think in terms of domestic and export markets. The reality is that they are competing with producers all over the world for a share of the global market.

In this buyer's market, consumers exert greater power and are becoming more discerning about the quality and value they expect. Their demands go beyond safety, quality, convenience and consistency to production issues – for example, organic products, free range eggs, dolphin safe tuna etc.

Globalisation is also providing further opportunities for increasing concentration of supermarket and food service chains. Companies are building retail networks across the world and sourcing globally to supply them. In responding to the requirements of customers, they are also looking to source from fewer and larger suppliers, who they can rely on for volume, quality and consistency, including year-round supply.

The need to respond to the increased specificity in consumer demand, the need to control costs to be competitive, and the need to reduce risks such as the variation in the price, quality and quantity of products have all provided incentives for the formation of agribusiness **chains**.

Increasingly, international competition is chain versus chain, rather than company versus company or product versus product. Successful companies will join others to build competitive agri chains.

Ultimately future competitiveness will depend on effective participation in, and control of, global agri chains. In many cases control will not require ownership. Control can be

---

achieved through knowledge of the chain and the development of alliances. Rather than competing against other elements in the chain for a share of the consumer's dollar, all elements will need to cooperate to make the chain more competitive against other chains.

To be competitive, the coordination, sharing of information, cooperative management, goal setting and planning that have traditionally been done within an organisation will now need to be undertaken between chain partners. This requires new skills and knowledge that are often lacking in the African agribusiness sector.

African producers and others in the product chains will need to develop the skills, knowledge and capacity to manage relationships with chain partners if we are to become influential players in the global economy, rather than a price taking global supplier of product.

### *Supply Chain Management Lessons from Case Studies in "Chains of Success"*

Work undertaken by AFFA in support of Supermarket to Asia has been brought together in the publication, 'Chains of Success'. The book contains:

- an assessment of the changes underway in global agribusiness;
- implications of agri chain management for Africa's food industry; and
- analysis of the critical factors for successful agri chain partnerships.

Included in the publication are 10 case studies, which illustrate how African, Dutch and US companies are becoming more competitive by the way they manage or control their supply chains.

Based on the experience of the case study companies in "Chains of Success", the key characteristics which define businesses that successfully operate as partners in a supply chain approach are chain coordination, customer responsive quality, investment in market knowledge, and a global market outlook.

Chain coordination typically involves understanding end user needs and the assumption of responsibility for customer satisfaction. It can be achieved through ownership of critical links in the chain or through knowledge acquired through close cooperation with all links in the chain through to the consumer.

Customer responsive quality requires an ability to meet total customer needs for both the product and services, and a customer focus in internal business culture.

Investment in market knowledge includes understanding the social, cultural and economic environment in which the chain operates. It can be achieved through strategies which range from recruitment of personnel with market knowledge and experience to direct involvement with end users (whether or not sales are made through third parties).

---

A global market outlook includes the need to determine target markets and business opportunities by the value of the opportunity, not by cultural and geographic comfort zones. (John Sainsbury, 1998)

In each of the cases above, access to timeous, relevant information is critical and hence the need for appropriate information networks is imperative.

## **Observations and Problems Related to the Current Situation**

### ***The role of information industries***

Information and communication technologies are now a crucial enabler, underpinning productivity and competitiveness in every industry. Unfortunately very few industries in Africa have exploited the potential of information and communication technologies to improve competitiveness. It is through their enabling role that the information industries can contribute most to Africa's future economic growth, employment and productivity.

### ***Employment***

The application of information and communication technologies is changing the structure of employment in Africa. New jobs and industries will be created through the advances of these technologies, particularly in the information industries themselves and in service industries where these technologies provide new opportunities to globalise. At the same time as these new jobs are created, a reduction in jobs is likely to occur in certain administrative and wholesaling areas, as well as in industries subjected to increasing trade exposure – the latter occurring as a result of the declining *de facto* protection of distance that modern communication brings.

The employment outcomes for Africa will depend on how, as a continent, we manage the loss of jobs in some industries and the creation of jobs in others. This will be underpinned by the level of economic growth Africa is able to attain, and the strategic management of the industrial structure or composition of African economies over the coming years.

### ***Trade deficit***

Current trends in Africa's production and use of information and communication technologies will lead to Africa's trade deficit in those technologies increasing substantially. Simple projections of Africa's information and communication technology trade trends during the 1990s suggest that the deficit could reach as much as \$6-\$8 billion by 2005 especially as a result of telecommunications equipment importation.

### ***Africa is not choosing to compete***

A large proportion of African-based information industries businesses are not competitive because they are not consciously choosing to compete. Many of Africa's leading services industries are not choosing to compete in new on-line markets and are not sufficiently

---

aware of the size or nature of the challenge they face. A change in management attitudes and greater entrepreneurial drive and awareness of the impact of globalisation are prerequisites for success.

### ***Understanding the nature of competition***

African industry policy tends to favour commercial activity in areas where markets work well – markets where there are a number of relatively small companies, none of which dominate the market: in short, where the economic theory that underpins our policies is a reasonably accurate model of the real world. In industries dominated by a few global players (such as semiconductor production, large-scale computer manufacturing, large-scale telecommunications transmission and switching equipment manufacturing, automobiles and chemicals) where there is oligopolistic competition – Africa has no leading players and performs poorly.

If Africa is to be a player in such industries, industry policy needs to be informed by a greater appreciation of the nature of competition in the real world, and not rely on textbook simplifications. This implies introducing radical policy reform to stimulate these industries.

### ***The taxation regime impedes growth***

Dividend imputation creates a bias towards high dividend, low growth stocks. At the same time, high growth investments are not sufficiently incentivised with respect to taxation. Consequently, the current tax regime is acting as a major impediment to the development of high-technology businesses in many African countries and as a disincentive to high growth, venture and development capital investments.

### ***Business environment***

There are many ways in which Africa is already an attractive place to invest, nevertheless, there are still challenges ahead. Pressure for microeconomic reform must be maintained and even increased in areas where progress to date has been slow. Increasing capital mobility places limits on the extent to which Africa can tax capital. As globalisation proceeds, Africa's taxation regime is likely to become an increasingly significant barrier to investment. This must not be allowed to occur.

### ***Global scale***

Current information industries policies are based on a variety of uncoordinated strategies with little sophistication in integrated development planning. Because of its focus on access to individual countries markets these strategies led almost entirely to domestically-scaled activities. To be a winner in the increasingly globalised world, Africa must make or attract far more regionally – or globally-scaled investments. Future development requires information industries investments in the hundreds of millions, or even billions of dollars – one or two orders of magnitude greater than those Africa has seen to date.

---

### ***International competition for investment***

As industries become increasingly globalised the investment environment becomes more internationally competitive. Countries in all regions are actively encouraging investment by offering explicit and direct incentives. Important as the underlying environment for investment attraction is, it is not of itself sufficient to compete with the incentive packages offered by other countries. Africa must compete proactively and on equal terms to attract global investment. This implies developing all the characteristics of an attractive investment area including access to skills, technology and innovation.

### ***Information society initiatives***

Recent years have seen the emergence of major initiatives in developed countries, aimed at the creation of national information infrastructure or information society investment and change programs. The more successful of these tend to be championed by a senior member of government, which reflects not only the urgency these initiatives warrant, but also the fact that the investment and change agenda cuts across existing administrative responsibilities and structures.

## **Globalisation, Competitiveness and Constraints in the African Context**

One of the notable trends in world trade is the long-term decline in the share of natural resource-based products vis-a-vis engineered products. Elaborately transformed manufactures (ETMs) – including such things as consumer electronics, information and communications equipment – have been the major source of growth in world trade for the past 50 years. And yet commodities still dominate African country's exports. This means that exports are not providing the same level of growth opportunities that ETM exports are providing to other countries – and would provide to Africa if it were a significant exporter of ETMs. Africa could lift its growth by increasing exports of elaborately transformed manufactures (ETMs).

Moreover, prices fetched on world markets for natural resource-based products are falling vis-a-vis those fetched by ETMs. As a result, the things Africa is exporting are earning less and less on world markets, while the things we are importing are costing us more and more. Compared to the mid 1960s Africa now has to export at least 50 per cent more commodities (by volume) to be able to afford to import the same volume of manufactures.

The deteriorating trade position is not simply a matter of gradual decline. Africa cannot rely on natural resource-based products forever. Even if it is believed that endless productivity improvements in agriculture, mining and related industries are possible and that Africa could turn around the decline in standard of living that way, natural resources are a finite, non-renewable asset.

---

Globalisation is changing the game. Wade (1990) argues that as capital becomes increasingly internationally mobile, its owners and managers have less interest in making long-term investments in any specific national economy, and hence they have less interest in the overall development of any specific economy – including their home base. Wade concludes that governments must compensate for changes in investment incentive structures brought about by globalisation in order to manage investments in the national interest (Wade 1990, p350).

In the long-term Africa will not be able to achieve a developed-world lifestyle unless we shift the structure of the economy towards higher value manufactures and services. The passive acceptance of global forces will not lead it to future prosperity.

### ***Key trends affecting the Information Industries***

One of the keys to taking a strategic view of what is happening within the information industries is to understand major underlying trends and how they shape the dynamics of the industries. While there are many forces at work, those most actively shaping the information industries over the next decade will include globalisation, the changing composition and terms of trade, implications of convergence, regional growth and the shift in value from hardware to services.

#### **Globalisation**

Until the 1980s the main dimension of international expansion was trade. More recently firms have used new combinations of international trade, investment and collaboration to expand internationally, to secure supplies and markets, and to reap the advantages of greater efficiency and scale.<sup>1</sup> Investment, technology and trade flows are now intimately linked.

It is no longer sensible to focus only on domestic production and exporting. Policy must now focus on globalisation – fostering the formation and growth of businesses which may produce in several countries and distribute to many more.

#### **The changing composition and terms of trade**

Africa's terms of trade has declined markedly over the last 30 years. There has been a long-term decrease in the share of natural resource-based products in world trade vis-a-vis engineered products. Elaborately Transformed Manufactures (ETMs), of which information and communications equipment form a substantial proportion, have been the major source of growth in world trade for the past 50 years. And yet commodities still dominate Africa's exports.

As the world moves towards freer trade there is a momentum propelling Africa towards producing those things for which we have a comparative advantage – namely, commodities. In the absence of policy intervention, global free trade is likely to push Africa towards de-industrialisation and make it even more dependent on commodities. In the long-term, Africa

---

will not be able to achieve a developed-world lifestyle unless we shift the structure of our economy towards higher-value manufactures and services.

### Convergence and its implications

At the technological level, convergence relates primarily to the phenomenon of digitalisation, which is seeing ever greater amounts of information converted to a digital format. Accounts, television programs, films, books, and conversations can all be processed in digital form and delivered via the same medium. At the industrial level convergence relates to the tendency for the computing, telecommunications and broadcasting industries – and their formerly distinct lines of business – to merge into new digital media businesses.

In this environment many businesses will be under challenge. If a business primarily involves the distribution of products that can be digitalised, then global broadband communications may present a threat to that business. However, new opportunities may emerge for businesses which perform as information intermediaries, so-called ‘infomediaries’, who link users to the information sources they require.

### Shift in value from hardware to services and software

As the price of hardware continues to decline, the relative share of total information industries’ revenues from services and software increases. Although less traded than equipment, services are becoming an increasingly important sector of the information industries.

### ***What is Required?***

If Africa is to prosper in the twenty-first century it will be necessary to pursue industry policies designed to adjust the composition of the economy towards high-growth strategic industries by managing investments and investment incentives. This will involve the combination of three things.

First, it will be necessary to create and maintain a pro-growth business environment. This must include supporting and encouraging capital accumulation and saving, and shifting attitudes to overcome the ‘fear of growth’ and of the potentially inflationary impact of growth.

Second, it will be necessary to ‘choose growth’ by intervention and by establishing an incentives structure which is supportive of key growth sectors. In doing this it will be necessary to make strategic choices about which sectors to support and about the nature of incentives used to support them.

---



Third, it will be necessary to provide infrastructural support for the choices made. This will involve investing in and tailoring: the innovation system; education and skills development; and the national information infrastructure – as well as building key industry clusters. Social overhead infrastructure investments (e.g. an information and communication technology literate workforce) also have positive employment effects, because they raise the marginal productivity of labour.

Above all else, it will be necessary to grasp the fact that the composition of production in the economy *does* matter and that the future prosperity of Africa depends upon managing that composition and facilitating the emergence of a pro-growth industrial structure in Africa.

### ***Production Chains***

Received wisdom on the composition of production can be summed up in the phrase: ‘potato chips, wood chips, micro chips; it doesn’t matter, they are all chips.’ There is an underlying notion that the market will move towards the optimum allocation of resources, and governments should not be concerned with the structure of the economy or composition of production. But is this realistic?

Let us assume that Africa’s comparative advantage lies in agriculture, mining and related industries. As the world economy moves towards freer trade one might expect greater specialisation, and for agriculture and mining to take up a greater share of the African economy. There would seem to be a world-wide net benefit, but is this really good for Africa’s longer-term prosperity? Let us consider just two things: growth and trade.

Growth does matter. As has already been noted, countries with a higher proportion of high-growth industries will tend to gain a growth advantage. Growth of an economy’s production base is fed, *inter alia*, by revenue growth and (re)investment. Clearly, if Africa specialises in minerals and, say, Taiwan in the production of faster growing products, such as information and communication equipment, then there is every chance that Taiwan’s economy will grow more quickly. The composition of production in an economy tends to be a major factor in setting the speed limit to growth (Cohen and Zysman 1987, p104).

The terms of trade also matter. As has already been noted, Africa faces long-run declining terms of trade. Put simply, exports earn us less while imports cost more. This tends to lead to balance of payments problems and to downward pressure on African currencies. As this drifts lower some of the exports become more price competitive, but imports are even less affordable than before. This is not to suggest that we should give away agriculture and mining. On the contrary: we should continue to exploit historical comparative advantages, while developing new advantages and adding new industries – new strings to the bow.

To take one example: information and communication technologies contribute to the productivity of industries across the economy. We already have a large and growing trade deficit in them, and currency depreciation would make them even more expensive to

---

import. This would put us into a vicious circle, where we are trading off a large and growing trade deficit against the productive capacity of all industries throughout the economy.

Could we choose a virtuous circle instead? Clearly it is possible to target industries that have high growth, transformative potential in order to attempt to raise the speed limit to growth.

*...at any given moment particular industries are economically strategic – that is, certain sectors are at the centre of a web of technical evolutions and developments that will reshape the entire economy. The mastery of steam engines altered the application of energy to manufacturing throughout Europe. Its use in rail transport altered economic and social distances. The emergence of modern chemical industries created new products and altered old ones. The expansion of the automobile industries had similar effects. There are elaborate theories that would argue formally that growth moves in spurts, driven by waves of technological development. But we do not need an entire theory of growth to contend that those countries solidly placed in these strategic industries which symbolise the transition and which have a web of sectoral interconnections that permit the industries that are driving the technological advance to influence more traditional industries are better situated for sustained expansion.*

(Cohen and Zysman 1987, p105).

At the core of such key strategic industries are transformative technologies:

*The so-called high technology industries are in fact transformative sectors. Their products and processes alter or transform the goods and production arrangements throughout the economy, that is they alter the choices open to firms and the very nature and definition of markets.* (Cohen and Zysman 1987, p106).

Understanding the nature of transformative technologies, like information and communication technologies, and of the industries that produce them, is an essential part of understanding the need for industry policies for the opportunity industries.

*Precisely because the new technologies involve the emergence of new sectors and reopen and disrupt established competitive patterns in traditional sectors, they make competition a strategic game. It is not simply one in which the clear constraints of competition in perfect markets bound the choices and possibilities of firms. Rather the decisions of particular firms, and often of governments, alter the market by changing the possibilities of other firms in the industry. Competition in emerging and transforming sectors does not follow the model of perfect competition so dear to economic analysis. Markets in these cases are inherently imperfect and the outcomes – what firms produce and where – are powerfully and often in an enduring way shaped by corporate strategic decisions and government policy.*

(Cohen and Zysman 1987, p106).

---

As Chapman (1991, p83) observed: we must recognise (i) that the industrial structure of the economy does matter, (ii) that this industrial structure is a matter for government intervention because it involves interactions which are external to the market and individual firms, and (iii) that industries differ in their ability to create beneficial linkage effects. Once we recognise the different potential role of different industries within the economy the importance of considering realistic selective and discriminating intervention becomes obvious.

### ***Path Dependence***

The fact that there are multiple roads to growth, and vicious and virtuous circles reinforces the need for sectoral policies for opportunity industries.

Rodrik (1996), for example, points to market co-ordination failures. Countries rich in both human and physical capital naturally specialise in high-skill, high-technology industries; while countries poor in both tend to specialise in relatively labour intensive, low-technology industries. But, countries in between, countries with a disparity between human and physical endowments, may face a multiplicity of possible specialisation patterns.

This suggests that countries that can enhance human capital because of latent potential, but suffer a relative lack of physical capital, may face multiple equilibria – a high-technology equilibrium and a low-technology equilibrium at the points of tangency between the economy's capital-labour ratio and the factor price frontier(s).

These equilibria can exist because of the 'chicken and egg' problem of coordinating the production of intermediate and final products.

*What creates the multiplicity of equilibria for countries of the intermediate type is a coordination problem inherent in many industrial activities. Production and investment decisions in upstream and downstream parts of the industry will often be interdependent. When these decisions are made in a decentralised fashion, skill-intensive industrialisation may fail to take hold in countries which otherwise possess the requisite human resources.*

(Rodrik 1996, p2).

The model Rodrik develops depends upon assumptions about the characteristics of intermediate production, namely that the high-technology sector depends upon the production of a range of differentiated intermediate inputs that are produced under conditions of economies of scale and/or increasing returns to scale (e.g. semiconductors) and are in part non-tradeable (e.g. specialised, production-specific skills embodied in labour). What Rodrik's model demonstrates is that it is possible for countries in Africa to get locked into a relatively low growth path, and for high-technology industries to fail to fully develop without government intervention aimed at overcoming co-ordination failure and facilitating access to the high growth development path.

---

### ***What do opportunity industries look like?***

In making the necessary strategic choices about which industries Africa must develop to support future prosperity it is important to understand what ‘opportunity industries’ look like. Among the key characteristics of today’s opportunity industries are that they:

- are the producers or deliverers of transformative technologies;
- are high growth;
- exhibit significant positive externalities;
- exhibit significant learning economies;
- often exhibit increasing returns to scale; and
- are knowledge intensive.

Each of these characteristics is briefly explored in this section.

#### Fundamental change agents

The most strategic industries are those that are ‘transformative’ – producing and/or delivering key generic technologies which transform production in other industries at a particular phase of development. Examples of historically transformative technologies include steam power and electricity. Currently information and communication technologies, biotechnology and advanced materials are the major transformative technologies.

For example: information and communication technologies are becoming crucial to the competitiveness, even survival, of almost every business in every industry. The transformation to electronic commerce and the on-line information economy makes information and communications technologies, and the industries that produce them, among the most important in both economic and strategic terms. They have the potential to transform production and delivery of products and services across the economy.

#### Influence and are influenced by the environment

Externalities are an important characteristic of a number of the opportunity industries and a significant form of market failure. Opportunity industries like the information industries are knowledge-based and knowledge intensive, and there are many areas in which there are knowledge spillovers – where a firm cannot appropriate the full benefits of its investment in knowledge due to such things as staff mobility, technology and intellectual property leakages and diffusion, and the public good nature of knowledge.

Information infrastructure-based services are centred around networks, which are inherently subject to network externalities. Demand for networks and network-based services is a function of price *and* the size of the network. The presence of such

---

adoption effects profoundly affects market behaviour and performance. Since social marginal benefits exceed private marginal benefits, the market equilibrium size of the network will be smaller than the socially optimal size. "The perfectly competitive equilibrium is not efficient. Moreover, because of the positive feedback nature of such networks, even adoption externalities that are small at the individual level may lead to large social welfare losses" (Creti 1995).

Where there are positive externalities there may be a role for government in correcting the market failure, and ensuring that network externalities do not retard the roll out and adoption of information and network-based applications and services.

### Display high growth

Growth is another key characteristic of opportunity industries and an important goal for industry policy.

Hirschman (1958) outlined a theory of growth through the promotion of leading industry sectors with strong linkages to, or complementarities with, other industries throughout the economy. The argument is that the act of investment creates knowledge that, because of complementarities, can be used by both the original investor and other firms to make better decisions about future investments. The leading industry sectors in this theory are those which generate the most externalities and where the diffusion of technology to other industries can occur most readily (BIE 1992, p24).

Lucas (1988) identified high-technology production activities as generating the greatest learning externalities (BIE 1992, p33) – externalities that can contribute to the development of sustainable competitive advantage.

### Growth in the information industries

Among high growth industries, the information industries stand out. They are amongst the fastest growing in the world and account for an ever greater share of the value of world trade.

The computer industry was the fastest growing industry in the United States, Japan, Germany, the United Kingdom and France throughout the 1970s and 1980s, based on constant price gross output growth (OECD 1996b, p115).

The United States Semiconductor Industry Association estimates that world-wide sales of semiconductors will almost double, from US\$144 billion in 1995 to US\$270 billion by 2000.

The more developed African countries information industries market revenues (vendor revenues) have grown at a compound annual rate of almost 12 per cent through the 1990s. Some market segments have been growing at compound annual rates in excess of 20 per cent especially in South Africa.

---

To put this in perspective, the value of global trade in minerals increased by 20 per cent in the *decade* to 1995, whereas trade in information and communication technology equipment increased by 26 per cent in 1995 *alone* (Stanford 1996).

New and evolutionary growth theorists point out that the level of spillovers varies among sectors and technologies. They are thought to be greatest where there is a pervasive cluster of technologies (Freeman, Clark, Soete) or general purpose technologies (Helpman and Trajtenberg) (Van Meijl and Soete 1995, p112).

#### Shaped by dynamic attractors

Growth theorists also point to the possibility of the development of 'growth poles', wherein some countries specialise in low growth industries while others specialise in high growth industries. Growth and growth potential are an important consideration in shaping the composition of production in an economy. Other things being equal, a country that has a higher share of fast growing industries in its economy will gain a growth advantage over countries with a preponderance of slow growing industries.

#### Scale and learning economies

In some industries, especially high-technology industries in which competitiveness often depends upon large up-front investments in R&D, firms may require a relatively large market share in order to achieve adequate returns. High-technology industries also experience significant learning economies, making those producers that achieve large-scale production quickest relatively lower-cost producers.

For example, the semiconductor industry is especially subject to learning economies. A rapid decline in unit costs is achieved with cumulative production, because manufacturing experience leads, *inter alia*, to higher yields in the number of good chips per wafer. It is very difficult for a late starting producer to catch up. It is only the less than complete transferability of the learning between technological generations in semiconductors that allows new entrants and shifts the competitive position of players in the industry.

#### Increasing returns

Increasing returns also propel the opportunity industries towards large scale. Traditionally economics has been based largely on the assumption that enterprises face diminishing returns. The argument was that as production expands producers are driven to use ever more marginal inputs. In so doing they face rising costs and, thereby, diminishing returns.

---

In the agricultural and basic processing world of the nineteenth century diminishing returns made sense. Increasingly, however, there appear to be cases where diminishing returns do not apply. Indeed, increasing returns – declining average costs in production – can be observed. It is widely argued that many of the high-technology industries, including information industries, are subject to increasing returns (see, for example, Arthur 1996).

There are several reasons for this. For example, there may be high up-front costs. High-technology products are complicated to design and deliver to the market. R&D costs are typically high relative to unit production costs, and average costs tend to fall as sales increase. Learning and scale economies may also lead to increasing returns. Such industries as the computer hardware, software and telecommunications equipment industries are often characterised by increasing returns.

In most cases services are characterised by decreasing returns, but increasing returns may apply. “Services belong to both the processing and the increasing-returns worlds. But their center of gravity is crossing over to the latter” (Arthur 1996, p108).

In circumstances of increasing returns it is not clear in advance which product or service will come to dominate, it is not necessarily the best product or service that wins out, and the company that does establish the ‘standard’ typically enjoys significant margins. Industries facing increasing returns develop structures out of the concentration effects they create – those that are ahead get further ahead. Industries facing increasing returns tend to be concentrated.

### ***What policies and plans are appropriate for opportunity industries?***

Traditional policies have championed a free market approach with a few exceptions based on compensating for clearly identifiable market failures. These have been called corrective policies. Strategic trade policy goes further in that it seeks to secure economic welfare by providing for the strategic protection, fostering and encouragement of selected industries which may not otherwise achieve the same level of development (Honda et al 1994, p9). ‘New growth’ policies focus on knowledge, learning and the national innovation system.

At the theoretical level these are radical alternatives. Corrective policies are aimed at the efficient allocation of resources (in a Pareto-optimum sense), while strategic and new growth policies are aimed at growth and development – a response to opportunities or threats which seeks to affect the structure or composition of production in the economy. In policy practice, however, these approaches represent a range of policy options which can be employed in various combinations depending upon the circumstances. Determining the correct mix of corrective, strategic and pro-growth intervention, and what form intervention should take, depends upon a realistic understanding of the circumstances.

---



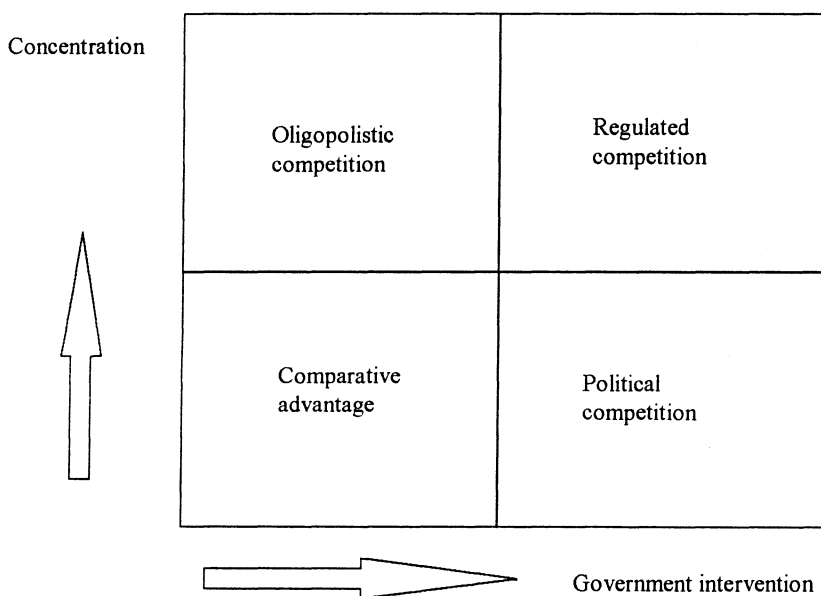
In some cases the law of comparative advantage provides an adequate model of the real world, and the free market approach may be sufficient. In other cases there will be market failures, and corrective policy intervention will be required. In still others the potential for growth, concentration, intervention and strategic behaviour may be sufficient to demand more strategic responses. The key policy question then becomes: what game are we in?

**What is the nature of the challenge?**

In an attempt to understand trade and investment patterns, the patterns of specialisation and the composition of economies, Yoffie et al (1993) identified four characteristic industry structures. (see figure 1 below)

In the lower left-hand quadrant the law of comparative advantage rules. In the other three there is a buffer that allows room for strategic behaviour by firms, governments or both. The four characteristic structures are derived from the interplay of two key dimensions: namely, industry concentration and government intervention. The fundamental hypothesis is that international industrial specialisation, trade and investment can only be understood by looking at the interplay of five factors: country advantages, industry structure, the organisational and strategic attributes of firms, government policies and corporate inertia (Yoffie et al 1993, p12).

**Fig 1 An industry / market framework**



Source: Yoffie 1993.

### Comparative advantage – low concentration / low intervention

In industries that have few market imperfections, and where the role of government is modest, the most important drivers of competition are relative factor costs, factor endowments and domestic demand conditions. Comparative advantage rules. The role for government policy in situations of comparative advantage will be largely confined to the generic base, and will focus on competition policy, cost structures and the underlying business environment.

However, comparative advantages are not fixed. South East Asia emerged as an assembly base for semiconductors, computers and customer premises (telecommunications) equipment during the 1980s, and has exhibited a snowball effect. Once an area becomes a location for one of these industries externalities emerge that make it more attractive to others. So there may be opportunities to enhance comparative advantage and factor endowment through such means as skills enhancement or, where there are significant externalities, infant industry initiatives. And the rewards to locational intervention may be multiplied many times through the effects of externalities and clustering.

It has, for example, been argued that the development of semiconductor industries in Taiwan and Korea were not only cases of deliberate government action, but that each country implemented a technology acquisition strategy which involved the coordination of government action and private capital (Mathews 1995). Similar cases of the operation of strategic or targeted industry development policies leading to the generation of new comparative advantages have been recorded in Japan (Kodama et al 1994) and in a number of other Asian countries (Wade 1990 and Kodama et al 1994).

The factor needs of the industries themselves also change through product life cycles. The origin of semiconductors in the United States can be traced to that country's skills, science, technology and engineering bases and local demand conditions. The subsequent rise of Japan can be partly attributed to strong local demand and the success of related and supporting industries – including consumer electronics – while assembly in semiconductors has been increasingly located in relatively low wage countries.

The dynamic logic of comparative advantage dictates that firms should make long-term commitments to countries that will act as the best platforms over time for a broad array of activities, and not focus solely on cost minimisation. As comparative cost advantages fade, which they inevitably do, firms profit most if they can leverage their sunk costs to capitalise on being close to large domestic markets, new production methods, or advanced suppliers of equipment and so forth (Yoffie 1993, pp432-433). In industries and

---

markets characterised by comparative advantage the major role of governments should be one of laissez-faire with minimal market regulation. However, governments can also play an active and constructive role in the development of comparative advantages and the enhancement of factor endowments – especially where that contributes to enhancing the productivity of relatively immobile factors such as labour.

#### Oligopolistic competition – high concentration / low intervention

When industries become relatively concentrated at the global level, industry structure and firm decisions propel trade and investment decisions in ways that differ from those one would expect on the basis of factor costs. In oligopolistic competition firms are influenced by the moves and counter moves of their global competitors. Firms in oligopolistic competition have larger scale or higher profits (rents) than firms in fragmented industries. This scale and cash flow gives managers the opportunity to buy options for future growth or insurance against financial, competitive or political risks. For example, in oligopolistic competition firms invest heavily in competitors' markets, almost *regardless of the profitability of such investments* (Yoffie 1993, pp434-435, emphasis added).

Reasons for the emergence of oligopolistic competition, especially in high-tech industries, are likely to include the existence of increasing returns, learning and scale economies. Yoffie et al (1993) found that in industry after industry the early mover into a market segment – the first to establish a technical standard, the first to make a large investment, the first to enter a new country – gained significant long-run advantages that often pre-empted competitors. When such early-mover advantages are reinforced with superior execution, the effects can last for many years.

Where there is oligopolistic competition derived from increasing returns and learning or scale economies there might be a role for government to play. The key dimensions of intervention are likely to be timeliness and scale. This includes provision of a business environment capable of supporting timely and rapid commercialisation of technologies *and* the rapid development of scale in global markets through export market facilitation, outward direct investment facilitation, regulatory speed and mergers and acquisitions policies that pay due regard to regional and global competition as well as domestic competition while at the same time managing the downside effects of concentration.

#### Regulated competition – high concentration / high intervention

Regulated competition exists where relatively concentrated industries are subjected to government regulation.

*In telecommunications, semiconductors and mainframe computers we found that government's heavy and visible hand often sculpted, manipulated or even directly determined the direction and volume of international trade flows. The all important role of country factors in explaining international trade frequently disappeared in these heavily regulated oligopolistic industries. Under the circumstances, international trade and competition became a game*

---

*of strategic business-government relations in which neither government alone nor firms and industry alone can explain the pattern of exports and investment. It was the interaction of business strategy, government policy, and industry structure that were the key drivers of global winners and losers (Yoffie 1993, p443).*

The work done by Yoffie et al (1993) on regulated competition demonstrates a number of important policy lessons.

1. Policies that appear theoretically sound, such as fostering competition through unilateral deregulation, can be destructive in a world of strategic players. In globally oligopolistic competition, deregulation in one country can be undermined by foreign governments. If foreign governments accommodate higher prices at home, effectively subsidising national champions abroad, they can provide real strategic advantages. This suggests that government policies should seek to coordinate major regulatory and trade moves. If regulatory policy changes are implemented unilaterally, then trade policy should be used to ensure equal national treatment in foreign markets in the same timescale.
2. Targeted industry development policies can work through governments shaping country and competitive advantage. Examples, such as Korea and Taiwan (Mathews 1995), Japan (Kodama et al 1994) and other South East Asian nations (Wade 1990), demonstrate that such policies can work in certain circumstances.
3. These examples also suggest that some governments can successfully manage trade. A good case can be made for considering strategic trade policies in oligopolistic industries (regulated or not), especially high-technology ones in which the spillovers from R&D and dynamic learning economies may be lost to a country forever in the absence of government intervention.
4. Governments vary considerably in their ability to execute infant-industry, strategic or other interventionist policies. But, by the same token, they can learn and can improve. If Africa is to participate as a global player in these industries we should be prepared to learn some of these new skills and accept the ups and downs that go with such a learning process.

In industries and markets characterised by regulated competition there may well be a role for governments in relatively small economies like Africa's in ensuring that there is an appropriate synchronisation of regulatory and trade policies and in seizing industry development opportunities likely to contribute positively to, or lead to a virtuous circle of growth.<sup>1</sup>

---

<sup>1</sup> The functional alternatives have been large scale local purchasing by defence in the case of the emerging semiconductor industry in the United States or by consumer electronics companies in Asia, or coordination such as that between IBM and Microsoft in the development of DOS. Such alternatives are not readily available to Africa.

---

### Political competition – low concentration / high intervention

In industries that are highly fragmented but subject to significant government intervention, political competition supplements competition based on comparative advantage. In such industries comparative advantage generally remains the best predictor of trade and investment patterns but, through regulation in their domestic markets or the use of trade barriers, governments influence the timing and pace of shifts in country advantage as well as the level of trade (Yoffie 1993, p448).

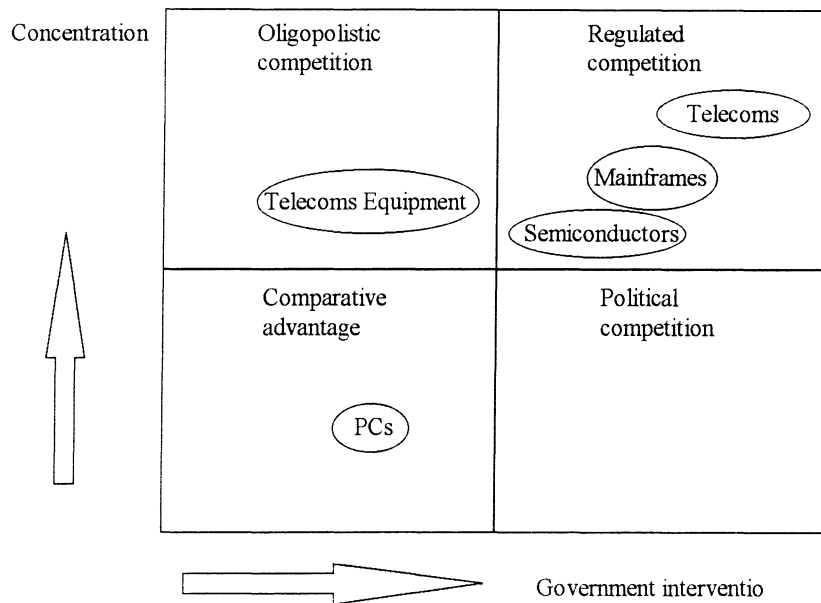
In industries dominated by regulated competition, government policy has a direct strategic impact on individual firms, whereas in industries characterised by political competition, governments operate at the aggregate level and at the margin – tipping the balance between countries.

For example, telecommunications network investments by NTT in Japan have been driven, in part, by government directive rather than by demand, and this has adversely affected NTT's price and productivity performance (Houghton et al 1995). Similarly, regulatory changes in the African telecommunications market have encouraged a domestic focus among facilities-based carriers. These impacts are at the firm level.

In contrast, something closer to political competition is evident in the development of the semiconductor industry. This has profoundly affected the structure and location of the industry, but had significantly less direct impact at the firm level. The corporate strategy of Intel has been born of the interests of Intel, whereas the corporate strategy of African telcos was born of the (perceived) interests of African countries (e.g. Community Service Obligations and Universal Service Obligations).

---

**Figure 2** Position of the information industries, circa 1990



Source: Yoffie 1993.

Figure 2 shows the position of some of the information industries on the basis of the analysis of Yoffie et al circa 1990.

The key message of this analysis is the importance of understanding the situation, and knowing whether one is playing a game of comparative advantage, political competition, oligopolistic competition or regulated competition, and how that game is changing.

### ***Real world industry policies***

The macroeconomic environment, microeconomic reform, competition policy and generic industry programs form the foundation or generic base of policy. These framework policies are likely to remain a central focus of policy and government action. And there are sound reasons why they should.

Re-structuring policies should continue to target industries that have been protected or where restructuring is required. There will also be a need for re-structuring policies in the context of historical or paradigmatic structural adjustment. The focus of these policies will be on removing barriers and improving competitiveness.

Industry policies for the opportunity industries should be founded on a blend of corrective, strategic and pro-growth initiatives aimed at compensating for market failures, building an industrial base for the twenty-first century and ensuring that Africa is launched onto a high growth path.

There is a clear need for intervention of the corrective policy kind where there are identifiable market failures and positive externalities. In opportunity industries there are spillovers and network externalities, learning economies and path dependence, economies of scale and increasing returns, strong and deep linkages and complementarities throughout the economy.

- Where there are spillovers there are sound economic reasons for government to ensure that such market failure does not lead to underinvestment.
  - Where there are network externalities there are sound economic reasons to support network extension. Governments can do this through investment in network infrastructure, but are more likely to do so through demand stimulation – leading by example or mandating use (e.g. electronic commerce).
  - Where there are learning economies there are sound economic reasons to support new and emerging industries during the learning phase (e.g. semiconductors or photonics).
  - Where there are economies of scale and increasing returns scale becomes the key business and policy challenge. There are sound economic reasons to support rapid market expansion and the development of sufficient scale to enable enterprises to take on the world as first mover or fast follower (e.g. semiconductors, computers, networking equipment and some areas of systems software). This implies facilitation of rapid scale-up in global markets (e.g. attraction of globally-scaled investments, outsourcing, support in export markets, support for outward direct investment, diplomatic attention to market access and trade liberalisation, etc.).
  - Where there are strong growth prospects there are sound economic reasons to encourage and support growth and the development of growth poles. Information and communication technologies are playing an increasingly important role in the prosperity and performance of industrialised countries. Countries' industrial and trade performance are becoming increasingly dependent upon performance in the production of elaborately transformed manufactures (ETMs); especially the information and communication technology cluster of ETMs. Strategically the information industries are central to raising the speed limit to growth.
  - Where there are strong and deep linkages throughout the economy, as there are with information and communication technologies, there are sound economic reasons for special support and attention. In use, information and communication technologies make a vital contribution to productivity; especially in service industries. Embodied technology, purchased as capital or intermediate goods, is accounting for an increasing share of technology input in most OECD countries. Africa is especially dependent on imported embodied technology. There are sound economic reasons for supporting diffusion through awareness and trade liberalisation, and encouraging diffusion through investment support, accelerated depreciation and the like. The services sub-sector of the information industries
-



plays an especially important role as the mechanism of diffusion – the vehicle for inter-industry spillovers.

There is a strong case for more strategic intervention where there is concentration or government intervention (be it regulation, strategic support or participation or the maintenance of barriers).

- Where there is sufficient concentration for there to be a margin for strategic corporate behaviour there may be a need to assist African-based businesses to develop sufficient scale quickly so as to benefit from increasing returns and position themselves to reap first-mover or fast-follower advantages.

If Africa is to 'host' oligopolistic industries we need to develop policies to attract and support them – including proactive investment recruitment, up-stream and down-stream supply-chain development and the facilitation and development of clusters.

- Where there is both concentration and regulation the margin for strategic action is similar, but the impact of government intervention is greater. In such circumstances deregulation in the domestic market should be synchronised with trade-related initiatives.

The implications of concentration for industry policy include: the need for an understanding of the implications of increasing returns for industry structure and market competition; a willingness to provide a business environment capable of supporting timely and rapid commercialisation of technologies; and a willingness to support the rapid development of scale in global markets.

There is a strong case for pro-growth intervention where industries or a related cluster of technologies are transformative. As Rodrik puts it:

*When multiple equilibria exist, the role of government policy is to move the economy out of the bad equilibrium into the good one. ...As long as the high-tech sector is more capital intensive than the low-tech sector, a strategy of subsidizing domestic investment... can not only push the economy in the direction of the more desirable equilibrium, but, in view of the higher living standards thereby resulting, be self-sustaining. (Rodrik 1996, p2-3).*

In such a situation focused investment incentives may be required to embed the high-growth virtuous circle and ensure access to the productivity gains of specialisation in the high-technology sector – gains that can be reaped in perpetuity.

In concentrated (oligopolistic) industries, be they regulated or not, governments must engage with the players. There are many multinational companies that are bigger than a number of national economies. They must be dealt with by government leaders on equal terms, one business (the company) with another (the country). Industry policy must recognise the importance of strategic behaviour in oligopolistic industries. Thus for oligopolistic industries, governments need to develop sectoral policies which deal strategically with industry players, pursuing win-win outcomes. Governments must

---

maximise the growth and employment opportunities that opportunity industries present, and minimise the threats to both African businesses and national economies arising out of others seizing the opportunities.

## **Analysis**

Policy debate should reflect the shifting landscape, within which industry policy is evolving from a restructuring focus aimed at removing barriers and promoting competitiveness, towards a focus on the opportunity industries with an accent on investment and building businesses in global markets.

Industry policies must be based on a sophisticated understanding of the real world circumstances facing each industry, and a realistic appreciation of the place of African enterprises and governments in the global economy. We must, in short, understand the game we are in – then act accordingly.

Each of these industry structures implies different sets of information flows. For private sector information systems and networks to be effective an understanding of the relevant industry structure is first required. Based on this information systems and networks can be developed.

The key message of this analysis is the importance of understanding the situation, and knowing whether one is playing a game of comparative advantage, political competition, oligopolistic competition or regulated competition, and how that game is changing.

## **Challenges, Development Models and Action Plans**

### **Challenge 1**

#### Recognising the strategic importance of the Information Industries

*The computer software business has risen rapidly to become America's third largest manufacturing industry, paying wages twice the national average. On a value-added basis, software ranks third in the United States after automobiles and electronics.<sup>ii</sup>*

*The Washington-based Economic Strategy Institute estimates that the US economy could add up to US\$ 721 billion, approximately 10 per cent, to Gross National Product by 2005 thanks to the growth of spending in the communications industry and the impact of the Internet.*

The first major challenge Africa faces is to get widespread recognition of the size, impact and strategic importance of the information industries worldwide.

---

The information industries are important as industries in their own right because of their size and growth potential. But it is their potential to contribute to the productivity and competitiveness of businesses throughout the economy that is of greatest significance.

#### Impact of the Information Industries on economic growth

The information industries contribute to economic growth in a number of important ways. They are major producers of high value elaborately transformed manufactures (ETMs), they are high growth industries and they provide the 'information infrastructure' which increasingly underpins growth in other industries.

The importance of the information industries in elevating Africa's growth rate and thereby raising the speed limit to growth, is clear. Hence, a shift in the composition of Africa's production towards information and communication technology manufacturing would make a substantial contribution to reversing our declining terms of trade and raising the speed limit to growth.

Information industries' markets are growing rapidly, and have good long-term growth prospects. Some major services and content markets are growing at rates in excess of 20 per cent per annum. And forecasts suggest that these growth rates are likely to continue into the next century.

This growth and growth potential must be an important consideration in shaping the composition of production in an economy. Other things being equal, a country that has a higher share of fast-growing industries in its economy will gain a growth advantage over countries with a preponderance of slower growing industries. Recent studies from the United States show the enormous contribution that the software industry is making to economic growth and the reduction of unemployment there. This makes the information industries of strategic economic importance, and should make them the focus of attention for any government seeking to promote economic growth.

#### Semiconductors, a high growth industry

The semiconductor industry is among the fastest growing of all industries. Global sales increased by 20 per cent compounded from 1990 to 1995, when the total reached US\$ 151 billion.

The near-term economic benefits of attracting a single world class semiconductor fabrication project include: construction (over US\$ 250 million, excluding equipment), employment (1,000 to 2,000 jobs), output (over US\$ 500 million per year) and exports (most of the output).

It is forecast that there will be 926 wafer fabrication plants operating by 2000. Of the 102 fabrication plants currently under construction or announced, 62 will be in Asia, 28 in the United States and 12 in Europe.

Source: Charles, D., Allen, R. and Buckeridge, R. (1997)

---

As providers of the national information infrastructure, the information industries also enable growth in other industries. In 1992, the Washington-based Economic Strategy Institute indicated that the accelerated introduction of high speed telecommunications could boost United States economic growth by 4 to 6 per cent over the next 15 years. Repeating the study in Europe, Teknibank found that a similar effect could be generated there. They also found that the boost to competitiveness and economic growth would be strongest in the more industrially developed countries, where advanced communications multiply the efficiency and effectiveness of sophisticated information systems.

### Policy for the semiconductor industry

With few exceptions, the great semiconductor houses of the US, Japan, Korea and Europe, and the emerging participants in Taiwan and Singapore, have grown to their present size not through market forces alone, but also through the active intervention of their national governments. Economically peripheral nations such as Ireland and Israel, both of which have thriving semiconductor industries, acquired them only through major policy commitments and national programs. There is in fact no second-tier economy where the semiconductor industry has taken root and thrived as the result of pure market forces. This fundamental and strategic industry is essentially fostered by national governments.

Source: Charles, D., Allen, R. and Buckeridge, R. (1997)

**Impact of the Information Industries as the providers of key enabling technologies**  
Information and communication technologies are an important enabler, underpinning productivity and competitiveness in every industry. It is through their enabling role that the information industries can contribute most significantly to Africa's future economic growth, employment and productivity. Maximising their contribution depends upon:

- an awareness among users of the true potential of information and communication technologies to contribute to improving and expanding their businesses;
- the willingness and the skill of users to apply and fully exploit these technologies strategically;
- an open and competitive market for information and communication technology products and services;
- the ability of the information industries to supply leading edge business systems and solutions; and
- the availability of a world class communications infrastructure to underpin development.

**Action : Implement a National Information Industries Database**

---

There must be greater awareness of the size, impact and strategic importance of the information industries in government, across industry and throughout the community. It is particularly important that there be far greater appreciation of the significance of the on-line revolution and of the urgency with which opportunities and threats must be approached. If Africa is to be in a position to seize the opportunities that the on-line revolution will bring, information industry suppliers must become as central a partner in African businesses as bankers and financiers are today.

## **Challenge 2**

### Getting on-line to the 21st century

*Widespread usage of online services – among all socio-economic groups and in all geographic areas – is a critical condition for a successful online economy. The online economy and how it affects their business or portfolio must be 'front and centre' of senior managers' and government ministers' agendas.*

It is the enabling role of information and communication technologies that make the information industries strategic. They will play an increasingly important role as the foundation of the 21st century information economy. And the extent to which information and communication technologies are effectively applied across the economy will be one of the single most important determinants of Africa's future prosperity.

To prosper in the information economy, businesses must be leading users of information and communication technology systems, applications and services. But a number of recent reports have suggested that Africans may be 'better buyers than appliers'.

The National Information Industries Strategy must include a range of initiatives aimed at enabling and empowering users to maximise the returns on their information and communication technology investments, to recognise and seize emerging business opportunities and to prosper in the information economy that is rapidly evolving. Africa must become one of the world's leading users of information and communication technologies, in order to prosper in global markets as a result.

#### **Action : Get Existing African businesses on-line**

It is important that African businesses gain early access to, and experience of, the information economy. To this end there should be promotional and funding support for a campaign aimed at raising the awareness of African businesses about on-line business opportunities and threats.

Governments and businesses throughout the economy need to acquire new skills in developing and using applications that will enable them to provide products and services on-line. This must be underpinned by a commitment from industry and

---

governments that there be no impediments to the development of the information economy. Hence, attention must be given to proposals in other parts of the Strategy – including appropriate on-line taxation, no barriers to trade in information and communication technologies, and access to a world best price and functionality communications infrastructure.

- **Government should support the promotion of case studies which inform and excite.** A range of media, industry and professional associations, government and semi-government agencies and promotional activities can be used. These should be mobilised and coordinated through joint industry-government efforts. It is essential to develop greater awareness of information economy opportunities and threats at the board level.

Doing business on-line provides new opportunities in the nature of business and new business opportunities. It also provides new one-to-one, as well as the more traditional one-to-many, customer relationships and greater opportunities for customer-supplier interaction. New skills are required to take full advantage of these new opportunities.

- **Government should upgrade and focus existing programs.** When doing this it will be important to focus on new skills, and not simply on the ‘automation’ of existing products, services and customer relationships. Attention must also be given to the development of broad level skills.

Action : Encourage leading edge users

Leading edge users provide a range of opportunities. The users themselves benefit from the productivity enhancing potential of information and communication technologies and from the new business opportunities that they open up. Information industries businesses can benefit from association with leading-edge users via the new innovative demands that are made on them, the development of a greater appreciation of business problems and their solutions, and the mutually reinforcing innovation and marketing advantage of being closely associated with exemplar sites, applications and users.

Here too, government can lead by example. While much government information technology is centred around large legacy systems, there are significant opportunities for the development of leading edge applications. Within the constraints of sound financial management, governments should use these opportunities to work with information industries businesses to develop leading-edge applications. There are ample opportunities to serve the joint goals of increasing the efficiency and reducing the cost of the delivery of government services through ‘informatisation’ *and* encouraging the further development of African-based information industries.

---

- **Government should establish a Leading-Edge Users Program** to provide early stage support for the development of supplier/user relationships that realise the maximum advantage for both parties. With appropriate mechanisms in place some of the lessons learned will spill over to other business users throughout the economy, and thereby justify the initial support.

Action : Kick start electronic commerce

Most larger businesses have taken the plunge into some form of electronic commerce. Typically this has involved EDI applications, the automation of related supplier ordering and payment functions or integrated supply chain management systems.

Technological developments are opening up the possibility of a much broader range of somewhat less formalised and constraining forms of electronic commerce. If African-based businesses are to prosper in the information economy of the 21st century the experience gained in these applications must be built upon, and new electronic commerce opportunities seized.

There is an important role for governments to play in encouraging and facilitating the shift to electronic commerce. Governments can encourage take-up through promotion, through coordination and assistance in standardisation and through themselves becoming early adopters, thereby increasing demand and demonstrating the possibilities.

- **Government must see the accelerated uptake of electronic commerce as an industry development matter and take steps to coordinate activity and increase the penetration of electronic commerce by establishing a multi-agency group led by an appropriate department (such as the equivalents of a Department of Trade and Industry)**
  - **Government should push harder to develop Internet-based payments**, so as to demonstrate that they work and are safe, and to encourage banks to establish and approve as soon as possible Internet-based payments systems like those already available in developed countries.
  - **Governments should lead by example.** Diffusion of the experience and example is invaluable and, because of the scale of government in some important markets, their lead can provide an important kick start. The increased use of electronic commerce would lower the total cost of services and of adoption throughout the economy.
-

United States 'White House Initiative' – A framework for global electronic commerce

The Global Information Infrastructure (GII), still in the early stages of its development, is already transforming our world. Over the next decade, advances on the GII will affect almost every aspect of daily life – education, health care, work and leisure activities. Disparate populations, once separated by distance and time, will experience these changes as part of a global community.

New models of commercial interaction are developing as businesses and consumers participate in the electronic marketplace and reap the resultant benefits. Entrepreneurs are able to start new businesses more easily, with smaller up-front investment requirements, by accessing the Internet's world-wide network of customers.

Governments can have a profound effect on the growth of commerce on the Internet. By their actions, they can facilitate electronic trade or inhibit it. Knowing when to act and – at least as important – when not to act, will be crucial to the development of electronic commerce.

The success of electronic commerce will require an effective partnership between the private and public sectors, with the private sector in the lead. Government participation must be coherent and cautious, avoiding the contradictions and confusions that can sometimes arise when different governmental agencies individually assert authority too vigorously and operate without coordination.

The variety of issues being raised, the interaction among them, and the disparate fora in which they are being addressed will necessitate a coordinated, targeted governmental approach to avoid inefficiencies and duplication in developing and reviewing policy.

Source: <http://www.whitehouse.gov/WH/New/Commerce/read.html> on July 3rd 1997.

- **Governments should consider their adoption of electronic commerce and the delivery of services on-line in a coordinated manner.** A piecemeal approach, leaving adoption decisions to be taken at an agency level on the basis of agency by agency cost-benefit, is not appropriate. It ignores the fact that there are substantial network externalities – that increased adoption and use will lower total cost and that there is a critical mass required to kick start Africa's information economy.
-



**Action : Ensure that Africa has a world class information infrastructure**

The full enabling potential of information and communication technologies will not be realised unless there is a national information infrastructure capable of supporting 21st century commerce and providing the platform from which African-based businesses can participate in the global information economy. The information industries clearly have a key role to play in the development of such an infrastructure, but industry cannot do it alone. There must be a commitment from government to ensure that communications reform delivers world best price and functionality.

Government must:

- **Ensure that communications reform delivers** world class price and functionality through paying attention to the outcome, not just the means.
- **Undertake regular benchmarking studies** into the international competitiveness of Africa's information infrastructure.
- **Focus roll out of broadband communications infrastructure on enabling business users**, ensuring that they have access to adequate bandwidth in industrial and semi-industrial suburbs as well as CBDs, and to a full range of business oriented services.
- **Clarify bandwidth availability** to reduce investment uncertainty, and where inadequate take steps to ensure that adequate bandwidth is installed.
- **Increase attention to international bandwidth, access and pricing**, so as to ensure that Africa has access to world leading international links at world best prices.
- **Improve spectrum management.** Radiocommunications regulations should be *business-based*. It should examine radio frequency spectrum allocation with a view to retrieving unused allocations, making them available for commercial application and instituting effective and appropriate management of the spectrum.

**Action : Establish a model framework for the Information Economy**

Governments play a key role in establishing the 'rules of the road' for the information highway. The first step is achieving on-line standards and regulation that are at least equivalent to those existing for paper-based transactions. Making them world best should be the goal.

Infrastructure regulations play a determining role in the rate of adoption of on-line products and services and, thereby, in determining the future prosperity of African businesses. Other countries are grasping the nettle. Malaysia's recent announcement of a ten point Multimedia Bill of Guarantees is just one example. Germany has also introduced a suite of on-line legislation. Africa's businesses will be at a competitive disadvantage if they face greater uncertainty in their investments than their international competitors. Africa must develop our own model framework.

---

**Governments must adopt a non-regulatory, market-oriented approach to electronic commerce, one that facilitates the emergence of a transparent and predictable legal environment to support business and commerce.**

Security and privacy are essential preconditions for the successful conversion to an information economy. Unless people have confidence in the integrity of the systems they will be reluctant to use them.

Malaysia's 'Cyberlaws': One example of a model on-line framework

The Malaysian Government is transforming the nation's legal and regulatory environment by introducing cyberlaws which will facilitate Putrajaya – the new administrative capital – to electronically govern and legally administer activities in the Multimedia Super Corridor (MSC) and ultimately support companies undertaking multimedia commerce.

The proposed cyberlaws for digital signatures, multimedia intellectual property, computer crime, telemedicine development, electronic government and multimedia convergence are all expected to be discussed and tabled in Parliament.

- The digital signature cyberlaw: will enable businesses and the community to use electronic signatures instead of handwritten ones in business and legal transactions.
- The multimedia intellectual property cyberlaw: will give multimedia developers full intellectual property protection through the on-line registration of works, licensing and royalty collection.
- The computer crime cyberlaw: will provide law enforcers with a framework that defines illegal access, illegal interceptions, and the illegal use of computers and information, provides standards for service providers, and outlines potential penalties for infractions.
- The telemedicine development cyberlaw: will empower medical practitioners to provide medical services from remote locations using electronic medical data and prescriptions standards with the knowledge that their treatment will be covered under insurance schemes.
- The electronic government cyberlaw: will allow politicians, public servants and the public to communicate electronically with one another using established and secure formats and standards.
- The multimedia convergence act: will rationalise the various technologies leading to a convergence of different media which before were governed by different Acts.

Source: <http://www.geocities.com/CapeCanaveral/Lab/5651/> on July 2nd 1997.

The rapidly emerging information economy is raising a challenge to existing regimes for the protection of intellectual property. The key issue is to balance strong protection for intellectual property holders with low cost, certain and ready access to protected materials for potential users and (multimedia) developers of those materials. To ensure strong protection for copyright works in the new networked multimedia environment it may be necessary to introduce a transmission right, extending current broadcasting rights to the transmission of protected works. Africa must grasp the challenge of establishing a model framework before it is too late. Governments and industry must:

---

- **Develop a model framework for the information economy**, and push it through as a matter of urgency. There must be a coordinated approach to security, privacy, intellectual property rights, etc. to underpin electronic commerce and the development of the information economy.
- **Support the development of a domestically and globally uniform commercial legal framework that recognises, facilitates and enforces electronic transactions world-wide.** This will not necessarily result in new legislation. Indeed, there may be areas in which clarifying that there will be no new legislation can provide the certainty required to encourage and unleash investment. A prerequisite of secure on-line financial transactions is regulatory change to support the use of digital certificates and signatures.

### **Challenge 3**

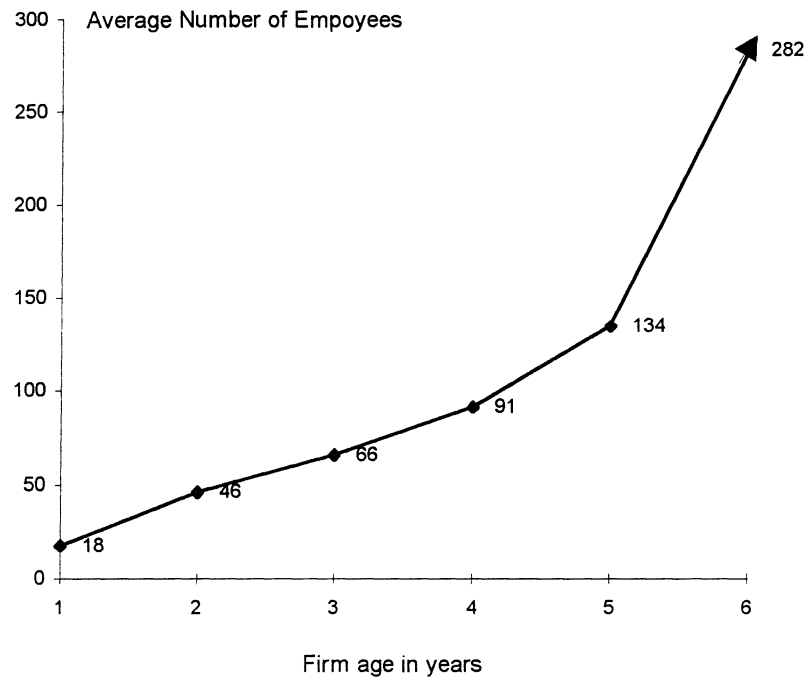
#### **Access to Capital**

Access to capital is fundamental to the development of the information industries. There must be fully functioning venture and development capital markets in Africa. Venture capital backed companies can make a very substantial contribution to employment and growth.

It is clear that many ventures are not **investor ready**. Many lack sufficient management skills and a convincing business or marketing plan. Africa must achieve a rise in the number and quality of venture capital proposals. There are many ways to do this, and business improvement programs should be established which provide practical skills in business planning, entrepreneurship, business structures, intellectual property, project management and export marketing, and encourages start-up businesses to participate in business networks and business training and awareness programs.

---

Employment growth in venture capital backed companies, United States 1995

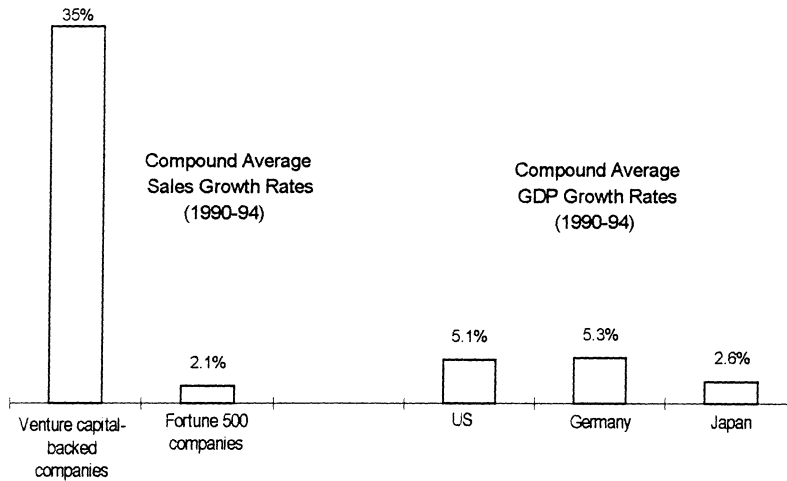


Notes: Average annual job growth in venture-backed firms 1990-94 was ~20 per cent. By contrast, over the same time period, Fortune 500 jobs declined by 0.9 per cent.  
Source: Charles, D., Allen, R. and Buckeridge, R. (1997)

Once the standard of the venture projects coming forward is improved there will be a need for more funds. So Government must also act to **ensure that the supply of venture capital matches the realistic demand**. As demand for early stage venture capital increases, Government should examine the need to increase the amount of funds available through other mechanisms which could be expected to be mainly self-sustaining in the long-term.

---

Venture capital backed company growth, USA 1995



Source: Charles, D., Allen, R. and Buckeridge, R. (1997)

There are some important changes that would open the gate to international venture capital. These include **adjustments to capital gains tax (CGT)** and to **the treatment of limited partnerships**. Many United States venture capitalists operate as limited partnerships, which allow the advantages of limited liability together with flexibility in regard to entry, exit and taxation. This is a model that could be adopted in Africa.

African bankers seem to be much less inclined to lend to, or invest in, new high-technology projects than do bankers and financiers in the United States. Growth businesses need money. Government must back capital with finance by offering bankers and financiers appropriate incentives to encourage their participation in high-technology ventures. As their knowledge of these industries grows their participation will be more readily forthcoming.

Action : Alternative Market on Internet

By early 1998 Australian SMEs will be able to raise capital on the Internet.

The Australian Stock Exchange (ASX) is setting up a market for unlisted companies of any size.

While not a conventional stock exchange, it will allow shareholders to sell their shares in unlisted entities by generating a level of liquidity which might not otherwise exist.

African countries can implement similar initiatives.

Source: Napier, J. (1997) 'Net market for small business,' *Canberra Times*, June 12th 1997, p13.

#### **Challenge 4**

##### **Going global – Exporting to the World**

*The economy's entry into its globalisation phase has radically altered the nature of competition. Now, numerous new actors from every market in the world are simultaneously in competition on every market. This new competition has accentuated the interdependence of the different levels of globalisation (trade in goods and services, direct investment, technology transfers and capital movements).*

Africa's future as a viable economic region will depend on the extent to which it participates in the evolving global information industries as a provider of products and systems; not just a taker. Full participation in the digital economy will require a significant increase in current exports by the information industries based on a much more focused and cohesive export strategy. That export strategy must focus on enhancing the export readiness of information industries businesses, facilitating their exports from Africa, and reducing external barriers to exporting. It must be industry driven, recognise the varying components of the industry, including export objectives and targets, and improve co-ordination within and between industry and government.

**Government, and in particular senior Ministers, have an important and essential role in championing the export efforts of Africa's information industries.**

However, exporting is not the whole story. Globalisation is characterised by an increasingly complex interrelation between trade, investment and technology flows. Whereas trade was the key to internationalisation, foreign direct investment is the key to globalisation.

**The challenge is to develop an export strategy which supports Africa becoming a significant global player in these industries.**

Action : Networking and consortia among SMEs to warrant more attention by the businesses themselves and within government programs.

#### **Challenge 5**

##### **Enhancing skills formation, education and training**

*OECD economies have become knowledge-based economies in which knowledge in all its forms plays a crucial role in economic processes, including growth and job creation. Individuals with more knowledge get better paid jobs, firms with more knowledge are winners in their markets, and nations endowed with more knowledge are more productive. This is why individuals, firms and nations are increasingly investing in knowledge.*

Investment in, and promotion of, high quality education and training is one of the most important contributions that can be made to Africa's future. The availability of skilled workers is a key to attracting investment, advancing the take up of new technology,

---

undertaking innovation and creating sustainable competitive advantage. In the information industries more than most other sectors of the economy, the core competitive advantage rests in the skills of people. And this is becoming increasingly true of information and communication technology user industries too.

**The key requirement for the information economy of the 21st century is an education system which is flexible and responsive to the needs of information and user industries.** Africa needs to develop high level skills in core areas, such as software engineering, project management and multimedia applications. Africa also needs to treat information and communication technology literacy as a fundamental life skill.

Despite expressed intentions to develop the continent, real education expenditure levels are more indicative of a continent that is falling behind. If Africa is to be a part of the economic growth and prosperity of the 21st century we must significantly increase aggregate expenditures on education, including contributions by the private sector.

There are perennial shortages of people with specific skills. If Africa is going to flourish in the economy of the 21st century both providers and users will need to develop *new* skills. The skills needed in the on-line world are fundamentally different from those required in the offline world. Governments and businesses need to acquire skills in developing applications that will enable them to provide services on-line. Businesses using the on-line economy as a marketplace need to develop new and more sophisticated marketing skills to attract and retain on-line customers. And users in business and the wider community need to develop the skills to take full advantage of the on-line services and opportunities as they emerge.

As we move into the 21st century the 'creative destruction' wrought by technology will be even greater than it has been over the last 200 years. If the unskilled worker and the young are not educated or re-educated there will be significant increases in inequality, with all the social costs that imposes. The solution is education.

As we move into the next century not only will Africa require more people with information and communication technology skills, the level and sophistication of the skills required will increase. We need **more** information and communication technology-related provider and user skills, and we need **higher** information and communication technology-related provider and user skills. If we are to meet these needs we must create more tertiary places and more postgraduate places.

#### Action : Enhance tertiary information and communication technology education

Although there are exceptions, it is generally true to say that students with high tertiary entrance scores are not attracted to information and communication technology-related tertiary courses. To overcome this problem there should be an information program aimed at schools and improved status for the courses to attract top students to them.<sup>iii</sup>

---

Some existing courses do not recognise sufficiently the requirements of industry. University environments have tended to emphasise theory and research, whereas industry places more emphasis on reliability, best practice, broader communication skills and industry experience. In software and systems integration, available skills are not at a high enough level. While routine programming skills are available, there is insufficient strength in project management.

Government and industry should encourage partnerships between industry and educational institutions at all levels to help ensure course relevance. There are already a number of courses which specifically involve industry, but more are required. The success of overseas initiatives that involve industry-education partnerships, such as Spielberg's design centre and the Pasadena School of Design in California, show how cooperation can lead to more responsive and flexible, 'just in time' skills development.

Information and communication technology skills are also important for users in industries across the economy. **All tertiary graduates should be information and communication technology literate in their chosen fields of study and expertise by the year 2005.**

There are a number of things can be done to raise the standard of information and communication technology-related education in Africa's tertiary institutions, increase the responsiveness of tertiary education institutions to the needs of industry and enable greater industry-education cooperation.

To enhance tertiary information and communication technology education government and industry must:

- **Encourage partnerships (including staff exchanges) between industry and educational institutions at all levels to help ensure course relevance.**
- **Focus vocational training** to challenge and develop the skills of those with special technical aptitude and produce graduates that are skilled in strategic information and communication technology leadership and able to build innovative solutions to business problems.
- **Create centres of excellence** – we need a few high quality centres of excellence around Africa, focused on a particular field and recognised around the world as leaders in that field for education and for research.
- **Encourage universities to integrate the various facets of information and communication technology disciplines more effectively.**
- **Increase access to the technology.** Students must have access to PCs and to the Internet. They are an essential instrument of education.

Action : Enhanced ICT education in schools

No child should leave school without mastering a basic level of skills and knowledge of the application of information and communication technologies to their chosen subject areas. information and communication technology literacy must become the 'fourth R' in

---



Reading, 'Riting, 'Rithmetic and Ready for the information economy – an essential life skill.

Governments must:

- **Ensure that school students have access to PCs and to the Internet from an early age.** PCs (connected to Internet) are not an optional extra. They are an essential part of schooling and life skills development. Government should provide greater funding for information and communication technology in schools. By the year 2005, every school student should have Internet access – including e-mail and World Wide Web access – by end of their first term of secondary schooling, as should every primary school library.
- **Establish national 'learning to use' initiatives.** The use of computers and related skills should be taught in all African schools as an essential subject. Courses should continue through schooling, building up student skills in a way that progresses knowledge and supports the use of computers in other courses. There must also be remedial and support classes available to ensure that everyone has the opportunity to get up to speed and stay ahead.
- **Establish a national 'using to learn' initiative.** Computers should be used as an integral part of learning, used both in teaching and in the learning process as a basic tool.
- **Provide the opportunity to teach the teachers.** It is essential that teachers have the skills to support these initiatives successfully. Governments must provide ongoing support for schools to ensure that their teachers are up to speed and remain capable of imparting up-to-date knowledge and skills. Teacher training curriculum developers must ensure that their courses equip teachers of all subjects to provide the necessary guidance and leadership.
- **Implement an Information Management Education Program.** Information management is increasingly becoming a core skill. Governments should introduce a program to teach students in all areas and walks of life to manage information and apply information and communication technologies in enterprising ways

Action : Enhance education in the workforce

To enable businesses to develop their skills base a multifaceted approach is required using existing and some new mechanisms to deliver better skilling outcomes for business.

There are a number of thing that should be done.

- **Enhance industry skills and retraining.** Industry must be willing to commit to developing skills for the future. There are a number of ways in which industry can make a significant contribution to ensuring that when they need skills in the future they will be available. Given the dynamism of the information industries and of information and communication technology-related skills it is essential that industry shoulder a share of the skills development burden.
-

- **Enhance certification and professionalisation.** There must be greater efforts towards professionalisation for information and communication technology professionals. Information and communication systems increasingly permeate industry and society. In many areas systems are safety critical. We do not trust bridge building to unqualified engineers. Nor should we trust the programming of navigation systems, weapons systems, communication networks and major financial market systems to unqualified systems designers and programmers. The relevant professional associations should collaborate with universities in an effort to realise this objective.

### **Challenge 6**

#### Enhancing research, development and innovation

A national R&D infrastructure is a key to attracting investment, advancing the take-up of new technology, undertaking innovation and creating and maintaining competitive advantage. As high-technology industries the information industries depend heavily upon product, process and service innovation.

As a relatively small proportion of the world economy Africa cannot hope to excel in all fields of research. There must be a degree of focus, and this focus should be biased towards the 'D' rather than the 'R'. Africa must actively attract multinational centres of excellence in order to provide focal points around which research, development and innovation activities can cluster.

In view of the strategic importance of information and communication technologies there should be much greater focus on related research and greater focus on their development and application.

#### Action : Ensure greater ICT focus

In view of the strategic importance of the information industries in the African economy, and of information and communication technologies for the productivity and competitiveness of enterprises across the economy, the information industries are not being given their due attention. Government support for R&D relating to information and communication technologies development and applications should be at least equivalent to that available to the primary industries.

There are many things that Government can do to ensure that greater attention is paid to information and communication technologies.

- Focus R&D Funding on Co-operative Research Centres (CRCs):
    - \* **Funding should include more information and communication technology-related centres.**
    - \* **Both new and existing centres should be focused on emerging issues, rather than more traditional communications and computer science topics.**
-

- \* **There should be greater effort made by the centres to meet and network with industry.**
- \* **There should be greater involvement of SMEs in CRCs.**
- **Government and aid agencies must ensure that funding support is responsive to changes** and does not lag behind, thereby creating bias in allocation and slowing the emergence and development of strategically important disciplines. Research funding has tended to favour the traditional sciences. Information Systems areas, which combine information technology and business skills, have not yet gained recognition or adequate funding support.

#### The R&D Start Program in Australia

R&D Start is an umbrella program comprising a number of assistance measures which support industry in undertaking research, development and related commercialisation activities. R&D Start includes a range of grant elements for R&D, concessional loans for early commercialisation activities, and support for early venture capital investments.

R&D Start aims to:

- increase the number of R&D projects with high commercial potential which are undertaken by companies;
- foster greater commercialisation of outcomes from R&D projects;
- increase the level of private sector funding of R&D and the commercialisation of R&D activities; and
- foster collaborative R&D and related activities within industry, and between industry and tertiary or research institutions, or both.

Source: AusIndustry.

#### **Action : Provide support for major projects**

There have been many examples of major projects around the world, such as ESPRIT and RACE, through which countries aim to acquire new capabilities in an area they regard as strategically important. While Africa does not have the scale to undertake such grand schemes we can increase our participation in international projects and give support to our own major projects.

To improve support for international innovation and development linkages which contribute to enhancing Africa's own innovation capacity, technological capacity, reputation and integration into regional and global activities Governments should:

- **Support visits, exchanges and secondments** for qualified and approved professionals.
-

- **Support agencies contributing suitable professionals** to major international collaborative/cooperative information and communication technology-related initiatives.
- **Support industry-based organisations participating** in major regional and global innovation and development initiatives aimed at the development of new infrastructure and capacities. It would be expected that participants receiving such support would represent and report back to a range of African firms and development agencies.

Action : Provide support for key infrastructures

Governments have a leading role to play in providing support for key infrastructures that are important to the development of research and business opportunities.

The following initiatives are worthy of early Government support.

- **Supporting the development of an African Spatial Data Infrastructure (ASDI)**, to provide the umbrella of policies, standards and procedures under which organisations and technologies can interact to foster more efficient use, management and production of spatial data.

Over 80 per cent of the information used by governments, business and the public is spatially related. Governments can make a significant contribution to the development of a leading African information infrastructure. There are a number of private businesses already developing and commercialising parts of an ASDI, especially in South Africa but governments can play an important co-ordinating and catalytic role in cooperation with industry to bring these efforts together.

- **Supporting the development of 'Internet-II'**, a new state-of-the-art Internet information infrastructure which is required to support research and education in information and communication technologies, and in a wide range of information and technology-intensive industry and user disciplines. The global evolved from specialised research networks into more widely accessible commercial networks. The nature, structure and traffic loads now common on the Internet no longer serve the specialised purposes of research and education.
  - **Creating a Software Engineering / Software Quality Network** – a network of centres of expertise in specific areas of software engineering, with at least one node in each participating country. These centres would:
    - \* provide a first point of contact for local industry to obtain help from any node in the network;
    - \* provide training and consultancy services in specific areas of expertise on a fee for service basis;
    - \* perform collaborative, contract and applied research;
-

- \* provide an interface with international software engineering activities in specific areas of expertise, including reporting on and participating in standards activities.

Such a network or one of its nodes could take on the role of a Software Engineering Institute such as those in the United States and Europe.

### **Challenge 7**

#### **National leadership**

*The new role of government might be described as that of promoter, in the sense of trying to promote innovation and investment and providing direction for industry leaders.*

If Africa is to meet the challenge of the on-line revolution there must be commitment and personal involvement from the top. Strong and consistent national leadership is essential. It should come from both government and industry in a policy partnership, and it must come from the highest level.

Government leaders must accept the need for the information industries to be competitive. There must be greater awareness that information and communication technologies are inevitably transforming the economy, that the productivity and competitiveness of African businesses in all industries throughout the economy will depend upon best practice application of best of breed systems and solutions, and that this will not happen unless the African information industries are themselves innovative, financially sound and world competitive. Government must provide leadership *and* lead by example.

#### **Leadership**

##### **Action : Appoint a Minister for Information Industries**

Because responsibility for the information industries falls across a number of different departments and Ministers there is a lack of coordination and strategic focus within government. The variety of issues raised by the information economy, the interrelations between them and the disparate fora in which they are being addressed will necessitate a coordinated and targeted governmental approach in order to avoid inefficiencies and duplication of effort in developing and reviewing policy.

- **There must be a Cabinet-level Minister for Information Industries** (a Minister whose primary responsibility is the information industries).
-

### National leadership in other countries

Countries internationally recognised as leaders in information industries initiatives have senior ministers championing their cause.

- **United States:** Vice President, Al Gore, has been a strong promoter of the Information Society with the National Information Infrastructure (NII) initiative.
- **United Kingdom:** The UK's Prime Minister, Deputy Prime Minister and Minister for Industry during the Major Government all demonstrated strong leadership in promoting the nation's information and communication technology capabilities and establishing the UK as a desirable investment location.
- **Malaysia:** The National Information Technology Council (NITC) has been established with the vision of creating an information-rich society in line with the aspiration of Vision 2020. The NITC aims to enhance the development and utilisation of information technology as a strategic technology for national development. The Chairman of the NITC is the Hon. Prime Minister of Malaysia, Dr Mahathir, and the Deputy Chairman is the Deputy Prime Minister of Malaysia.

Action : Support improved industry statistics and benchmarking

Reliable and comprehensive statistical information is an important requirement for planning and measuring: the progress of the information industries; the use of information products and services; and the success of the National Information Industries Strategy.

The information industries are characterised by being difficult to characterise. The value of statistical information will depend on success in the very difficult task of establishing a broadly agreed set of industry and commodity definitions which set the scope and coverage of the work. While most Bureaus of Statistics provides good information, there are sometimes significant timelags before the information is published. There is also a problem with the frequency of data collection. Government and industry associations should work together to bring forward a workable, broadly agreed and credible plan for the collection, collation, analysis and dissemination of industry statistics.

Performance benchmarking is also important for the successful implementation of the Strategy. This should involve both ongoing international benchmarking and regular reviews of appropriate measures of competitiveness. This work should cover applications of information technology as well as production benchmarks. There have been some fragmented attempts at benchmarking, but a more holistic approach is required.

- **Comprehensive and credible information industries statistics, annual reports and international benchmarks must be published regularly.**
-

## Leading by example

Action : Drive the application of information and communication technologies in government

Government must set an example in its own activities. **Governments should work with the appropriate departments and industry bodies to bring forward a plan for the systematic application of information and communication technology in government** (a government informatisation plan) which sets out an agenda for the conversion of government services delivery and commercial interactions to 'on-line' as a matter of urgency. The plan should set ambitious targets, mobilise high level support and publicise its progress and benefits.

The government informatisation plan should include mechanisms for:

- developing a government electronic services delivery framework;
- promoting government adoption and use of electronic procurement systems;
- promoting innovation and excellence in the use of new media in government communications;
- introducing new networking approaches to streamline government service delivery channels to business; and
- promoting the adoption and use of information systems supporting Ministers, Cabinet and Parliament.

Action : Maximise industry development benefits from government procurement

The sheer size of the government market makes it significant for businesses in the information industries. It is also significant because government installations serve as excellent example sites, particularly for SMEs seeking to export or set up operations overseas. In addition, and perhaps more importantly in the current environment, governments are significant leading-edge customers.

In many cases large international corporations have considerable locational flexibility. These corporations see the benefits of being associated with leading-edge government developments and, if this offers sufficient incentive, can make location decisions accordingly.

- **Governments must develop a more sophisticated and national approach to achieving industry development benefits.**

Action : Use outsourcing for industry development

Outsourcing should be viewed more strategically. It must be driven by the needs of the government agencies as customers and the needs of government clients, but it is not simply a cost cutting exercise for government or industry. Outsourcing must be recognised as an important lever for industry development, an important mechanism for

---

technology and skills transfer, and an important source of intellectual property that can be commercialised.

Government needs to pay greater attention to industry understanding – to clarify, consult and remove uncertainty.

Government must:

- **Push industry development through outsourcing.** It is important for government to outsource new product and service development, as well as processing functions, in such a way as to encourage industry development. Government must take positive steps to ensure that information industries' SMEs are not locked out of the process, while maintaining maximum potential cost savings.
- **Encourage diffusion through outsourcing.** Increasing industry awareness of outsourcing as a mechanism for the diffusion of information and communication technologies and practices through technology and skills transfer would achieve this.
- **Develop scale through outsourcing.** Governments and industry should work together to identify government outsourcing opportunities.
- **Enable the commercialisation of intellectual property** – industry and governments should agree a single system of low-cost licensing, without upfront fees, for information and communication technology-related intellectual property developed within government contracts, including outsourcing contracts, so that there are incentives for collaborators to invest in commercialisation.

#### Action : Streamline government procurement processes

An ongoing challenge is to drive costs and time delays out of procurement processes both for the benefit of the taxpayer and for industry bidders. There is almost universal agreement in industry that doing business with government is made more difficult and costly than it need be. This acts as a significant deterrent to businesses, especially SMEs.

Government and industry must work together to identify ways to simplify and reduce the cost and time of doing business with government, and government must commit to implementing the changes as soon as possible.

---



## The Role Of the ECA

The fundamental challenge to implementing the proposed action plans on a continent-wide basis is one of co-ordination. Numerous studies have recently been conducted (especially by the MIT School of Co-ordination Science and the Stanford School of Decision Analysis) that point to the primary importance of sound co-ordination, decision-making and project management in the context of complex development initiatives.

The quality of co-ordination, decision-making and project management, above all else will determine the success or failure of development initiatives. Most umbrella organisations such as the ECA are active at the policy and planning level, few however have grasped the challenge of superior co-ordination, decision-making and project (and programme) management.

The ECA is clearly in a position to co-ordinate all development and aid initiatives that are focussed on Africa as a continent. Similarly a decision framework that filters projects and initiatives needs to be established and finally these initiatives must be program managed in a sophisticated manner. The adoption of these actions will significantly leverage current developmental initiatives and will align resources toward the common purpose of African private sector development.

In addition to the approach above this paper also sets the scene for the establishment of an ongoing action-reflection cycle by the ECA. Based on systemic insights, desired models are derived and used to develop plans of action. These actions will then be monitored to see if they have produced the predicted outcomes upon execution. The evaluation will then inform a fresh cycle of predictive models and consequent action plans. Based on this feedback loop, premises are re-examined, learning takes place, conclusions are drawn, and projects are adapted, re-designed or modified.

An action research is a practical way to test new ideas and participate in solution development that goes beyond traditional interventions. It allows individuals and stakeholders to take action and reflect on the outcomes of such action, thereby attempting to narrow the gap between predicted and observed outcomes by putting a theoretical concept, practice, or totally new hypothesis to the test in a real situation.

Action research is done by and for the people taking the action and relates to the action they are taking. Its purpose can be improving the practice of an individual institution, or it can be collaborative and focus on stakeholder goals. Interventions usually raise questions about a problem situation, carefully document procedures and gather data on the problem situation, then reflect on that data and practical experience to determine what to do next. Action research cycles often start with a question (e.g., How does one develop information systems and networks for the private sector, or can the continent structure a response to the development of an information economy?). The steps that often follow problem formulation are theory development, design intervention, project plans and execution, data collection, and project reviews and analysis. The process is not a lock-

---

step regime. More often than not, data collection and analysis lead to new questions or further adaptations to plans of action.

In addition to being cyclic, action research tends to be

- Participative - the clients and informants are involved as partners, or at least active participants, in the development process;
- Qualitative - it deals more with language than with numbers; and
- Reflective - critical reflection upon the process and outcomes are important parts of each cycle.

The ECA should therefore adopt an action-reflection approach where the premises of projects and expected outcomes are clearly articulated prior to their commencement and then evaluated upon completion. The evaluation should help improve plans and adapt expectations for the next cycle of projects and so a learning cycle can be established. This also implies the ECA would become a central knowledge-repository that can be accessed by all other institutions undertaking development initiatives on the continent and elsewhere.

The value of the action-reflection cycle is the ability it creates for participants/change agents to reflect on their experiences and ask such questions as:

- What were the anticipated effects?
- Were there some unanticipated effects?
- What have we learned from this?
- What might we have to relearn or unlearn in our work?
- What are our next steps? Should we *stop* doing this because it doesn't work? *Continue* doing this because it is getting results we find desirable? *Start* doing something else that may be more likely to succeed?

This process can be viewed as a Learning Cycle, which is the foundation of the framework. This is diagrammatically illustrated in the following figure.

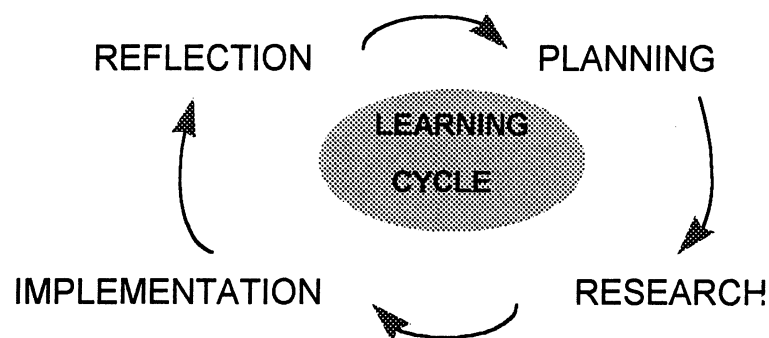


Figure 3. Learning Cycle

This cyclical process is action oriented and allows for continual review and adjustment. As one repeats the cycle, the questions, methods and answers become less fuzzy. There is

---

an increase in rigour, precision and responsiveness. Ultimately, learning and understanding is enhanced.

One justification for action-reflection methods is that they can be responsive, at least in the short term, to the situation in a way that many other methods cannot, and hence their suitability for tackling the development problems facing the African private sector as it grapples with the consequences of globalisation and the information economy.

---

## **Conclusion**

### ***The Importance of Prioritising Initiatives and Sequencing Action Plans***

The actions and initiatives outlined above are fundamental to the development of a broad-based information economy and maximise the involvement of the private sector. Most countries that are successful in meeting the challenges of the information economy have implemented the majority of these initiatives in one form or another.

Equally important to implementing these actions though is the need to prioritise and sequence them appropriately. Only then will they deliver value and be sustainable.

Path dependence and emergent evolutionary behaviour in economic development life cycles is of critical importance. A lack of understanding of these phenomena have resulted in numerous programs failing or not living up to expectations.

One cannot for example establish R&D centres when there isn't a critical mass of companies with basic expertise and understanding of the needs of end users. Similarly any initiative to streamline government procurement processes must be undertaken in tandem with an initiative to get SME's on-line. Co-ordinating and sequencing projects on the basis of unfolding behaviour is needed. This necessitates understanding of the impact of any initiatives and how that will induce behaviour in various stakeholders that lead to changes in the environment. As behaviour changes and competency develops new demands and challenges arise and these need to be met with a new set of sequenced projects and interventions. This sequencing determines the growth path and can lead to either vicious or virtuous cycles.

Also the funding requirements and impact of projects differ and it is necessary to prioritise these on the basis of well-defined criteria. Each country needs to understand the nature and dynamics of it's industry structures and the stage that it currently is in with respect to it's development life cycle and the establishment of an information economy.

Understanding of path dependence and evolutionary behaviour is required and these must be projected for each country's economy.

Only then can suitable projects be defined that will accelerate development and create self-sustaining opportunities.

### ***Recommended Sequence of Identified Actions***

Based on the actions described earlier the following sequence is proposed:

1. Implement a National Information Industries Database
  2. Support improved industry statistics and benchmarking
  3. a) Enhance tertiary information and communication technology education  
b) Enhance ICT education in schools  
c) Enhance education in the workforce
-

4. Drive the implementation of information and communication technologies in government
5. Maximise industry development benefits from government procurement
6. Streamline government procurement processes through use of ICT
7. Kick start e-commerce
8. Get existing African businesses on-line
9. Encourage leading edge users
10. Establish a model framework for the economy
11. a) Ensure greater ICT focus in R&D spending  
b) Provide support for major projects  
c) Provide support for key infrastructures
12. Establish an alternative capital market on the Internet
13. Use outsourcing for industry development
14. Networking and consortia among SMEs to warrant more attention by the businesses themselves and within government programs to develop export capability in ICT.

By following the above sequence countries will firstly create market awareness and intelligence amongst the private sector. This will be done through the establishment of the first two actions. It is necessary to undertake in parallel the ICT literacy development of the future and existing workforce to establish a broad based capacity to exploit ICT. Government must then drive the implementation of information and communication technologies in it's own functions and processes. This will have the effect of creating demand for ICT products and services that can be exploited by the private sector. Industry development benefits must then be maximised from this government procurement. This sets the base conditions for the dynamics of a virtuous cycle, especially if SME's are appropriately incentivised. The scene is then set for government to streamline procurement processes through the use of information and communications technologies, thereby further increasing the involvement of SME's. This will kick-start greater use of e-commerce applications with benefits to both the demand and supply side. The impetus from this will then create the demand necessary to get as many existing African businesses as possible on-line. This will lead to a more complex environment where leading edge users can be established. If this is encouraged through appropriate actions then suppliers will become more sophisticated in understanding the complex needs of users in a dynamic e-commerce environment and respond with increasingly relevant solutions. This will necessitate the establishment of a model framework for the economy where standards and regulation can be addressed. A critical mass of ICT experts and companies will also have come into existence which provides a fertile environment for a greater focus on R&D initiatives. This will require increased funding for R&D, support for major projects and key infrastructures such as Internet II and a Software Engineering Quality Network. Increasingly complex products, services and infrastructure will require venture capital funding and an alternative capital market can be established on the Internet. Government can then consider total outsourcing for greater industry development. Finally networks and consortia among SME's and other local and international players involved in the production value chains can be formed to develop the ICT export market.

---

The above scenario is only one possible path related development cycles. Some countries will develop alternative paths to the establishment of virtuous cycles and others will adapt the above appropriately for their circumstances. Either way the importance of understanding the existing industry structure and its path dependence must lead to a logical sequence of well co-ordinated and monitored projects. Programs established this way should be more likely to lead to sustainable outcomes.

---



## Bibliography

- 1995, Hidden Order, How Adaptation Builds Complexity, Addison-Wesley
- Argyris, Drucker, Nonaka et. Al, 1987, Harvard Business Review of Knowledge Management, Harvard Business School Press, Boston
- Arthur, B, Durlauf, S and Lane, D (editors), 1997, The Economy as a Complex Evolving Systems, Santa Fe Institute Proceedings Vol XXVII, Addison-Wesley
- Arthur, W Brian, 1994, Increasing Returns and Path Dependence in the Economy, University of Michigan Press, Ann Arbor
- Beer, Stafford, 1994, Beyond Dispute, Wiley
- Beer, Stafford, 1994, Brain of the Firm, Stafford Beer Classic Collection, Wiley
- Beer, Stafford, 1994, Decision and Control, Stafford Beer Classic Collection, Wiley
- Beer, Stafford, 1994, Designing Freedom, Stafford Beer Classic Collection, Wiley
- Beer, Stafford, 1994, Diagnosing the System for Organisations, Stafford Beer Classic Collection, Wiley
- Beer, Stafford, 1994, Heart of Enterprise, Stafford Beer Classic Collection, Wiley
- Beer, Stafford, 1994, Platform for Change, Stafford Beer Classic Collection, Wiley
- Bignell, V and Fortune, J, Understanding System Failures, Manchester University Press,
- Brown, Shona and Eisenhardt, Kathleen, 1998, Competing on the Edge, Harvard Business School Press, Boston
- Casti, J, 1994, Complexification, Harper Collins
- Casti, J, 1998, The Cambridge Quintet, Helix Books, Massachusetts
- Casti, John, 1997, Would Be Worlds, Wiley
- Clemson, B, 1984, Cybernetics - A New Management Tool, Abacus Press
- Cohen, J and Stewart, I, 1994, The Collapse of Chaos, Penguin
- Crevier, D, 1993, Artificial Intelligence, Basic Books, New York
- Dehaene, Stanislas, 1997, The Number Sense, Penguin
- Downes, L and Mui, C, 1998, Unleashing the Killer App, Harvard Business School Press, Boston
- Fisher and Fisher, 1998, The Distributed Mind, Amacom, New York
- Gouillart, F and Kelly, J, 1995, Transforming the Organisation, McGraw-Hill
- Hamel and Prahalad, 1994, Competing for the Future, Harvard Business School Press, Boston
- Hammond, Keeney and Raiffa, 1998, Smart Choices, Harvard Business School Press, Boston
- Hertz, J, Krogh, A, Palmer, R, 1991, Introduction to the Theory of Neural Computation, Addison-Wesley



- Hill, C and Jones, G, 1995, *Strategic Management*, Houghton-Mifflin, Boston
- Holland, J, 1998, *Emergence, From Chaos to Order*, Helix Books, Massachusetts
- Kauffman, S, 1995, *At Home in the Universe, In Search of the Laws of Self-Organisation and Complexity*, Oxford University Press, New York
- Lauwerier, H, 1991, *Fractals*, Penguin
- Lewin, Roger, 1993, *Complexity*, Phoenix, London
- Mandelbrot, B, 1977, *Fractal Geometry of Nature*, Freeman and Company, New York
- Mann, Murray Gell, 1995, *The Quark and the Jaguar*, Abacus, London
- Matheson, J and Matheson, D, 1998, *The Smart Organisation*, Harvard Business School Press, Boston
- Mulgan, Geoff, 1998, *Connexity*, Vintage, London
- Prigogine, Ilya, 1996, *The End of Certainty*, Free Press, New York
- Senge, P, 1990, *The Fifth Discipline*, Doubleday, New York
- Stewart, Ian, 1990, *The Mathematics of Chaos*, Penguin
- Stewart, Thomas, 1997, *Intellectual Capital*, Brealey Publishing, Great Britain
- Sveiby, K Erik, 1997, *The New Organisational Wealth*, Berrett Koehler Publishers, California
- Weigends, A and Gershenfeld (editors), 1994, *Time Series prediction*, Santa Fe Institute Proceedings Vol XV, Addison-Wesley
- Weisbuch, 1991, *Complex Systems Dynamics*, Addison-Wesley

IITF (1993) *The National Information Infrastructure: Agenda for Action*, Information Infrastructure Task Force (IITF), Washington DC.

Industry Canada (1996) *Building the Information Society: Moving Canada into the 21st Century*, <http://info.ic.gc.ca/info-highway/ih.html>.

ISPO (1996) *Information Technologies, Productivity and Employment*, Information Society Project Office, <http://www.ispo.ce.../pubs/prodemp.html>.

ITU (1995) *World Telecommunications Development Report: Information Infrastructure*, International Telecommunications Union, Geneva.

OECD (1992) *Globalisation of Industrial Activities*, OECD, Paris.

OECD (1995a) *New Dimensions of Market Access in a Globalising Economy*, OECD, Paris.

OECD (1995b) 'OECD Workshops on the Economics of Information Societies', Toronto, June 1995 & Istanbul, December 1995.

OECD (1996a) *Technology and Industrial Performance*, OECD, Paris.

OECD (1996b) *Globalisation of Industry: Overview and sector reports*, OECD, Paris.

---

OECD (1996c) *The Knowledge-based Economy*, STI/OECD, Paris.

Ohlin, B. (1933) *Interregional and International Trade*, Harvard University Press, Boston, Mass.

OTA (1994) *MultiNationals and the US Technology Base*, Office of Technology Assessment, Washington DC.

Spectrum (1996) *Development of the Information Society: An international analysis*, Spectrum, London.

---

---

