Chapter 4

CREATING A DEVELOPMENT DYNAMIC

INTRODUCTION

Human development has come to be understood as going beyond the three basic rights to decent shelter, good health and freedom from poverty. It encompasses the strengthening of human capabilities through literacy, knowledge and skills, access to services and freedom from all forms of deprivation, such as coercive cultural, religious or political systems, gender discrimination, relative and absolute poverty, etc. A country's future development is closely linked to the success with which it can unleash each citizen's true potential to play a meaningful part in the development process.

This is often a four stage process of skills (through education and training), attitudes (in the form of an enterprise culture), the necessary infrastructure and trade and investment or technology transfer. To seed a development dynamic, all four should exist in a mutually re-enforcing and supportive manner, since provision of one without the others would not set in train the complex integrated development process to usher in new opportunities for growth. If a hierarchy were formed of the four-piece unit, then education (skills) would be the prime resource, followed by infrastructure and entrepreneurship together as they compliment each other and lastly trade and investment.

EDUCATION AND HUMAN DEVELOPMENT

EDUCATION: a Human Right

A country's development is measured by the quality of life of its citizens, rather than the overall country's wealth. To this end, education is an important factor in achieving human development. By informing citizens, education sets the stage for conscientiousness about individual rights and responsibilities, hence citizens are cognisant of the need to conserve and preserve their environment for the good of future generations[1]. It is therefore not surprising that education is also an important component of the universally recognised measure of human development, the human development index (HDI). In consonance with the above, the United Nations Universal Declaration of Human Rights (1948), recognises education as the right to life, a human right, meaning every man, woman and child should have the right to basic education. Several other treaties reflect this belief, for example the International Covenant on Economic, Social, and Cultural Rights (1966), the Convention on the Elimination of All Forms of Discrimination Against Women (1981), and the Convention on the Rights of the Child (1990). Botswana, like many other nations, has ratified some of these treaties, and through its Vision 2016, is positioning itself to work towards the attainment of universal access to basic education.

Countries that invest in human development legitimately expect their citizens to not only promote healthy living, but also expect spin-offs that will enhance the development process. ICTs, are typical gains realised from investments in human development. Indeed countries that have registered high development gains in the recent past are those that

have made investments in information infrastructure coupled with the development of proactive policy frameworks for access and diffusion of ICTs. Inversely, there is a strong likelihood that with the use of ICTs, the existing digital divide between economically prosperous countries and the developing world will widen. As a result of this widened gap, human development differentials will be exacerbated further[1]. ICTs are also increasingly being cited and used as a powerful tool for increasing access to education and learning.

Education is an important factor in acheiving human development

As a middle-low income country that was extremely poor nearly four decades ago at independence, the public education sector in Botswana has performed relatively well in improving the quality of its human capital. Botswana owes its success thus far to its investment in education, and an education policy framework, which is aimed at attaining equity in the provision of the education service. The guiding philosophies for policy development at the national level in Botswana are the principles of democracy, development, self-reliance, and unity, the combined effect of which should give form to kagisano, or social harmony. To the extent that there is kagisano in Botswana, it can be argued that the education system has achieved a considerable measure of success. This argument develops from the premise that even though Botswana cannot purport to be a developed nation in the sense of having a highly competitive economy or highly developed human resource base, the necessary building blocks in terms of education infrastructure and participation at all levels of education have already been laid down. Evidence of this can be inferred from the achievement of universal access to basic education,[2] and a high level of participation at the secondary school level as shown in Table 4.1.

1 United Nations Development Prpgramme. 2001. Human Development Report 2001: Making new technologies work for human development, NY
2 Ministry of Education. 2000. Education Statistica Report, Government of Botswana

Table 4.1:
Gross and Net Intake and Enrolment Rates: Primary Education, 2000

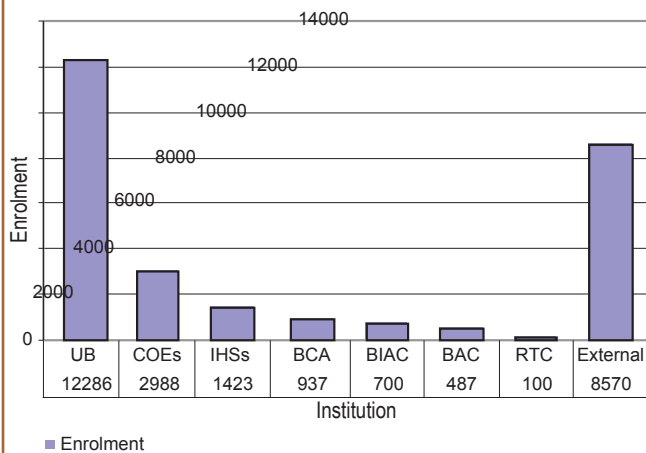|	Primary	Secondary
Gross Enrolment Ratio (GER)	118.0	99.7
Net Enrolment Ratio (NER)	100.0	52.6

Source: Education Statistics Report. 2000. Government of Botswana.

There is a corresponding increase in enrolment and participation at the tertiary level. Tertiary education is provided by the UB, the Institutes of Health Sciences, Colleges of Education, Botswana College of Agriculture (BCA), Botswana Accounting College (BAC) and institutions that are affiliated to universities or colleges outside Botswana. There was a notable increase in participation at this level in the 1990s, from 9 345 in 1992 to about 22 221 in 2000. In 2002, the number enrolled in tertiary institutions at home and abroad was estimated at 27 491. Figure 4.1 below provides the number of government sponsored students, in institutions around the country and abroad. The data does not show the contribution of the vocational training centres (VTCs), which have to date been regarded as part of the second level before they became technical training colleges (TTCs).

The University of Botswana, one of Botswana's tertiary institutions

Figure 4.1: Enrolment in tertiary institutions, 2002

Institution	UB	COEs	IHSs	BCA	BIAC	BAC	RTC	External
Enrolment	12286	2988	1423	937	700	487	100	8570

■ Enrolment

Source: Ministry of Education, 2003

3 Ministry of Education. 1994. Singapore, 1997
4 Revised National Policy on Education, 1994: p.5

With the exception of the UB and the BCA, all tertiary level institutions in Botswana offer certificate and diploma level courses only. In the 2001/2002 school year the UB enrolled 12286, (an increase of 48.3% over 5 years). Thirty-four per cent were enrolled in certificate and diploma programs, 58.2 % in undergraduate degree level courses, while 7.7% were enrolled for higher degrees (Masters and Doctoral levels). About (8 570) other students at tertiary level are enrolled in universities outside Botswana; 6,529 of these in South African universities, 168 in other African countries, while an estimated 1873 students were studying elsewhere (Europe, the Americas, Australia, etc). More than half of these are pursuing science and technology related courses.

Botswana's Education Policy

Access, infrastructure and participation in school are necessary conditions for all forms of learning. Countries that have made investments in infusing technology into learning culture have achieved higher success rates in leveraging education for development[3]. Such success depends on sound education policies that require continuous evaluation and updating to incorporate current science and practice. In line with this thinking, Botswana has realised the need to review its current education policy, the Revised National Policy on Education of 1994 (RNPE) (see Text Box 4.1), with a view to better articulate proactive strategies for technology driven learning.

Box 4.1:   RNPE national education objectives

The overall objectives of education, from the national perspective, are pronounced in the RNPE to be the following:

1. To raise educational standards at all levels.
2. To emphasise science and technology in the education system.
3. To make further education and training more relevant and available to larger numbers of people.
4. To improve the partnership between school and community in the development of education.
5. To provide life-long education to all sections of the population.
6. To assume more effective control of the examination mechanism in order to ensure that the broad objectives of the curriculum are realised.
7. To achieve efficiency in educational development.[4]

Given that Botswana needs to develop a human capacity that will enable her to diversify the mineral driven economy, it is apparent that the RNPE needs to be reviewed so as to nurture learners who will have more than just an appreciation of S&T as a vital component for the country's development. For its TyBEP, Botswana repackaged the objectives of the RNPE into Botswana's Aims for the TyBEP. Of these aims, two are directly relevant to the development of S&T:

• To acquire the basic science knowledge and skills, including basic knowledge of the laws governing the natural world.
• To acquire an appreciation of technology and technological skills including basic skills in handling tools and materials.

Thus, the RNPE is a clear demonstration by the GoB of its commitment to providing and improving the infrastructure, facilities and resources that will enhance the overall capacity for delivery of the entire curriculum, as well as teaching and learning of basic science by employing all the available technologies. From an overall national development perspective, the most compelling statement of Botswana's education policy is the declaration of equity as a goal of education, and the call for monitoring of equity using a set of equity indicators to be developed by educators. This recommendation is interpreted to mean that providers of the education

service should ensure equitable distribution of the limited public resources in this sector, and use information from the equity indicators to correct any errant actions or patterns of behaviour. In the context of S&T and utilization of ICTs, in the education policy sets out to discourage, if not prevent the digital divide in public education, between different groups of our society. The RNPE also calls for a Science and Technology Policy which is envisaged as a multi-sectoral policy tapping the minds of experts to deliver benefits to all the different sectors of society.

Promoting Science and Technology

Access and participation in school are necessary conditions for all forms of learning. In Botswana, access to education at the primary level is universal, while participation was almost universal in 2000 as shown in Table 4.2. Unfortunately, the rest of the achievements that relate to S&T are infrastructural. At the primary level, science teaching facilities have been built in all new primary schools built since the beginning of NDP8, while buildings in existing schools are being upgraded to include a science room and a library. Telephone lines have been installed in more than 50% of the schools with many more connections anticipated in the near future. Table 4.2 presents a summary of the physical resources and facilities that support learning at both primary and secondary levels.

Table 4.2:
Facilities and technology resources in schools in 2000

| Facilities and equipment in Basic Education	Primary Level	Secondary Level
Number of schools across the country	A total of 736 schools (664 government schools catering for 93% of the learners)	A total of 273 schools (233 government schools catering for 87.5% of the learners)
Classrooms (in government schools across the country)	78% of streams have classrooms	90% of streams have classrooms
**Special Learning Rooms (in government schools across the country)	30 general science labs 53 computer labs	215 general science labs 233 computer labs 312 Home Economics labs 471 Design & Technology labs 235 libraries
Multimedia Equipment (in **all** schools across the country)	69 Television Sets 63 VCRs 3429 radios	Television Sets VCRs Overhead projector
Computer Equipment (per school, for government schools)	None	19/20 computers; 2 multimedia PCs; 2 network printers; 1 colour printer; 1 scanner; 1 multimedia projector;1 Windows 2000 server; 50 surge protection power plugs; 50 security plugs; 10 KVA Online UPS; Local area network; Microsoft Office XP standard
Power Supply (in all schools across the country)	251 of 736 schools have national grid electricity, and 181 schools on solar power and generators	All schools either on national grid electricity, solar power or generators

Source: Ministry of Education, 2003

Through MoE, government has also increased the number of S&T subjects in the curriculum. Students at the secondary level can take Mathematics, Science, Agriculture as well as Design and Technology. Mathematics and Science are compulsory subjects for all secondary school students, while Design and Technology is only compulsory for the first three years of secondary school. In 1999 a computer awareness course was introduced in 71 government secondary schools which had adequate resources. All senior secondary schools offer Computer Studies as an optional course as outlined in Figure 2. It is obvious from the distribution of learners that Agriculture is the most popular optional subject. There is a significant difference in the sex breakdown figures for Design and Technology compared to the other two optional subjects.

Generally it is viewed that the low enrolment by female students in Design and Technology mirrors their participation in technical tertiary courses either at the UB or in institutions outside Botswana. Following the 1995 World Conference on Women held in Beijing, the Botswana Government took a bold decision to promote S&T amongst women through its National Gender Programme Framework. The policy has specific strategies adopted to:

- Promote education and skills training of girls/women in a variety of non-traditional career programmes.
- Strengthen career guidance and counselling in schools to include the provision of better advice to young girls on diversified career opportunities.
- Encourage female students through positive action to take science subjects and enrol in vocational training institutions.
- Promote access by women on training programmes at different levels, including types of skills and the range of methods and appropriate technologies.
- Sensitise parents and teachers on gender socialisation from pre-school through to secondary education, through Parents and Teachers Association meetings and the media.

Figure 4.2: Students enrolled in optional Science-based courses, 1999

	Agriculture	D & T	Computer
Male	61909	46344	4073
Female	68123	12422	4658
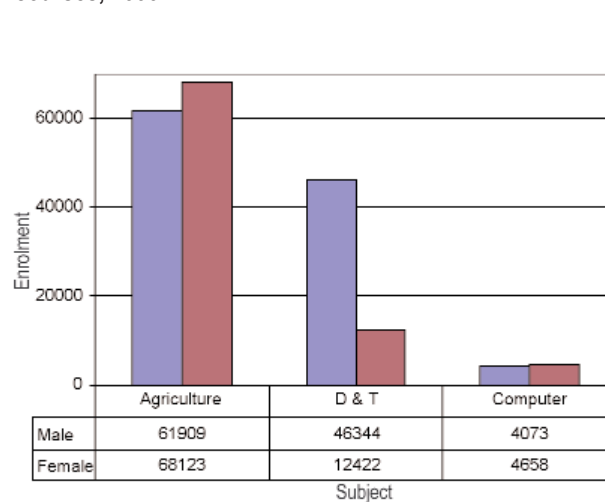
Source: Central Statistics Office. July 2001. Education Statistics 1999

Institutions, specifically secondary schools, promote S&T through exercises such as maths and science fairs. In preparation for these fairs that are carried out at the regional and national level, students are encouraged to come up with S&T projects that have relevance to society. The national Maths and Science Fair takes place at the UB, where the students defend their projects to a selected panel of judges. Although there is no follow up to any of the winning projects, this exercise is very important in enhancing the interests of the learners. Institutions also participate in career road fairs where different people in the area of S&T talk to the students, particularly at the secondary school level to encourage them to take up science.

Computer studies are offered at all senior secondary schools on an optional course

Figure 4.3: Time series of enrolment in S&T programs, UB

Year	1997/98	1998/99	1999/00	2000/01	2001/02
Engi/Tech	808	904	998	1157	1272
Science	1257	1289	1353	1337	1384

Source: University of Botswana. FactBook 2002

There has been a drive at the UB to promote S&T amongst women through the Women in Science and Technology component of the Botswana Education, Democracy and Development Initiative (EDDI) Programme. The Botswana EDDI programme launched by the former US Secretary of State, Madeleine Albright in 2000, has the theme, 'Transformation of the University of Botswana through technology applications', and is part of collaboration between the USA State Department, USAID, Peace Corps and the African Education Ministers. The Women in Science and Technology committee in Botswana involves members of the Faculties of Engineering and Technology, Science, Education and the Botswana College of Agriculture. To date, the committee has been involved in the following:

• Organising of conferences addressing equity in S&T
• Production of a motivational video on women's participation in S&T in Botswana
• Production of booklets to be used by both pupils and their parents
• Running of S&T clinics over the school holidays for girls
• Visits to schools by female scientists, playing the part of role models

Some of the literature produced includes booklets on 'Profiles of female Batswana scientists', career description for Science, Agriculture, Mathematics, Engineering as well as Computing. These booklets specifically written for parents to encourage their daughters to do science subjects in schools, and calendars profiling Batswana women in S&T, are very well distributed in Botswana.

For more than 20 years, the mining industry in Botswana, mainly diamond and copper/nickel, has offered incentives to students with good grades to pursue careers in S&T. These incentives have been mainly in the form of scholarships to study abroad as well as a job guarantee after completion of studies. In 2000, the UB and the BOTEC collaborated to promote S&T by hosting the first Botswana Symposium on Harnessing of Science and Technology for Economic Development (BOSHASTED). The symposium brought together S&T practitioners as well as policy makers from various countries, institutions as well as disciplines who examined how S&T could be used for economic development.

An Evaluation of the Revised National Policy on Education

The RNPE is a sound policy and roadmap for overall provision of education that is meant to deliver on the promises of NDP 9, by achieving technological and/or information literacy, or positioning the workforce for global competitiveness. It is the framework within which the education sector is to realise the transition of enrolments and resources in schools into high quality human capital for Botswana. However given that it is almost ten years after its inception, in order to retain its relevance with respect to technological developments, the policy needs to be revised to address its limitations. Some of the major limitations of the RNPE have been associated with quality of delivery, harnessing of ICTs, access and leadership.

The major limitation of the policy has been the lack of a comprehensive quality framework and indicators of success. There is a need to assess and ascertain the quality of the learner as well as contribution to society. Therefore the policy has failed to live up to its overall objective to raise educational standards at all levels. Secondly, the concept of harnessing of ICTs as a priority goal of the education systems is not clearly pronounced. E-learning has an impact on harnessing of technologies by learners as well as on access, particularly in special education. Given that one of the guiding principles of the policy is the spirit of botho, it is rather surprising that providing for access by children with disabilities only comes as an afterthought. Indeed this can be blamed on the leadership, as what is seemingly an obvious component of the policy is not realised. There has
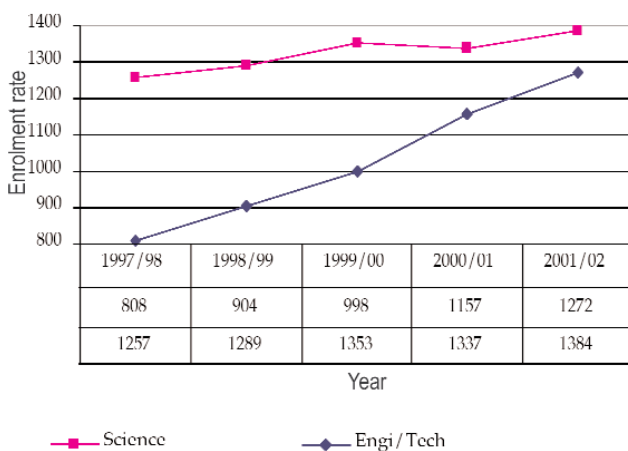
probably been a lack of implementation capacity that would have ensured that all recommendations of the RNPE are effectively transformed into strategic plans. For example, the establishment of the National Council on Education (NCE) was supposed to ensure that government was well advised on the education system: to monitor and evaluate implementation of the education policy, to monitor quality, to initiate reviews and propose changes in the educational policy[5]. Unfortunately, the NCE seems to have abdicated some of its responsibilities to structures such as the MoE's Policy Advisory Committee. Botswana has thus failed to benefit from United Nations Education and Scientific Cultural Organisation's (UNESCO) initiative of setting an agenda for harnessing ICTs for educational development. Other short comings of the policy framework as it applies to the harnessing of S&T for education include:

- Absence of pronouncement on developing the implementation capacity of non-school personnel who have to develop strategies and plans for the school system.
- Absence of implementation targets, "smart planning" or monitoring. An example of this is failure to take advantage of the availability of electricity supply in most localities, with the result that primary schools have remained the "poorer cousins" of secondary school in the provision of physical facilities that promote learning.
- Perpetuating an implementation environment that is tolerant of mediocrity, and fails to reward excellence[6].
- Failure to create an environment where the school and the community progress on parallel paths, where the school could be the learning centre for community life.

Botswana's Response to UNESCO's Education for All Initiative

The MoE has recently developed an embargoed national action plan (NAP)[7] in order to fulfil the Darkar Framework for Action, Education for All (EFA): Meeting our Collective Commitments initiative. The action plan borrowing primarily from the Darkar framework, has been contextualised to Botswana policy instruments and development strategies. The plan, "realigned with the Botswana National Development Plan 9 (2003/4-2008/09)" as stated in the foreword by the then Minister of Education, K.G. Kgoroba, addresses issues raised in the RNPE and the national vision (Vision 2016). The NAP sets out the process to achieving the six EFA goals by indicating the objectives to be achieved, target groups, implementation strategy, time frame, resources required, lead department and organs, performance indicators and lastly means of verifying that indeed the objectives have been met. The six goals are:

- Expanding and improving comprehensive early childhood care and education especially for the most vulnerable and disadvantaged children
- Ensuring that by 2015 all children, particularly girls, in difficult circumstances and those belonging to ethnic minorities, have access to and complete free and compulsory primary education of good quality (to date, it had never been government policy to compel primary education attendance).
- Ensuring that the learning needs of all young people and adults are met through equitable access to appropriate learning and life-skills programmes.
- Achieving a 50% improvement in levels of adult literacy by 2015, especially for women, and equitable access to basic and continuing education for all adults
- Eliminating gender disparities in primary and secondary education by 2005, achieving gender equality in education by 2015 with a focus on ensuring girls' full and equal access to and achievement in basic education of good quality
- Improving all aspects in the quality of education and ensuring excellence so that recognised and measurable learning outcomes are

achieved, especially in literacy, numeracy and essential life skills.

The fundamental shift in approach in the action plan is the acknowledgement that access per se is not a major problem in Botswana, what is lacking is the "matching of access with provision of good quality basic education system in terms of the curriculum and instructional delivery". Whilst it is too early to say whether or not government will deliver on this promise, it is encouraging that there is a budget estimate of how much it will cost to deliver on all six goals in the period 2004/05 to 2009/10. In total the ministry estimates a total of P660.4 million covering the provision of equipment, ICT facilities, human resources, buildings, development of curricula and learning materials, upgrading of facilities and competencies of trainers to developing a national qualifications framework, overseen by a national accreditation board and the financing going with such a venture.

Expanding and improving early childhood care is one of the 6 EFA goals

Enhancing Development Opportunities Through E-Learning

'E-learning is a means of becoming literate, involving new mechanisms for communication: computer networks, multimedia, content portals, search engines, electronic libraries, distance learning, and web based classrooms'

-Peter Stokes, Eduventures.com LLC

International Perspective

A report by the British Educational Communications and Technology Agency (Beca), claims the British government between 1998 and 2002 committed over £700 million to enable schools to connect to the National Grid for Learning. During the same period, a further £200 million was committed to enhance, through staff development, teachers' confidence, competence and effectiveness in delivering ICT to pupils in schools. Beca is the British Government's key partner in the strategic development and delivery of its ICT and e-learning strategy for the schools and the learning

---

5 Recommendation 6a, Revised National Policy on Education
6 Failure to reward excellence, as can be demonstrated by recruitment policies that reward longevity, is likely to place Botswana at the periphery of the IT industry.

7 Miinistry of Education. 2004. Education for all. Botswana National Action Plan 2003-2009. Pre-production copy October 2004, Gaborone

and skills sector. From the foregoing, it is apparent that the British Government acknowledged the role of e-learning in enhancing human development.

E-learning is a new type of education that enables learners to study at their own pace and convenience, provides access, provides a classroom without walls as well as provides a platform for the exchange of ideas. Learners and entrepreneurs drive this mode of learning. According to Cath Scott of the Elmfield community special school for the deaf in Bristol, UK, 'Using e-mail and computer-generated text gives children another choice in how they communicate. It is non-confrontational, non-judgemental and easy to edit'. Mobile phones, video phones and emails have opened up avenues for disabled learners who would otherwise be stuck in their own environment because of mobility limitations or other such issues. The Beca Report concluded that learners showed improvement in performance due to harnessing of e-learning facilities. However this does not necessarily mean that one suddenly becomes tech-wise due to e-learning. In fact there are some cynics who argue that learners lose the opportunity to develop basic social skills as they become glued to the computer screen or that they are not able to develop their hand writing, reading or spelling capabilities. Research has already shown that children are more concerned with playing with their friends in the playground than surfing the internet. It is true that with the ability to cut and paste, information can move from one document to the other without necessarily passing via the brain. Therefore there is a need to use proper strategies in order to help learners gain the advantage that e-learning offers. It has been demonstrated elsewhere, for instance, that e-Learning as a strategy is capable of making learning more enjoyable and meaningful. It can also enhance understanding of concepts, and cut down on the time it takes to learn difficult concepts[8]. It can be argued that e-learning can promote logical and analytical thought as it gives the pupil an opportunity to focus on higher order thinking skills.

However, the recent closure of UK's leading e-learning company, Xebec McGraw-Hill also shows that there are challenges to be met for the e-learning dream to be fully realised. According to Peter Stokes, the challenge is the connectivity, content and community. For most developing countries, the infrastructure that will enable connectivity is non-existent. Huge amounts of money have to be spent to address the issues of installing the infrastructure as well as maintaining it. Most institutions of higher learning in the African continent are still grappling with the aspect of providing a slow, but reliable e-mail service. The traffic rates for data will obviously determine the load that can be carried as well as the costs. Wireless communication has proven to be an attractive alternative, but learners need to wait a while before it is available. Generally computers and technology need to be updated regularly and as such the option of leasing rather than purchasing has to be explored if the e-learning drive has to be maintained.

Botswana's Efforts
Experiences from other countries suggest that creating an e-learning environment by harnessing ICTs requires progressive thinking and changes in public policy on telecommunications, education technology, human resource development, and resources to enable implementation of such policies. In developing countries such as Botswana, this means that desperately needed resources should be diverted from competing development priorities. There is need for clear justification for expenditure that maps out the anticipated development gains on such expenditure for individual learners and for the country. Above all, it should be demonstrated that investment translates into gains in human development. Recent trends in the

USA and UK have shown that e-business, which really drives e-learning has grown at a very slow pace, much slower than was anticipated when governments in these countries pushed for the establishment of 'universities without walls.' Unlike developed countries that can boast of e-business, the GoB is faced with a situation where it needs to invest in infrastructure, human capacity development and given the small number of learners, invest in development of relevant information within the local context since the role of entrepreneurs is minimal.

NDP9 proposals on education and training outline lifelong learning as "a key component of national human resources development" and "a central element of the education strategy for NDP 9"[9]. The plan also proposes development of a national e-Learning strategy and strengthening the technological infrastructure, in particular the Education Network System so that computer laboratories in schools could be connected to the Internet. The MoE will also pay more attention to the Education Information System, as well as intensify efforts towards acquisition of computer literacy skills at the basic education level[9]. These plans are laudable since it is well understood that ICTs create more content than can be used to enhance learning, both in the classroom, and for lifelong learners. It avails an array of on-line resources that students can use to deepen their understanding of concepts. Also, specialised software in certain subject areas is available, sometimes with on-line interactive tutoring and feedback mechanisms. The other advantage of using on-line education resources is that information can be updated regularly, with the result that students are likely to graduate with the most up-to-date knowledge in their subject area. Also, investing in on-line material is cheaper than buying (science) textbooks for many students, some of which may even be out-of-date as soon as they enter the public domain.

Expanding and improving early childhood care is one of the six EFA goals

One of the most compelling reasons for introducing IT-based learning is its magnanimity with special populations of learners. Students benefit from active self-paced learning. "Assistive technologies" have

8 Milken Exchange, 2000
9 Ministry of Education, 2002

been developed both for students with disabilities, and for gifted students. For students with disabilities, some of which may have physical disabilities which impose limitations in movement, computer-based learning provides an opportunity to learn at their own pace, as well as to communicate with other learners via email, and/or engage in collaborative projects on the Internet. In the case of gifted students, computer resources are tools that they use to explore a subject matter in depth.

It is also true that e-learning and ICT resources are self-empowering in various ways, both for the learners as well as the communities. They provide information and also serve as a window for distributing information. However limited access is a major setback for most that could benefit. Minimal access is due to lack of resources as well as lack of the know-how to explore the available facilities. Botswana has introduced a compulsory computer awareness program for junior secondary school learners and an optional computer studies course for the senior secondary school learners in order to address the access problem. Progress in the first three years of the implementation of these programmes has been limited by deficiencies in both infrastructure and human resources as outlined below:

- The programme has not yet reached all students due to the shortage of teachers who have the necessary competencies[10]. Also, Computer Awareness teachers get their posting to teach their major subjects; hence their Computer Awareness assignment is, in most schools, considered to be secondary.
- The contact time of 40 minutes per week for each student, with no opportunity for additional practice time is not sufficient time for students, given that this is a new subject for most.
- With only one lab with a maximum of 20 computers in each school, and a student computer ratio of 1:50 in some schools, the computer room is almost always occupied with Computer Awareness students, hence other students do not get the opportunity to use the lab.
- The number of students per instructional computer (student computer ratio) is exorbitantly high in all schools.
- An overwhelming majority of teachers in other subject areas are themselves not skilled enough to infuse computer skills into their teaching, even if they so desired.

The desired approach of teaching computer skills through infusion into the curriculum is conceptually sound, but impracticable. Furthermore, there seems to be no plan on the ground to monitor if students acquire the necessary skills at the end of the course, given that the course is non-examinable. Also the intent of the Computer Awareness programme, indeed the overall education technology strategy, seems to be missing the point; ICTs should be deployed in education first and foremost to improve learning; they should not be the content of education. Trends in other countries that have been successful with e-Learning shows that ICTs are being deployed as tools for education. Where there is internet and on-line services, the spin-offs will be acquisition of information seeking and management skills, and the generation of interest in information technology as a career.

Infrastructure as a Lever for Development

As will become clear in Chapter 5 where we capture the ICT infrastructural endowments Botswana possesses, technological infrastructure is one input that critically contributes to the competitiveness of an economy. In the context of developing a development dynamic, it comes in two forms: the necessary infrastructure to deliver education and training, including creating a

platform for life-long learning by the community, as well as an input to enterprise development in the larger economy (by making it easier and cheaper to conduct business).

Educational Infrastructure

As Table 4.2 indicates, there has been some attempt to provide the necessary ICT infrastructure in the public school system. The provision at secondary level has been somewhat accomplished and is improving yearly, where there is a glaring deficiency is at the primary school level. Considering the fact that primary schools exist in all communities in Botswana, if the idea is to encourage life-long learning habits for all citizens the provision of ICTs at primary schools, which will form community resource and access centres, is of an urgent nature. There are mooted intentions to engage the private sector by the MCST in technology provisioning for primary schools, but the urgency of the need means an opportunity is lost to dynamically plant the seeds for this country's future economic wellbeing. All this pre-supposes that the necessary electrical connections exist in schools; but this is not the case. Chapter 5 is testimony to the fact that much more needs to be done to bring schools into the information age.

ICT Infrastructure in the Broader Economy

The deployment of technology in schools will assure a multiplier effect in the economy through a number of streams: first learners will be availed the opportunity to tap into the rich resource that the Internet provides, with the added benefit of graduating students who have current skills that add to the country's knowledge base. This encounter with the internet should equally generate curiosity in the minds of users who could then use the platform as an exploration deck, as they navigate the rough waters of employment, further education and hopefully, enterprise development.

On the other hand by deploying ICTs in schools, they could be the seeds for community access centres and resource libraries,[11] which will not only guarantee life-long learning opportunities for the broader public, but more importantly bring technology within reach of the important but technologically disempowered SMME sector. By investing in technology in schools, to match the impressive overall ICT infrastructure in the broader economy (as will become clear in Chapter 5) the Government could sow the seeds for "eternal harvesting" as innovation and entrepreneurship can be nurtured and sustained by increasing access to information. Thus if Botswana is to prosper in the future, then there must be aggressive investment in educational infrastructure, particularly technological, to provide access and a platform for mostly rural communities and other urban poor families and enterprises that need the requisite leg-up to lead meaningful lives.

But provisioning of technology into the school system, by itself, will not be a sufficient stimulus to creating a development dynamic for Botswana. To be relevant, the ICT deployment in schools must the seedbed of activity for access and use by the communes in which these schools are located. It is only by making this platform available for use as a resource and business support tool for the wider community that a dynamic contribution to the wellbeing of these communities, necessary to ensure they can meaningfully participate in the economic life of the country, will be assured. Even this will not of its own suffice. We have indicated that to prosper a country needs to entrepreneurial flair in its citizens, and argued that Botswana needs to put in place a training and support scheme for entrepreneurship. Combining this training with ICT deployment to the remotest parts of rural Botswana will create a wider pool of entrepreneurs upon whom the future of this country depends.

---

10 Molopolole College of Education is the only college that trains teachers in Computing as a minor teaching subject. To date the programme has graduated about 120 teachers who have been deployed to the junior schools. Unfortunately, some of the teachers have been deployed to schools that are not yet equipped for the

CA course.
11 (whether along the Senegal or South African teleaccess centre models, United Nations Development Programme Human Development Report 2001)

Botswana must equally join the international entrepreneurship monitoring programs to allow her to measure and compare her level of activity against the best performers in the world, and thus use this as a yardstick to focus further interventions to not get left behind by the competition.

ENTREPRENEURSHIP

NFTE's mission is to teach entrepreneurship to low-income young people, ages eleven through eighteen, so they can become economically productive members of society by improving their academic, business, technology and life skills.

-The National Foundation For Teaching Entrepreneurship[12]

The leading economic thinkers have always held that entrepreneurship in a given country determines its position in the global world and the quality of the life of its citizens. Starting from this standpoint, one wishes to interrogate whether or not Botswana as a country has enough enterprising minds to guarantee its sustained growth in the highly competitive globalised market place. The country has, as has already been acknowledged in the first chapter, done very well economically over the last two or more decades. By all measures of development, such as child mortalities, educational achievements, GDP per capita, life expectancy at birth etc., it has surpassed many nations and achieved much by evolving from one of the world's poorest countries to its current middle income status. The mineral led rapid development that the country has experienced is certainly in danger unless other "engines of economic growth" are found urgently. Technology, particularly ICT can be used to jump start this process of diversification away from diamond mining to an economy based on the skills and creativity of its citizenry.

Although no base-line data exists to indicate the level of entrepreneurship in Botswana, it is safe to assert that there is very little of it in the broader economy. Some anecdotal evidence can be garnered from the list of unsuccessful attempts of the Government subsidy programs such as the FAP and SMME, which have not led to sustained, manufacturing based companies, despite the focus of some of these schemes, in particular the FAP. A more recent scheme, CEDA, which in a break from the past where finance was advanced freely or on a shared basis (with government footing most of the cost), gives loan capital to any enterprise that can show it is profitable. The only concession being that the interest rate charged is below market rates. Even with this new scheme, there are no ground-breaking ideas coming forth other than copycat projects that have resulted in overflooding in some sectors since disbursement of CEDA. The number of new and operating companies is also unimpressive, although, since CEDA, more people are registering private companies or trade names. Thus Botswana urgently needs to develop and encourage an entrepreneurial culture and approach which is critical for economic growth desparately needed to maintain and improve the sustained current livelihoods.

Isolated attempts have been made to encourage just such a process, but these have been through local chapter of international associations (mostly for students) such as AISEC[13], Student in Free Enterprise (SIFE) at the UB, Junior Achievement Botswana (JAB) and similar initiatives. No national framework has been put in place to develop entrepreneurship, and worse still in the ICT field. The National Commission for Science and Technology (NCST) has recently at a workshop tasked itself with encouraging entrepreneurship in technology through a process of incubators and innovations centres. Even this noble idea is a few years from being

piloted, let alone started meaningfully at a national level. But the example of the bar owner in Matenge village who is also operating a mobile phone battery charging service, is a practice that is replicated all-over rural Botswana where households with electricity connections in small vallages, indicates there are pockets of enterprise that require more structured support and training system to flourish and contribute to the unfulfilled national desire for economic diversification.

Putting an entrepreneurship training and support framework in place is a necessary but by no means adequate nor a sufficient step. To be competitive, Botswana must join the international mechanism where the level of entrepreneurship at both the firm and economy level is measured and compared. The global entrepreneurship monitor (GEM) is one such network that should give an indication of where Botswana is compared to leading countries such as Uganda and Venezuela in the developing world, or USA, Austria and Ireland amongst developed nations where entrepreneurship is vigorous and an important contributor to economic growth. Following the findings of this Report, Botswana could learn two important lessons:

1. Availing money will not solve lack of entrepreneurship problem as the report says,, "although financial support is identified as one of the main problems facing entrepreneurs in South Africa, this does not seem to account for why South Africa's rate of entrepreneurial activity is so much lower than in other developing countries".
2. If the education and training system is not geared towards developing an entrepreneurial society, then it should not come as a shock that despite an enabling socio-economic setup, no active entrepreneurial activity takes place: "overall, therefore, issues relating to skills and capacity and the failure of the education and training system to develop these (entrepreneurial skills) remain an important factor limiting entrepreneurial activity according to experts…".

Botswana must thus heed the overall conclusions of this study particularly on the policy front: "Two priorities seem to stand out. Firstly, changes in the school education system are required to raise entrepreneurial awareness and create a good grounding in basic financial and businesses skills. Secondly, effective training in specific financial administrative skills is required on a fairly large scale amongst existing entrepreneurs"[14].

To Botswana's credit, schemes such as the Integrated Field Services (IFS), that provide technical support to SMEs in their localities have been put in place. Enterprise Botswana, on the other hand provided entrepreneurs with business/management training as part of supporting entrepreneurship in the country. These two organs have recently been merged together with the former Small Business Promotion Agency (SBPA) and rationalised into two agencies: the Small Business Council (SBC) as the policy advisory arm and the Local Enterprise Authority (LEA) whose mandate is to promote the development of a vibrant SMME sector. Whether these new organisations will deliver and usher in new and successful enterprises, is yet to be seen.

TRADE AND INVESTMENT

Botswana is a country with a very small population. According to analysis by Jeffrey Sachs, Botswana falls into the third group of countries that is home to more than one and half billion people who are technologically excluded. These countries include much of the Andean region, most of Sub-Saharan Africa and a very good part of Central and South Asia. Botswana's foreign direct investment, as a

12 www.nfte.com
13 AISEC
14 Global Entrepreneurship Monitor, South African Executive Report 2003,
http://www.gemconsortium.org/download/1086537011812/GEM%202003%20Update.pdf

mineral driven economy, depends mostly on its diamond industry. Therefore even though it is the largest producer of diamonds in the world, by virtue of the nature the industry, there are no technological spin-offs to other sectors of the economy.

In assessing the extent of trade and investment in Botswana, it is necessary to acknowledge the limitations associated with a small population. In highly populated countries like the USA, the need by government to address critical issues in sectors such as health, agriculture and the environment, results in intensive investment that encourage innovation. The need for S&T to address and provide public goods is in itself an important lever of development.

It is generally accepted that for technologically excluded countries, innovation systems are failing in many respects. There is no provision of public services as the Governments are mostly cash strapped. In contrast, this is not the case for Botswana, where investment has been made in many areas of the economy. For example, there are dedicated laboratories to deal with water quality (through Department of water affairs), food (national food technology research centre), health (HIV/AIDS laboratory), environment (National Environment laboratory) and to ascertain the quality of imported goods. The Botswana Bureau of Standards (BOBS) whose mandate it is to ascertain this quality will soon be moving into dedicated offices with laboratories equipped with state of the art facilities and instrumentation.

According to Sachs, the absence of scientific capability in the non-government sectors of the poorest countries, and the lack of purchasing power by governments in these countries, are critical elements of the technological stagnation and isolation of the world's poorest countries. Since technological innovation is a process of increasing returns to scale, in the sense that new discoveries depend on a culture of innovation, and that the scope of the market is itself an incentive for innovation, this presents a difficult scenario for excluded countries. For any development that is driven by S&T, there should be cost returns for direct investment. The cost return should be experienced in terms of the quality of life the researchers live if they are to remain in their own country, and also that there should be enough units sold to cover the initial investment. Because S&T is market driven and also somewhat ecologically dependent, to keep the development dynamic, Botswana must explore further ways of trading in and attracting investment in S&T, particularly ICTs. As will be discussed in Chapter 5, the massive investment in HIV/AIDS research and intervention programs should be an example the country could use to trade out of the expertise generated. The response of the international community to this crisis has formed the necessary technology and knowledge transfer for the development of a native base for the future.