Chapter 6

An agenda for the future

'Without science (and technology), rich countries could never have achieved economic growth. Their failure to invest in research in developing countries is undermining efforts to fight poverty, disease and environmental destruction'

Jeffrey Sachs

What should science and technology deliver for Botswana?

In Botswana, the benefits of S&T are felt largely by those who live above the poverty line. The poor, who mostly live in under resourced rural areas as well as female headed households, are at risk. The large numbers of households stricken by HIV/AIDS are coping with great difficulty. Thus in mapping the future, a response must be sought to the following questions: "How can science and technology help deliver opportunities for all Batswana, and especially for the poor, underprivileged and the sick around the country? How can this be achieved while at the same time supporting the 16,000 operating SMMEs out of 44,000 registered companies, which are potential drivers of the local economy? How can this be done while contributing to national development and to the realisation of Vision 2016?"

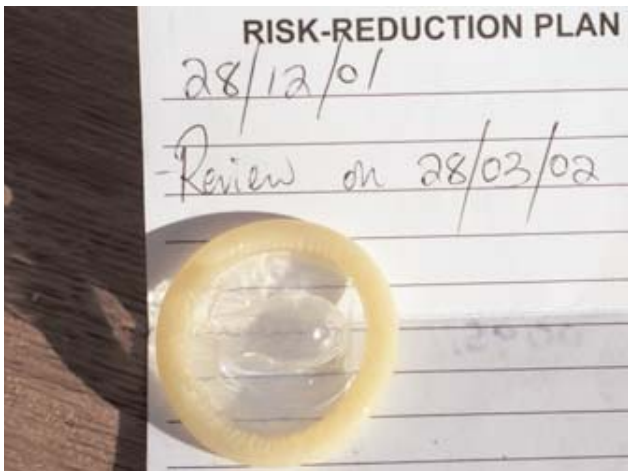
A number of suggestions for tackling some of the challenges discussed in this Report and specifically the harnessing of S&T to achieve development goals including the MDGs, the Vision 2016 objectives and the NDP have been compiled over the years. The BOSHASTED 2000 symposium identified four challenges which are:

- Tackle the crisis in the health sector, especially the HIV/AIDS epidemic.
- Provide people with better ways of sustenance.
- Continually improve Botswana's human resource base.
- Add value to Botswana's natural resources in the quest to eliminate poverty and unemployment.

The magnitude of the challenge facing Botswana can only be appreciated if some of the present efforts are evaluated before the way forward is outlined. Areas of importance include, but are not limited to fighting HIV/AIDS, econmic diversification and private sector development, enhancing opportunities for women, filling the skills gap, enhancing entrepreneurship, building the capacity of SMMEs to use ICTs, modernising the civil service as well as developing a research and innovations capacity. In charting the way forward, our effort will be limited to the major challenges that the country must tackle if it is to prosper. Answers to these challenges will form part of the effort to creat the "educated and informed nation; prosperous, productive and innovative nation" as envisaged in the national vision, components which must combine together in the formation of an information society for Botswana.

Fighting HIV/AIDS and the Health Crisis

The World Summit on Sustainable Development in Johannesburg espoused the view that a country in crisis should lead other nations in providing solutions. As one of the countries with the highest HIV/AIDS prevalence in the world, Botswana is at the forefront of the fight against the disease. There is a significant commitment to raise public awareness that starts from the top. The President and all of his cabinet have been vocal and have spread word of the epidemic at every occasion. As much as the HIV/AIDS issue is very sensitive because of the amount of human suffering, and ethics to be addressed, it is also a potential money-spinner for those who will find a cure and reduce human suffering. In recognition of this, the GoB is collaborating with several international organisations such as, the Gates Foundation, Merck, Bristol Myers, Harvard AIDS Institute and the CDC of the USA on obtaining a cure for the disesase.



The HIV/AIDS issue is very sensitive

HIV/AIDS has to be fought on two fronts. On one front, education to enhance public awareness as well as research to understand the disease and consequently find a cure is needed. Public awareness campaigns have adopted and harnessed ICTs in the fight against HIV/AIDS. The message on prevention; improvements in the delivery of healthcare; improvements in surveying and data collection; the diagnosis, management and analysis as well as education, training and sharing of medical knowledge all depend to a large extent on the use of ICT. Radio dramatisations are broadcast in Setswana and reach out to

most of the country. Satellite TV broadcasts on the disease are beamed to all schools through UNDP, Brazil - Botswana teacher training project. However, effective use of ICTs is required in delivery of medical services. With the Government's recent moves to recognise traditional medicine as complimentary to modern medicine, ICTs should be exploited in capturing and documenting indigenous knowledge systems (IKS) and picking cure regimes that can prove complimentary in the fight against HIV/AIDS.

The challenge for Botswana is therefore:

- to maintain the awareness campaign and find innovative ways of carrying the message to all population groups;
- having moved from voluntary testing to the current routine testing for HIV/AIDS, government should explore the possibility of compulsory testing should the current campaigns not bear fruits—AIDS is a medical emergency, and in an emergency compulsion is not incompatible with the best human rights practices.

The greatest failure in this country vis-à-vis the HIV/AIDS fight, has been in knowledge transfer and capacitation of citizens be able to deal with the epidemic at research and development level. For Botswana, the epidemic will also need to be tackled from the perspective of developing local research and innovation capabilities. The fact that the scientific response is led and bankrolled by external partners has allowed a certain fatalistic mentality to creep in: ask no questions, just accept the goodwill of the benefactors. Going back to the understanding from the World Summit on Sustainable Development – that those most affected must lead the world in fighting an emergency/epidemic, Botswana should be locating the skills sets, the intellectual property and database on test regimes and protocols within and not allowing their flight to sponsor nations at the trials and public phase of the HIV/AIDS response. The challenge for the country as it anticipates forming a medical faculty at the national university is thus:

- To generate a core group of citizen epidemiologists, molecular biologists, geneticists, medical statisticians and modellers, together with a well developed medical technician class by specifying this as an outcome of the collaboration with current international partners such as the Harvard AIDS Institute.
- To sustain the research and development work that well equipped HIV/AIDS laboratories are currently engaged in, Botswana must ensure that current research does not depend on the life of projects such as the Harvards AIDS or BOTUSA projects. Research competencies should rather be based on attaining the core skills and personnel in the country.

The worst possible scenario would be failure to respond to this challenge, particularly in view of the potential benefits that could accrue to the country in future in terms of developing highly specialised medical research skills; spin-offs from the pharmarceutical industry, and possible economic outcomes as the country diversifies on the basis of deepened research and development expertise in S&T. Botswana must tap into HIV/AIDS knowledge skills and have something to show for having been the most ravaged by the epidemic.

Economic diversification and private sector development

Past efforts to diversify the economy have not been fully successful to the extent that Botswana's economy is still heavily dependent on the mining sector. Consequently, for Botswana, two fundamental issues need to be acknowledged, i.e.;

- Botswana does not have a well developed private sector and;
- Economic diversification away from the diamond sector is a necessity.

The Government has begun to address both of these problems. It has over the last three development plans (spanning a period of more than ten years) focussed on developing the capacity of the private sector to "become the main engine of economic growth". As recently as 2002, the Government put in place the Public Enterprises Evaluation and Privatisation Agency (PEEPA) as the body responsible for the orderly privatisation of public parastatals. PEEPA is currently working on a draft masterplan that will prioritise corporations to be privatised and the different forms they will take. The process will start with outright sale, and then progress to selling shares in the stock exchange, to developing public-private partnerships in the provision of services, outsourcing and commercialisation. Alonside developing a robust private sector, the Government has been struggling with economic diversification through a number of schemes such as FAPs, SMMEs, currently CEDA (finance/support schemes). Earlier focus on developing a manufacturing base, followed recently by development of the services sector, particularly tourism and the concept of the IFSC, all point to the Governments efforts in recognition of the need for diversification.

Diversification of Botswana's' economy requires that an enterprise culture be developed and nurtured; the human resources with the requisite ICT and other technical skills are developed and in substantial numbers; all citizens are empowered, women, rural communities and the SMME sector in particular; and finally the country must fight and win in the battle of attracting FDI flows both regionally and globally. A related issue to this is the need to enhance human freedoms, an aspect that will be discussed in more detail later in this chapter.

Enhancing the Human Resource Base

Education is the cornerstone of any knowledge society and information economy. It is therefore, imperative that the UB and all training institutions, from primary to tertiary level, be set up in such a way that they address the skills gaps that exist in the economy, specifically in the

Training - a means to closing the existing skills gap

area of S&T, and in particular the ICTs. With the current education education system in Botswana, training institutions depend on government for everything from staff salaries to tuition and maintenance allowances for students etc. This system will need to be re-evaluated and a more effecient one put in place that effects sel-sustainability among these institutions.

To facilitate this, the Government will need to institutionalise the concept of human resources/skills requirements evaluations on a regular basis to better project the available human resources and the skills combinations necessary to drive the economy over a certain period of time, say five years. The health sector is an area with a great need for local skills; currently 90% of the doctors are of foreign origin[1]. Recently the Government has taken steps towards the establishment of a medical school in an attempt to address to the situation. A regular needs assessment exercise will help with long term planning; this coupled with foresight or scenario planning will perhaps allow the country to accumulate skills before they are critically needed.

By introducing ICT infrastructure in schools, a larger pool of people will develop basic ICT skills before joining the job market, and enhance the efficiency with which businesses and government offer services to the public. Equally, the provision of ICTs in schools particularly in the rural areas should be structured as public resource centres or access centres to be used by the larger community as part of life-long learning platform or by the business community as business resource and services centres.

The concept of life long learning, enabled as a result of the widespread diffusion of ICTs, is now an essential component of any professional life. Countries that do not participate will miss out and will continue to lose their best and brightest to jurisdictions that do provide these opportunities and resources, further exacerbating the continous fight against the brain drain from the developing to the developed world.

- But more than anything else, the whole education system must be re-structured such that all students, no matter where they come off the conveyor, will have basic maths and science skills necessary for further education and training. The country should join global indices that measure achievements in maths (reading) and science skills throughout all levels of education so as to have a yardstick to measure its relative performance, and hence rectify mistakes before they become problems. The mooted second public university which is meant to have a S&T bias might perhaps be part of the answer.

Building an entrepreneurial culture

Entrepreneurs are necessary to power innovation and economic development[2]. There is no reason to believe that Botswana does not have its fair share of entrepreneurs evenly distributed in the population at large. Some Batswana entrepreneurs are well established and fairly well known locally. However, in general, self-employment is a new idea in Botswana and efforts to increase the number of Batswana entrepreneurs will require changing mentalities and behaviour.

Entrepreneurs do respond to opportunities. ICTs can extend the knowledge and intelligence, usually market intelligence that entrepreneurs need to seize an opportunity and turn it around into an investment, jobs and profit. In an increasingly global market place, opportunities are many fold. Botswana needs to facilitate access to local, regional and international markets for local entrepreneurs and investors in general by ensuring high speed access to the Internet at reasonable prices. As part of this effort, Botswana will need to overcome what was until recently a major problem, a lack of investment capital[3].

1 Africa Recovery. 2002. An African test case for wide distribution of life prolonging medicines. http://allafrica.com/stories/200210230001.html
2 Global Entrepreneurship Monitor. 2002. 2001 Executive Report.. http://www.gemconsortium.org/

For this to take place:

- The country must gear its education and training programs throughout the curricula to cover and increase awareness on entrepreneurship as an option, not as a last resort if one fails to get a job.
- Entrepreneurship support programs, including technology incubations, financial and management support in the formative years must be fostered.
- Technology, particularly ICT, must be availed to all those who need it (with proper financing by both government and the private sector), as a lever for growth.
- Botswana must join the global entrepreneurship monitor (GEM) or similar programmes to better appreciate where it goes wrong and avail opportunities to correct and continue along the enterprise path.

Empowering Small, Medium and Micro Enterprises through Information and Communication Technologies

One of the biggest challenges facing Botswana as it implements Vision 2016 will be how to develop the capacity of small, mostly female operated, and often rural based enterprises. Micro credit schemes are considered of limited utility at this time because of high interest rates.

ICT opens up access to opportunities for entrepreneurship

The greatest constraints faced by businesses generally are: access to capital, a shortage of adequately trained personnel and a lack of business management expertise or business models. Introducing ICTs per se will not change anything, indeed it might make things worse especially if ICTs are unknown to the potential beneficiaries. However in many countries, Botswana is no exception, encouraging entrepreneurship and building the capacity of the private sector to use ICTs as part of a general effort at capacity building may be the place to start. In this case, the first place to start may be in the communities themselves in order to achieve economies of scale, because it is not feasible to reach out to all households and registered companies in Botswana.

Assessing the e-readiness of people and communities can be a first

3 World Economic Forum. 2000. The Africa competitiveness report 2000/2001. Oxford University Press. NY. London

step in understanding the information sharing needs and behaviour of people and organisations and the eventual role that the private sector and perhaps ICTs can be called upon to play in meeting the needs of the local market. The Maitlamo project (draft ICT policy) has just completed one such assessment that shows the huge information divide between urban and rural communities.

While the experience of diffusing ICTs into poorer and/or largely rural areas is still relatively new, a community based approach mediated by local or community based organizations, or NGOs and associations of business people such as BOCCIM, and any local chambers of commerce, and that involves the local telecommunications operator may be a logical place to start in enhancing the capacity of local businesses. Botswana already has the basis for such understanding due to the BOTEC Community User Information Survey.

Community based resource centres that offer business incubator services, and at the same time also try to meet community development needs in general may be the solution. These centres, sometimes known as community access centres, multipurpose community telecentres or just telecentres may be useful for introducing change and new ways of doing things. They may be located in a post office, a local store, a local government office, in a school or in the offices of a small enterprise. In a regional capital of Benin, far removed from the capital, a community access centre was located in the offices of a travel agent. Other centres were located in agricultural training centres.

In Senegal, telecentres are small single owner enterprises that offer telephone, fax and related services and operate in collaboration with the national telecommunications operator. These telecentres are part of the business model of the national operator which leases telephone services to the small enterprise operators in exchange for a percentage (a large percentage) of the revenue generated. The income left over once the telecommunications operator has taken its cut is largely sufficient for the telecentre operator[4].

Multipurpose community centres are ideal for people to interface with S&T

In China, the Government of Hunan province implemented a pilot agricultural information network to share information about agricultural technologies and management practices as well as markets among farmers in the villages of the province. A computer operator was linked by telephone to the internet and to other operators located throughout the province and throughout China and beyond (Taiwan, Hong Kong and via some Chinese intermediaries, with markets in Japan as well as some other Asian countries). The farmers themselves did not have computers. In fact many were not literate. However, when a farmer had a question about a technology or was interested in learning who could be interested in buying his or her cash crops, that information was transferred to the local village party chief who would ensure that the information was phoned in, or sent by post to the computer operator who would dispatch the information to an expert if that is what was required or post it to the market place Web page for others to consider the sales offer or purchase request that was being made.

Whether a similar approach could be useful in Botswana would have to be seen. The point is that there are options to be considered. However, in order to consider which option would be most appropriate in the context of Botswana, the recently completed e-readiness assessment may help to better understand the level of development and various other needs of beneficiaries and the role, if any, that ICTs could play in helping private sector operators better take advantage of modern management practices and technologies. There is, in addition to the e-readiness exercise undertaken by the then Government Computer Bureau[5], an Africa-wide e-access and usage index study that the UB is carrying out in 2004 for Botswana as part of the Research ICT African (RIA) network[6], the results of which might be instructive for the country.

Enhancing Opportunities for Women

This will need to take place at different levels. First through the education and training system which must vigorously orient itself to attracting girls and young women into the sciences. At yet another level, it must be about building a profile of female achievers in all spheres of life, to play the part of role models to debunk the idea women are not capable and thus encourage the girl child to aim for the stars. At the third level it must be about putting in place skills and technology equipping programs for women entrepreneurs to break the divide that has always held then back from realising their true potential and has thus relegated them from being active participants in the economic life of the country.

In the higher echelons of power, women have not done too badly in recent times. There are currently at least four cabinet Ministers; the Governor of the Bank of Botswana, the immediate former Dean of the Faculty of Science of UB, several Permanent Secretaries including the one for MIST are al women. Despite this profile of women leaders, generally women in Botswana head a larger percentage of poor households and are paid lower salaries in a male dominated formal sector. Women have limited access to productive resources, particularly cattle, land, cash, labour and credit, whilst they own and run three-quarters of informal sector enterprises.

There is clearly a need to create more opportunities to empower women through S&T. There are many examples of women working through local and community self-help groups to strengthen their economic reach and to better make them heard. ICTs especially, at the local and community level, can be useful. There are several examples and many networks linking women with various resources and with other like-minded organizations who work to empower women and to forge collaboration and action around issues of common concern. Certainly science and technology could be used to enhance all these objectives in order to benefit the majority of women.
Government must find ways in which technology can generally and in

4 Fuchs, R. 1998. Little engines that did. Case histories from the global telecentre movement. International Development Research Centre. Acacia project. http://www.futureworks.ca/engine/eng_2.htm
5 The Computer Bureau is now known as the Department of Information Technology within the Ministry of Communications, Science and Technology

6 Research ICT Africa Network, www.researchICTafrica.net

certain circumstances, be specifically targeted at this grouping to empower them, and hence improve the country's gender empowerment index to rank amongst that of leading nations.

Developing a Research, Development and Innovations System for Botswana

Botswana must embark upon an ambitious training and re-tooling exercise in terms of both human resources in S&T and training institutions. A concerted effort should be placed on training researchers up to doctoral level with emphasis placed on home-based training. This means the local university and other training institutions such as the institutes of health sciences should be encouraged to introduce post-graduate training programs first in collaboration with external institutions, by tapping into established government or institutional networks such as USHEPiA[7], Southern and Eastern Africa Network for Analytical Chemists (SEANAC), National Urban Forestry Unit (NUFU) and Danish Cooperation for Environment and Development (DANCED), but ultimately wholly within. The local training of scientists will not only contribute to the closing of the skills gap, but will have the added benefit of creating capacity in the training institutions themselves, thus ensuring sustainability in production of the requisite human resource base into the future; and from programs deliberately tailored to address the country's specific needs. The current policy of sending all postgraduate students abroad is not only counter productive, it actually contributes to the mismatch in the skills requirements in the local economy and the actual skills acquired by the few who get this level of training.

- If Botswana is desirous of reaping benefits from intellectual property, then it it may want to consider building an impressive research and development capacity; going beyond just doctoral training, but placing its leading researchers in leading global centres of excellence as both guest researchers and postdoctoral fellows on structured exchange programs, so as to develop specific research strengths not yet available locally.
- It could prove favourable for MoE as well as the training arm of government, the Directorate of Public Service Management to adopt a proactive approach to post-graduate training for in-service public servants, where at least 60% are sent to the local training institutions.
- If no capacity exists, then government has, through the grant system, the option of building that capacity over an optional period of perhaps five years.
- It would be beneficial to the Government to speed-up the process of restructuring its' research institutions and also to move away from input funding to funding based on delivery of agreed outcomes.
- Encouraging the private sector to invest in research and development through tax and other fiscal incentives, will enhance their sustainability and ultimately their own survival.
- Botswana should consider building a centre of excellence for HIV/AIDS research by focussing funds towards such a designate centre. Since a significant amount of research is already carried out on HIV/AIDS, such a centre need not be created de novo. Centres of excellence can exist on their own, they can be part of institutions, or they can be a result of partnerships amongst different interested parties.

The Intellectual Property Rights Regime

The IPR regime requires streamlining to make it easier for innovators/creators to register and protect their intellectual property. In addition, Botswana must move with some haste to enact implementation legislation for the Botswana Copyright and Neighbouring Rights Law of 2000. This will enhance further protections given owners of intellectual property. A designers' or innovators' guild must be formed with the objective beyond facilitating a meeting of minds, but to encourage and reward innovation, thus serve as a pull factor in the future innovations process in the country. Specific incentives could be placed in critical areas of innovation and invention, encompassing ICTs.

The Information Communication Tecnology Framework

A view of a nation's ICT landscape can have one of two hues: at one end (and a fact captured in the UNDP's Technology Achievement Index (TAI)) would be the level and worth of innovations (patents and royalties) produced within – which emphasises products and payments from the owning of intellectual property. The second hue, and one with which we wish to associate this report with, though without excluding the first, is where you measure the spread (accessibility) and depth of usage of the available ICTs – best illustrated by the composite InfoState index developed by Orbicom[8]. In particular the info-use divided into sub-components uptake and intensity of use. This latter view expresses the benefits (socio-economic) that can accrue to any nation or society which accesses and uses ICT tools even if it does not itself produce them. Thus we refer here to the internet, e-mail, telephone and other elements of ICT technologies as enablers and providers of human freedoms, and economic facilitators whether or not they are products of the community/nation exploiting them.

Information Communication Tecnology Policy

That a national Information Communication Technology Policy is required as of yesterday is not open to question, since to have a structured development of the sector or industry and its leveraging into the greater economy from schools to business, from government to households, must be guided by an overarching vision that such a document could give.

In order to entrench e-business, the policy must specify standards of practice that would enable security of use of the Internet for business purposes. In this light the Government must through the financial services sector, assure the security of the digital transactions and move ahead to recognising, legislatively, contracts concluded and signatures signed digitally.

Botswana as the SADC Information Communication Tecnology Hub

As part of the policy formulation process, and in consonance with the declared desire by government to make Botswana a SADC ICT hub, government must move speedily and aggressively ahead and invest in the hardware and people skills to turn this into reality.

Information Communication Tecnology Infrastructure and Closing the Digital Divide

Government needs to act on providing ICT infrastructure in schools, by first making it policy to provide every primary school with an electrical connection where the electricity grid exists, or provide stand alone solar power where girds do not reach. That way, the provisioning of ICT infrastructure would be made with the full potential for use by the schools and the communities around which the school is located. Schools and public libraries where they exist must be turned into community resource centres, a feather in reducing the urban-rural digital and information divide.

Enhancing Human Freedoms

Enhancing human freedoms must be the ultimate in human development. This goes beyond just provision of the basic needs of: good health, food and shelter, but encompass all things that add dignity to the human person. This presupposes access to facilities and information; opportunities to improve self and freedom from degradation and depravity of whatever form. It is only by enhancing

7 USHEPiA is a "south-south" initiative with the aim of human resource development through sustainable capacity-building in the general areas of science, engineering and the humanities.
8 Orbicom is an international network that links communications leaders from academic, media, corporate and government circles with a view to providing for the exchange of information and the development of shared projects.

these freedoms that Botswana can reach the information society pinnacle she needs to prosper and compete in the globalised world.

Access to Information

The first requirement of an information society is access to information by whoever needs it. Therefore, the GoB must enact and implement a Freedom of Information Act (FoIA) as a first step to legally recognising this right and the desire to build an informed and educated nation, and make the national vision not just talk but reality. If nothing tangible should be achieved of the national vision in the remaining twelve years of its life – and from evidence so far not much will be (full employment, no new HIV/AIDS infections etc) – the least it could and ought to achieve is transparency (in government processes) and access to government information. These two are not guaranteed unless and until the public's right to information is backed up by a FoIA; and they may well be the ingredients needed for each citizen to strive harder and commit to higher levels of productivity through a feeling of inclusion.

Access to ICT enhances human freedom

Universal Service vs Access

The declared policy goal of both the GoB, through MIST and BTA of universal access, needs to run its course if the country is to achieve the information society envisaged. To fulfil this, he policy goal must shift to universal service, where the infrastructure is not only deployed, but the average citizen can actually use it. This is however a much bigger task since it means the economic status of the average citizen must be such that they have demand for ICT services. Technology must be anchored such that it contributes to the economic wellbeing of the average Motswana to afford them the economic might to be a participant in the ICT worldscape.

Public Service Reform and Decentralisation of Government

The use of ICT and computerisation of government processes in addition to the current performance management system (PMS) have combined to force reform in the way public servants render services. ICTs should be further embedded in all the functions of governament and used to give middle management decision making tools, as a conscientious effort at decentralising government. Government efforts to decentralise decision making to the local authorities must continue and be backed by robust ICT infrastructure and a pool of skilled personnel to make governance closer and more relevant to the user. A knowledge base in terms of a database that provides online assistance to users, reflecting policy and procedures, necessary to assist customers, without having to resort to a higher authority for answers must be part and parcel of every civil servant's repertoire of tools. It is only through these that the level of service delivery can be enhanced, where those who serve the public are empowered to act, and not stifled by bureaucratic procedures.