ICT for education: achieving the goals of PNG Vision 2050

Joseph Kim
Peter K. Anderson

Abstract

The PNG Vision 2050 is the overarching development roadmap by the government of Papua New Guinea which delineates the overall development goals. Through partnership between relevant stakeholders, ICT[1] could be used to provide education to the school population regardless of their location. The technology is available to realize this goal, given good leadership collaboration and cooperation between stakeholders. Partnership arrangements will result in benefits in terms of the sharing of costs and rewards, experiences and knowledge which will elevate public good by fulfilling the educational goals stipulated in the PNG Vision 2050. An example of such partnership in action and ensuing benefits is provided by the functioning of PNGARNet for the PNG tertiary sector.

Key words: Catholic, church and other education agencies, globalization, partnership, PNG Vision 2050, Information Communication Technology (ICT), pedagogy, content/curriculum, PNGARNet, course management systems

Introduction

The evolution and advances in ICTs interconnect the world electronically thereby accelerating the process of globalization which manifests itself in a multitude of ways making living in the 21st century very competitive and challenging (Singer, 2003). One possible consequence is that, with the emergence of new economic forces driven by globalization and ICT and their influence on the world economy, nations that are relatively small, weak, and impoverished will be further marginalized, making it even more difficult for them to compete (Yunus, 2007) on a global level.

In recognition of this reality, PNG needs to act now to capitalize on available opportunities and avoid being further marginalized by globalization. The recognition of the globalization phenomenon particularly through high level development strategic plans such as the PNG Vision 2050 is important to raise awareness and develop carefully thought out strategies.

[1] ICT, the acronym stands for Information Communication Technology and includes hardware, systems and processes for creating, storing, managing and sharing information (PNG ICT Policy, 2008).

This paper will argue that an educated and knowledgeable population is empowered to face the challenges of an increasingly globalized world. Moreover, ICTs can play a pivotal role at the various layers of the education system in PNG. The effort of PNGARNet to introduce ICT in learning and education is harmonious with the objectives of the Millennium Development Goals (MDG) and the World Summit on Information Society (WSIS) to promote ICT as the tool to achieve enhanced education targets.

The literacy and numeracy problems (Figure 1) in PNG persist for many reasons[2] but even for students attending schools, the quality of available learning materials is limited. Also many teachers are not consistently re-trained to keep up to date with changes in curriculum and even the subject matter. "The education system is in need of quality teachers to effectively teach and to implement the reform curriculum and its educational plans and policies" (Kukari et al., 2008).

In the rural areas of PNG, the problem is further aggravated by the lack of quality teachers, library facilities and necessary resources to support quality learning and education (Passingan, 2010). Students lack the opportunity to develop a culture of creative use of resources to further strengthen their learning and education abilities using ICT. We explore the possibilities for partnerships between the educational and government agencies to alleviate this problem through the use of ICT.

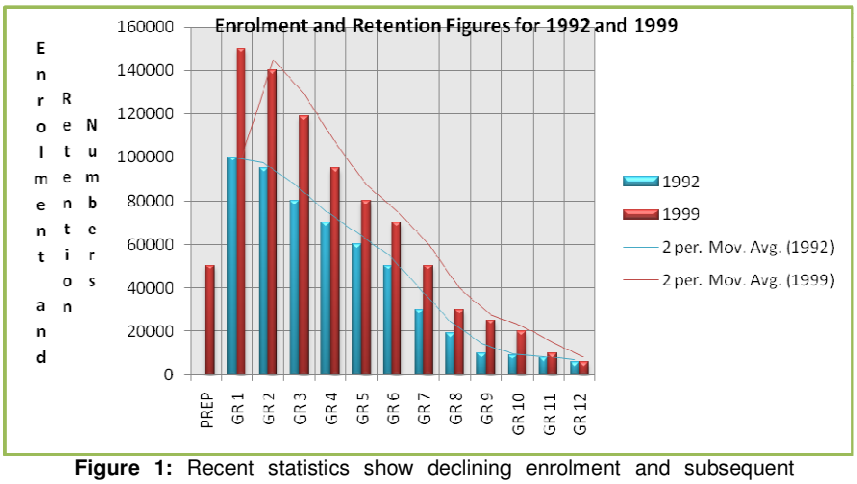

Figure 1: Recent statistics show declining enrolment and subsequent retention rates of students as they progress from Prep onwards to Grade 12. The retention rates for years 1992 (blue) and 1999 (brown) are shown. If these trends continue it will be impossible to have an adequately educated and empowered population and the society as a whole and the citizens themselves will not be able to sustain themselves becoming increasingly marginalized in the face of globalization.

[2] State of Education Report, 2002, p. 18

Divine Word University (DWU) with its involvement in the PNGARNET initiative has acquired much experience with respect to the use of ICT in teaching and learning. Developing a culture of meaningful learning and education using the available body of information, and content such as e-granary through ICT could be a well worthwhile initiative.

> *'I believe the biggest developmental challenge facing our nation after 32 years of political independence is the education gap',* (Madang Governor, Sir Arnold Amet, 2007).

Literature review

It has been proposed that ICT can bring education, knowledge, and skill training to the poor in a very friendly way. Yunus (2007) describes the difficulty, cost, and inconvenience of bringing teachers, consultants, and other suppliers of outside expertise into remote villages served by inadequate roads. For many purposes, the Internet can eliminate such barriers, making it possible for exchange of information and knowledge between experts in distant locations and ordinary villagers in the remote villages of Bangladesh (Yunus, 2007). Hence ICT can play an important role in education, knowledge and skill training.

The provision of a relevant, affordable and quality education for all in PNG remains a major challenge for the government, its line agencies, and its development partners (Kukari, Paraide, & Kippel 2008). Instead an elitist system of education seems to be an evolving which rewards the academically gifted few while suppressing, alienating, discriminating against, and marginalizing the majority particularly the disadvantaged, girls and women, the poor, and the underprivileged. While Kukari et al. (2008) do not make reference to ICT for education in PNG reference is made to declining state of education generally.

Educating students who excel in Mathematics, Science, English, History, Civics and the Arts at every level is critical to the competitiveness of all. The government needs to emphasize the importance of technology literacy to ensure that all public school children are equipped with the necessary skills to succeed in the 21st century economy (Obama, 2008). The emphasis of President Obama's election campaign was on the use of technology in the education system value chain to improve the quality of education necessary to empower the citizens to face the challenges of a highly globalized world.

Benefits of ICT to PNG

Benefits of ICT from the perspective of education and learning include the ubiquitous nature and high speed availability of information and content which can be harnessed by mitigating distance/time barriers (ITU News, 2008). ICT also has huge information gathering, storage, transmission and exchange capabilities, a useful feature for research and learning. The rugged geographical terrain and related challenges of PNG can be overcome through

the use of ICT for education purposes. Modern telecommunications and the Internet have the potential to greatly expand education opportunities for all in PNG (MTDS 2005-2010).

Further, the ubiquitous nature of ICT renders itself suitable for collaboration, research and learning anytime, anywhere and can usefully serve even rural/remote areas of PNG. ICT systems and networks can also be designed to be environmentally friendly, in the light of global awareness for a greener environment (IB, 2011).

ICT provides an important link in enhancing the quality of learning including content development and delivery. Many countries around the world such as Korea and Sweden have fully integrated ICT into their schooling systems with successful benefits (ITU News, 2010).

ICT and improvement of education

ICT can play various roles in the education system value chain which can result in an improved quality in education and learning in PNG. For example, PASTEP is involved with AV[3] equipment which helped strengthen teaching methods with the use of overhead projectors and use of computers which are used to write curriculum and assessment among other things (Nongkas, 2007).

ICT can also help in delivering lessons or educational content within and between distinct locations of PNG, a country with challenging terrain, mountains and islands spread over an area of more than 640,000 square km. Moreover, the introduction of ICT in the educational curriculum for schools, colleges and universities can help create a critical mass that could see a greater appreciation of it by the populace in the face of globalization. It is an empowering tool that enhances options and brings the world's knowledge to everyone's doorstep (Yunus, 2007).

The Education Plan 2005-2014

The vision for PNG Education Plan 2005-2014 is to achieve integral human development through an affordable education system that appreciates Christian and traditional values. It also seeks to prepare literate, skilled and healthy citizens by concentrating on the growth and development of each individual's personal viability and character formation, while ensuring all can contribute to the peace and prosperity of the nation (Education Plan 2005-2014). While placing emphasis on financial and policy issues together with the goals, this plan also provides a detailed situational analysis (pp 23-40) and lists many successes and challenges.

Among the successes are: Increases in enrolment by 68% by 2002; Increases in transition rates from Grade 6 to Grade 7 and Grade 8 to Grade 9; Community support for elementary education; Lowering of unit costs due to introduction of

[3] Audio Visual

elementary schools; Transferring of Grades 7 and Grade 8 from secondary to primary schools.

Challenges include: Improving retention through the years of basic education (see figure 1); Improving delivery of education services in rural/remote areas; Strengthening the vocational education and training sector to support appropriate courses; Make better use of partnerships with the private sector and community agencies; Securing adequate government budget support for the reform to manage the enrolment growth; and the drop in quality with growth in school population.

Against the backdrop of these successes and challenges, the Education Plan 2005-2014 further identifies pressure on infrastructure, teacher numbers, teacher training, materials development and distribution and the capacity of all levels of the system to monitor and administer the education reform, as well as greater community and parental demands for access to education.

This proposes that through partnerships arrangements between relevant stakeholders and the use of ICT in the value chain of the education system, the quality of education can be improved. The use of ICT can positively improve the quality of teaching, learning and the development of relevant content/ curriculum that could be made available in a timely manner to even the rural/remote districts of Papua New Guinea. This requires a paradigm shift that should necessarily harness the ubiquitous nature of ICT services and applications to support pedagogy and content/curriculum[4] development and delivery (Figure 2).

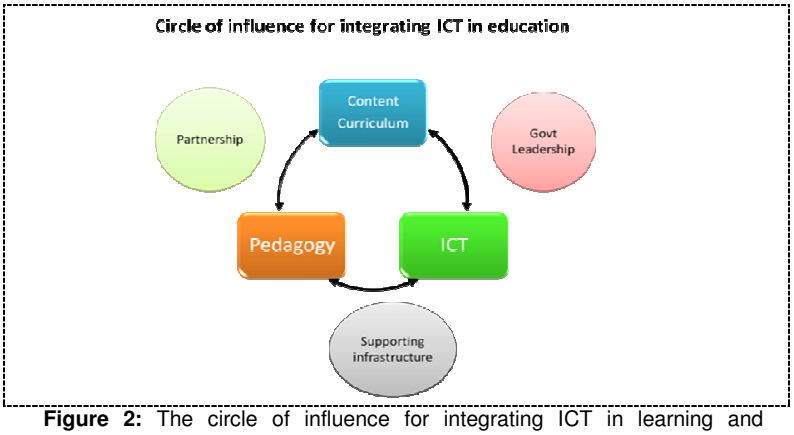

Figure 2: The circle of influence for integrating ICT in learning and education in PNG could enhance teaching, curriculum development and delivery within and between places in the country regardless of where the location is. This can be made possible by harnessing the ubiquitous nature of ICT and given the necessary support by the government leadership through partnership with stakeholders to ensure that the supporting infrastructure is available for the intended purpose.

[4] Curriculum is defined as the subjects comprising a course of study in a School or College (Concise Oxford English Dictionary Eleventh Edition)

With proper planning, ICT can provide high speed connectivity and services for all elements of the education value chain, within and between distinct locations reducing the need for travel, time and other costs. There is a correlation between pedagogy content/curriculum and ICT, with the indispensable elements of influence namely, partnership, government leadership and infrastructure support (Figure 2). It has been found in New Ireland that lack of communication has hampered the process of high school education, not only at the technological level, but also at the bureaucratic level (Tivinarlik, 2000). There is also a need for personnel holding on to top positions to give attention to an efficient way of communicating with all levels of high school education.

Catholic education agency

Catholic education is an important agent of education in PNG and has a proven track record of providing quality education. DWU is a notable tertiary sector example where ICT is an enhancer of pedagogy and curriculum activities. The paperless policy promoted by DWU is a further testimony of its commitment to place ICT at the centre of teaching, learning and content distributions within and between distant locations in PNG. This initiative should be extended to other learning institutions through partnerships with donors, utilities companies, policy and regulatory bodies and other stakeholders.

Nongkas (2007) researched the quality of education experienced in the three Catholic primary teacher's colleges and the finding, consistent across all three colleges, was that the lack of access to ICT impacted on quality of education. It was concluded that the main issues that promoted quality of education were staff qualification, student entry requirements, access to ICT, quality assurance policies, and quality of recent graduates.

Conversely, the issues limiting quality of education were lack of resources, inadequate funding, lack of strategic planning, high staff turnover, poor literacy level of students, over-enrolment of students, uncritical of knowledge and skills. There was also evidence of lecturers from the teachers colleges who used AV equipment, overhead projectors, and computers, which strengthened teaching methods, curriculum development, assessment, and other teaching and learning activities. (Nongkas, 2007)

Medium Term Development Strategy 2005-2010 (MTDS)

The MTDS recognizes literacy, basic numeracy and problem solving skills as key determinants of a person's capacity to take advantage of income-earning opportunities, particularly in rural areas. Education is recognized and accepted as the necessary ingredient for effective nation building as well as a necessary requirement for integral human development. In broad terms, poverty reduction

will be addressed under the MTDS by investing in people through education and health, and by promoting broad-based economic growth[5]

The promotion of economic growth and social development through the use of a vastly improved telecommunications network and a program to bridge the digital divide is mentioned in the MTDS but without the suggestion of a specific correlation between ICT and education. Hence the two agendas are captured as separate agendas without recognizing that ICT can be an enabler of quality education at all levels. This paper argues that improved education can be delivered to the school population regardless of where they live, through the use of ICT as clearly demonstrated through the experiences of PNGARNET.

The Guiding Principle No: 9 of the MTDS relates to empowering Papua New Guineans and Improving Skills which is further expanded to read "To help Papua New Guineans to help themselves through improving access to basic health and education services, information, markets and appropriate technology, with a special focus on the needs of those in the informal sector".

PNG Vision 2050

The PNG Vision 2050 has as its theme that 'we will be a smart, wise, fair, healthy and happy society by 2050'.

The quality of education available to the citizens of PNG will determine to a large extent the success or failure of the 'Human Capital Development, Gender, Youth and People Empowerment' pillar (PNG Vision 2050, p. 5). Using ICT based services and applications the quality of the learning can be greatly enhanced where both teachers and students can benefit from ICT without wasting time, money and effort on outdated learning materials and if utilized effectively, ICT can break down structural, cultural and distance barriers.

It can be noted that while the PNG Vision 2050 recognizes 'quality of education' to citizens of PNG as important, the use of ICT in education can achieve such goals. Hence there is a correlation between ICT, pedagogy and content/curriculum advancement which will necessarily support the goals of the PNG Vision 2050. This is an efficient and effective method of achieving integral human development in this information age (Yunus, 2007). The recognition by all stakeholders that ICT can promote the quality of education can lead to practical efforts through partnerships which is vital for the success of the PNG Vision 2050.

The Millennium Development Goals

PNG is a signatory to the Millennium Development Goals (MDGs), which has eight (8) agendas all of which are directly intertwined with education (Figure 3). In the PNG context education should play a pervasive (or central) role in order to achieve the Millennium Development Goals. The situation is

[5] MTDS 2005-2010, p. 23.

necessitated by the impacts of globalization that manifest themselves in various ways including demands for mobile, highly skilled and knowledge based workers owing to pressures highly competitive job markets. For PNG education is the key to enable and empower citizens to meaningfully participate in a globalized world.

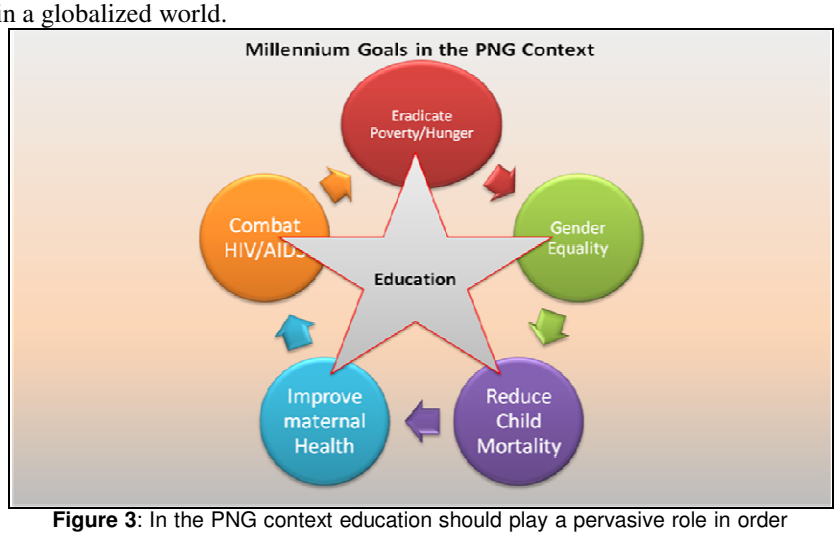

Figure 3: In the PNG context education should play a pervasive role in order to achieve the Millennium Development Goals. The situation is aggravated by the impacts of globalization that manifest in a variety of ways including demands for mobile, highly skilled and knowledge based workers owing to pressures from highly competitive job markets.

Partnerships

The previously mentioned Education Plan also seeks to promote collaboration and partnerships with private education providers, community organizations, church groups, other government organizations, and private entities such as mining companies. Such partnerships can benefit from sharing of experiences and ideas while progressing towards fulfilling the PNG's Vision 2050. Partnerships need to be executed through transparent arrangements because as shown in (Figure 4), such undertakings may overstep into other parties jurisdiction so care should be exercised to ensure that all party's interests are taken into account. 'Possible Partnership Arrangement' where all stakeholders may realize many benefits including CAPEX[6] and OPEX[7] advantages.

[6] Capital Expenditure
[7] Operational Expenditure

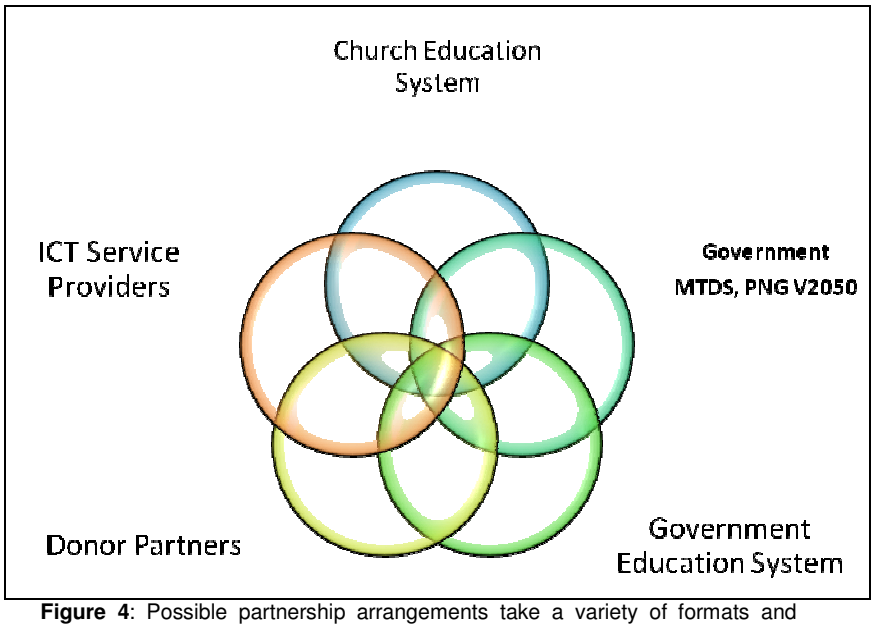

Figure 4: Possible partnership arrangements take a variety of formats and sometimes there will be overlaps or even gaps and the challenge is to make sure that such arrangements are undertaken through thorough consultation so that such initiatives are sustainable in the long term.

There needs to be strong leadership at all levels of the partnerships so that the outcomes are favourable and sustainable. The same is true of partnership arrangements that could be adopted to provide quality education as a collective effort to use ICT for learning and education.

Funding

Critical ICT infrastructure include a high speed backbone network to provide connection within and between towns, districts, schools and more importantly universities and research institutions (Kim, 2009). This infrastructure will require adequate funding and visionary leaders to realise the potential, and to recognize the importance and opportunities that could benefit the public and PNG as a whole. Such leaders could make bold decisions taking into account direct and indirect commercial and social benefits to the respective parties and the country as a whole.

The government has the responsibility to create a forward looking and necessary legal and commercial environment that will encourage the private sector to make the right marketing, technical and commercial mix including finance to undertake such impact projects (Kim, 2009). Given legal and regulatory support, partnerships arrangements can indeed result in a robust ICT infrastructure on which essential e-services can be delivered and enjoyed (figure 5).

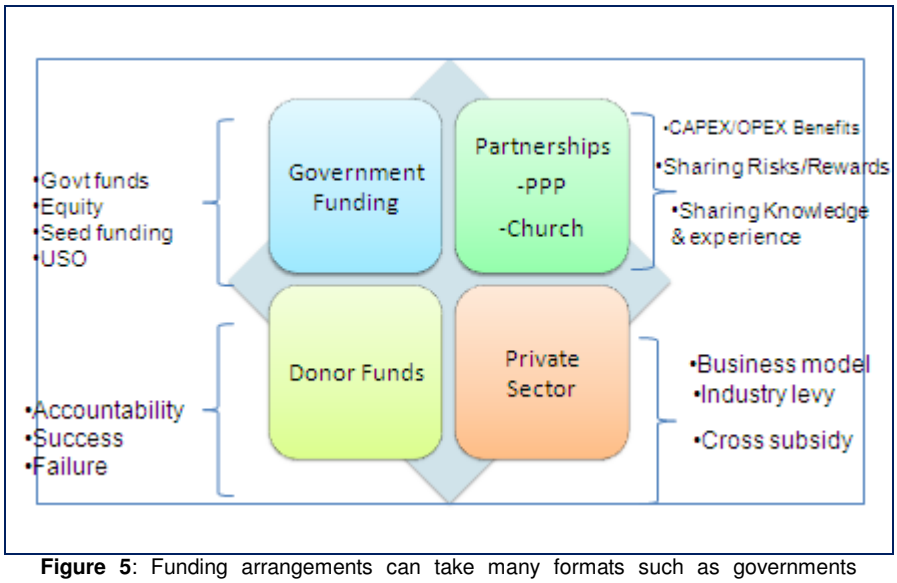

Figure 5: Funding arrangements can take many formats such as governments funding, Public Private, Church, and Community Partnership (PPCCP) which will result in sharing of experiences and knowledge. The private sector can also participate through unique business models. And donor funds have also been known to be successful but there could also be failures if accountability issues appear (Source: Kim, 2009).

Results

From this review of the literature, a number of generalisations can be drawn. In particular the relevance of ICT in pedagogy and curriculum development including delivery of the same within and between distant places in PNG is not given any recognition in major policy documents (MTDS and the Education Plan 2005-2014). We believe that this is a serious omission and efforts must be made to leverage the correlation of ICT, pedagogy, content/curriculum development and delivery at the higher level of the government and other agencies.

Numbers in the education system by grade (Grades 1 and 2 include those in both the elementary and the primary schools) show recent trends of declining school enrolment (Figure 1). Enrolment figures in Grades 7 and 8 include those in both primary and secondary schools. The huge rise in Grade 1 enrolment is noted including the continuing evidence of large drop out rates through the primary cycle of education.

Retention issues compounded by the lack of delivery of education services in rural/remote areas and the drop in quality of education with growth in school population is serious enough to warrant a creative solution such as the proliferation of ICT usage in the education system value chain. With reference to the situation report on the Education Plan, the preceding issues will impart pressure on infrastructure, teacher numbers, teacher education, material development and distribution. Added to this is the capacity of all levels of the

system to monitor and administer the education reform and the greater community and parental demands for access to education. In all these elements, there is a direct role that ICT can play in support of the mitigation efforts on these issues.

Tertiary sector ICT implementation

As an example of successful partnership in action we discuss the present and potential educational and other benefits arising from PNGARNet[8] developed by a consortium of PNG universities and research institutes.

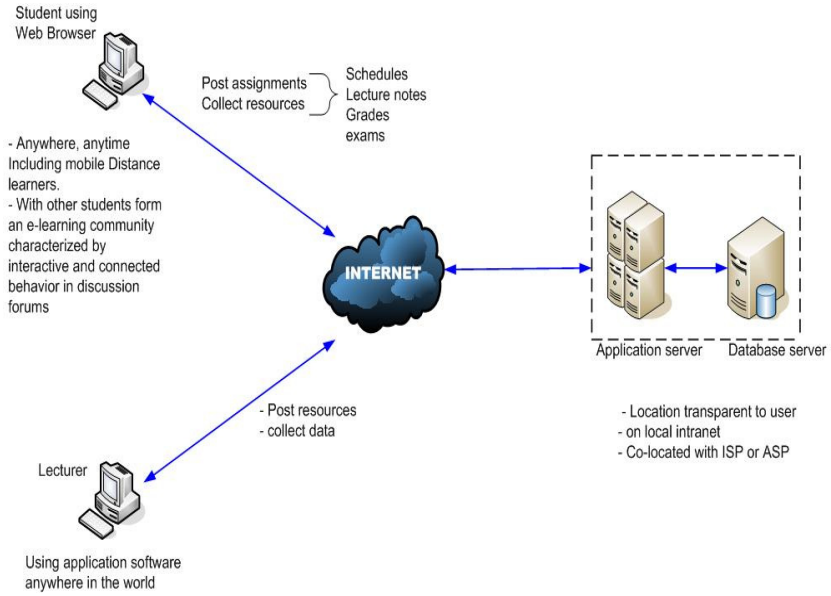

Figure 6 E-learning communities use the Internet or a consortium based Academic Research Network for linking and providing interaction between lecturer and students, and students with students on an anywhere and anytime basis. This enables sharing of resources such as lecture notes, posting assignments, student assessment and lecturer feedback. Access to application and database servers can also be provided.

Very Small Aperture Terminals (VSAT) are being used in satellite communication systems to link local area educational networks via communication satellites in the PNG tertiary sector. Such networks can be established and utilized to transfer audio-visual information and so can be exploited for both interactive teaching and video conferencing. Since it can be utilized without requiring any special training, it is a very effective and uncomplicated system.

[8] Papua New Guinea Academic and Research Network. See Anderson, 2009 for a technical description.

Satellite technology and the Internet play an important role in bridging the distance barrier between educators and students, who may be geographically dispersed in distant locations. Today, satellite and Internet technologies play a key role enabling quality education to be delivered to multiple locations.

Students are able to see and hear their teacher make a prepared electronic presentation using a blackboard or whiteboard as required. The teachers and students can interact over a voice channel thereby simulating an actual classroom.

E-learning course management

Given sufficient bandwidth, e-Learning can be used to improve education. Web Based E-Learning is used to supplement lecture room instruction. Creative use of technology enables educators to perform old tasks more efficiently (e.g. administer tests) and new tasks yet to be discovered. It has the potential to make learning resources available to more students such as those not able to be physically present at classes.

As well as enhancing on-campus learning, this new technology has the potential to vastly improve distance learning. Readily available Course Management Software[9] (CMS) enables instructors to post lecture notes electronically, send unit administration communications, receive and return assignments, and provide on-line testing (Figure 6).

Accessing library databases

It should be possible to conceive of expensive university library collections, when aggregated, as a national resource. This may be achieved by the central provision of a single catalogue for searching all collections, access for all to catalogues supplied by each institution, inter-library loans to avoid unnecessary duplication of specialised resources, requests for text data which could be scanned and forwarded by email, and shared access to full-text databases of journal material.

Web sites

Web sites enable staff and students to publish information about themselves, including their academic and other interests. By publishing areas of expertise, the knowledge of the whole PNG-wide academic community may be located and accessed thereby taking advantage of the newly recognized field of knowledge management. In particular, provision should exist for students and staff to host their own web sites, a PNG wide student portal with the potential

[9] An example of public domain CMS is the *Modular Object-Oriented Dynamic Learning Environment* (MOODLE). Moodle is designed to assist in the development of online courses with opportunities for rich interaction. It comes with an open source license and modular design thus allowing the development of additional functionality

to expand student knowledge and use of this vast resource, and positioning of online surveys forms for researchers.

Videoconferencing

Videoconferencing allows transmission of a visual and a voice channel communications between distant locations. This has the potential to enable students in a classroom or conference participants to function in a simulated wider learning environment. As well as vastly enhancing distance education, videoconferencing will enable discussion between groups of collaborative researchers, planning for joint projects, replication of an instructional environment in distant locations, education for those unable to travel for whatever reasons, particularly for costs involved in travel, and the linking of diverse sectors such as government and academia.

Other benefits

E-Learning services such as those provided by PNGARNet will develop and grow as its advantages become more familiar and are better understood. Creative minds will explore, in the years to come, presently undreamt of uses of a technology still in its early stages. In the first instance, it is intended to provide the following services: email for all users, Internet access for all users including access to full text databases, and shared data stores and collaborations with other universities of the South Pacific.

Further services, as technologies mature and on-site equipment becomes available, include real-time videoconferencing, real-time online research capacity, and access to more powerful computers.

Advantages to all PNG OHE institutions

By way of summary, it may be observed that the overall advantages to participating institutions and their members include: access to databases at reduced cost as consortium member, shared research projects and inter-institution partnerships, increased professional communications both within PNG and internationally, reduced costs to each institution, and increased facility for PNG academics to be represented and active internationally.

National benefits

Backbone networks for education will greatly elevate the level of computer literacy of all staff and students at PNG institutions of learning thereby reducing the digital divide. Students, later to become leading citizens in all walks of life, will be exposed to state-of-the-art technology and information communication techniques. In particular, national capacity will be developed by means of: e-Learning centres for Government and non-government sectors, health online consultancies, services to Provincial centres, services to local communities, and data gathering services (e.g. schooling, Police service)

Summary

ICT, pedagogy, curriculum development and delivery, within and between locations in PNG for improved education, will positively contribute towards integral human development which is important and necessary in achieving the goals of PNG Vision 2050. Without an adequately educated population, the theme of the PNG vision 2050 will continue to be a wishful dream.

Hence through partnerships between stakeholders and using ICT in the value chain of the education system, the quality of teaching, learning and the development of relevant content/ curriculum could be enhanced and made available and accessible to the school population regardless of location. This requires a paradigm shift in thinking to harness the ubiquitous nature of ICT services and applications to support pedagogy and content/curriculum development and delivery.

Whereas the PNG Vision 2050 is the overall national guide, the supplementary strategies such as the MTDS 2005-2010 and the Education Plan 2005-2014 fail to capture the correlation between ICT, pedagogy and curriculum. Leverage of this important correlation is urgently required especially among bureaucrats and high level policy makers. The serious decline in retention rates in school populations (Figure 1) may indicate, among other things, that students may be loosing interest in learning. If this is so, ICT, pedagogy, content or relevant curriculum may have the potential to provide creative and entertaining learning for students and thereby improve retention rates.

Conclusion

The effectiveness of ICT as a tool for the enhancement of learning and education through partnership programs in the light of PNG's Vision 2050 and developments in the tertiary sector deserves to be recognized by all stakeholders. Given the relevant legislative, policy support and through partnerships, ICT services and applications can provide quality education regardless of location. The ruggedness and geographically challenging PNG environment presents unique challenges to select solution from a wide range of proven ICT services and applications. Forward looking leadership that fully appreciates the goals of the PNG Vision 2050 and one that can champion a holistic plan for the intended purposes is required. Quality education is a critical component in empowering the citizens of PNG to face the challenges and opportunities brought about by globalization.

Much has been said about learning material in electronic form, either as developed lecture material or material posted on the Internet. Because of the lack of permanence and lack of peer review of much of this material, and because of its availability only when the user has access to a computer terminal, data in electronic form can never be assumed to be a replacement for hard copy printed material traditionally housed in university libraries.

Finally, it should be noted that there will always be need for ongoing expert technical support for system maintenance. This will not come easily and will cost money. Equipment failure will always be with us. Satellites have a life expectancy of around 15 years and PCs of no more than five years.

Acknowledgements

This paper originated in a presentation made by Joseph Kim at the Catholic Education Convention "*Churches education and partnerships*" held at Divine Word University 28 March - 1 April 2011.

References

Anderson, P.K. (2009). Satellite communication for PNG universities and research institutes: A new design. *Contemporary PNG Studies DWU Research Journal, 11. Pp.* 1-19. Madang: DWU Press.

Department of National Planning and Monitoring (2004). *The medium term development strategy 2005-2010, 'Our plan for economic and social advancement'*. Port Moresby: Department of National Planning and Monitoring.

Department of Prime Minister and NEC (2009). *Papua New Guinea Vision 2050, 'We will be a smart, wise, fair, healthy and happy society by 2050'*, Port Moresby: Department of Prime Minister.

Department of Education (2002). *The state of education in Papua New Guinea.* Port Moresby: Education Reform Facilitating and Monitoring Unit.

Department of Education (2004). *National Plan for Education 2005-2014, 'Achieving a better future'*. Port Moresby: Department of Education.

Department of Information and Communication (2008). *The Papua New Guinea national ICT policy.* Port Moresby: Department of Information and Communication.

Dodd, A. Z. (2005). *Essential guide to telecommunications (4th ed.)* NJ: Prentice Hall.

Kim, J. (2009). *Delivering broadband connectivity in rural areas.* A paper presented at Commonwealth Telecommunication Organization (CTO) Seminar. Nadi, Fiji.

Kukari A. (2009). Education decentralization in Papua New Guinea. *Papua New Guinea Year Book,* p. 98.

Kukari, A, Paraide, P. & Kippel, L. (2008). Education achievements and challenges. *Papua New Guinea Year Book,* p.60.

Nongkas C. (2007). *Leading education change in primary teacher education: A PNG study*. Unpublished doctoral dissertation, Australian Catholic University, Fitzroy.

Obama for America (2008). *Change we can believe in: Barrack obama's plan to renew America's promise*. New York: Three Rivers Press.

Passingan-Ngatapai, P. (2010). *Head teacher leadership in primary schools: A study of rural and remote Papua New Guinea*. Unpublished doctoral dissertation, Divine Word University, Madang.

Singer, P. (2002). *One world: The ethics of globalization*. Melbourne: Text Publishing.

Tivinarlik, A. (2000). *Leadership styles of New Ireland high school administrators: A Papua New Guinea study*. Unpublished doctoral dissertation, Iowa University, USA.

Yunus, M. (2003). *Banker to the poor: Micro-lending and the battle against world poverty.* New York: Public Affairs.

Yunus, M. (2007). *Creating a world without poverty: Social business and the future of capitalism*. New York: Public Affairs.

Authors

Joseph Kim Suwamaru M Eng Sc
PhD Doctoral Student
Formerly PANGTEL PNG
Divine Word University
Email: jkim@student.dwu.ac.pg

Peter K. Anderson PhD
Senior Lecturer
Head, Department of Information Systems
Divine Word University
Email: panderson@dwu.ac.pg