Public Private Partnership in Building ICT Infrastructure: Its Potential for Higher Learning Institutions in Developing Nations

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Abstract: *Integration of ICT into the teaching-learning process of higher education is important for enhancing educational quality through facilitating access to educational materials and knowledge as well as online services. Higher learning institutions (HLIs) in developing nations have critical capacity limitations in the areas of building ICT infrastructure that supports their growing demand for providing ICT based services. This created problem of digital divide among students in higher learning institutions as compared to that of global HLIs. Public Private Partnerships (PPPs) provide significant benefits in terms of leveraging joint resources, respective competences and strengths for building and availing a shared ICT infrastructure that ensures equitable access to digital technologies and high quality educational resources. PPP models adopted for such educational initiatives differ from the models that have been used for large infrastructure projects. The purpose of this study was therefore, to identify possible areas of public private partnerships and underlying principles in building and creating equitable access to ICT infrastructure in educational institutions.*

1. Introduction

Education is the key for developing human capital, improving productivity and promoting economic growth. It has always been regarded as an area of strategic investment for countries. Sarvi, et al. (2015) argued that the concept of Public Private Partnerships (PPPs) has been expanded to include sectors such as education. Typical examples stated by the authors include building school infrastructure (Philippines), managing schools (United Kingdom), and designing innovations in educational technology such as low-cost devices (India) (Ibid.).

Innovations in information and communication technology (ICT) are recognized as an important option for increasing access to education and for providing high-quality learning materials and experiences (Sarvi, et al., 2015). Increasing demand to adopt ICT supported education services or e-education outweighs the capacity of governments. E-Education is dependent on having good ICT infrastructure and high-quality connectivity. Due to lack of infrastructure and limited budget for acquiring and maintaining it

governments in several parts of the world are developing mutual and innovative partnerships with the private sector. Public Private Partnerships (PPPs) have become more significant, largely because of the huge capital costs and new types of expertise associated with e-education interventions. Such innovative partnership with the private sector leverage the flourishing technical expertise, capital, project management capability and technology of the private sector in integration of ICT in education. The partnership is vital for financing and building ICT infrastructure, developing applications and locally relevant content, and developing the human capacity required for harnessing the full capacity of ICT productive tools. It is also believed that such partnership plays key role in expanding equitable access to quality education and improving learning outcomes with lower costs. In developing countries private sector's support is necessity rather than an alternative due to excess demand and limited capacity. It is also believed that PPPs may have the potential to solve sub-Saharan Africa's profound infrastructure and service backlogs (Farlam, 2005).

The purpose is increasing the system of efficiency, effectiveness, quality, equity and accountability of services and enabling students to gain access to a higher standard of education in better and safer conditions. In a joint venture, the government jointly invests in developing information technology (IT) infrastructure with private sector partners and either jointly runs the project with the private sector or outsources the management of the infrastructure with caveats in place to ensure equity and quality of service provision. But PPP in education is still naïve area. Unfortunately, University education which is the primary provider of high caliber human capital and the key to Africa's technological advancement has not been benefitting from PPPs. The purpose of this study was therefore, to identify possible areas of public private partnerships and underlying principles in building and creating equitable access to ICT infrastructure by taking higher education institutions in developing nations as a context.

2. Literature Background

2.1 The Concept of PPP

Public private partnership (PPP) is a collaboration of public and private actors working together towards achieving a joint target through leveraging joint resources and capitalizing on the respective competences and strengths

as well as complementary expertise in both for the cooperative provision of services (Jamali, 2004). It is seen as a way of involving the private sector in projects of national importance. The private sector is more competitive and efficient in economic terms while the public sector is more responsible and accountable to society (Ibid.). The private party also assumes substantial financial, technical and operational risk in the design, financing, building and operation of a project (Ibid.). The private operator offers technical expertise and provides viable financial arrangements for the project, and bears the associated operational risks (Farlam, 2005). For PPP to be successful both the private and the public sector should jointly define specific goals, a clear assignment of responsibilities and areas of competence and should agree on the mutual advantages they can gain from the partnership (Jamali, 2004). For the public sector improved performance, cost-efficiencies, better service provision & appropriate allocation of risks and responsibilities could be the key advantages (Ibid.).

In the case of the private actor, the expected advantage could be better investment potential, financial compensation from the government for the delivery of the service or a good return on investment, collecting fees from users, revenue sharing with the government or a combination of the three options (Farlam, 2005; Jamali, 2004). Partnerships are high-risk strategies, particularly at the level of implementation, but that the advantages/mutual benefits in case of success by far outweigh the risks involved (Jamali, 2004). Therefore, the roles of the private and public partner are more of complementary and mutually supportive promoting a synergistic combination of the strengths, resources and expertise of the different sectors. Identifying common goals, delineating responsibilities, negotiating expectations and building bridges including common working practices are the major focuses of PPPs (Ibid).

PPP is a continuum between fully public and fully private which constitutes different forms of agreements or schemes including managed contracts, lease agreements, joint ventures, build-operate-transfer schemes, build-operate-own schemes, and concession agreements. In service contracts both parties take the responsibility of operations and maintenance while providing various services. In the management contract, the private sector takes the responsibility of providing managerial services and operational

responsibility. Lease contract refers to using government property for specified period and rent by the private partner. In concession agreement the government specifies the rules under which the company operate locally (Jamali, 2004; Farlam, 2005). The entire relationship qualifies as a partnership if it involves the joint definition of specific goals and a clear assignment of responsibilities and areas of competence between the partners in the pursuit of a common endeavor, which is public good (Jamali, 2004). Payment could involve the institution paying the private party for the delivery of the service; or the private party collecting fees or charges from users of the service; or a combination of these (Farlam, 2005). PPP can contribute in the areas of increasing access to education; increasing the quality of services from the public sector by concentrating more on their core functions; increasing effectiveness and innovation in education delivery; positively influencing capacity building and governance in the public sector (enhancing knowledge, capabilities and innovation); enabling much greater flexibility and innovation in education delivery and ensuring sustainability in case where the government is not strong enough (McGrath, 2015).

2.2 The Role of PPP in Building ICT Infrastructure for Education

PPPs have raised a lot of interest for leveraging private sector involvement in developing and sustaining public infrastructure and services including telecommunications, ports, eco-tourism and energy projects (Sarvi, et al., 2015; Farlam, 2005). The government is jointly investing in developing information technology (IT) infrastructure with private sector partners. PPPs have become more significant, largely because of the huge capital costs and new types of expertise associated with ICT based interventions. Huge capital is required to build and provide access to high quality connectivity. The partnership is either by jointly running the project with the private sector or outsourcing the management of the infrastructure with caveats in place to ensure equity and quality of service provision (Sarvi, et al., 2015). ICT investment by the private sector seems to have contributed to growth of the country at large (Kuppusamy, et al., 2009) and specific to education sector. PPP extends the potential of ICT as a powerful education multiplier and as a means to deliver innovative educational services to all levels and types of education (Sarvi, et al., 2015). PPPs in ICT for education have the potential to leverage finance, technical expertise, and e-learning resources from the

private sector (Ibid.). It can play a vital role in mobilizing the scale of resources required for financing and building ICT infrastructure, developing applications and locally relevant content, and developing the human capacity required for harnessing the full capacity of ICT productive tools (Pillay and Hearn, 2010). The expected benefits of PPPs include better access to private finance for expanding services, clear objectives, new ideas, flexibility, better planning and improved incentives for competitive advantage (Jamali, 2004). Support from the private sector can be leveraged to enable the sharing of resources to overcome such obstacles as limited funds and lack of technical expertise and project management capacities in ICT integration in education (Pillay and Hearn, 2010).

3. Lessons from PPP Initiatives in Building ICT Infrastructure

3.1 Collaboration Mechanisms

The key areas of PPP in ICT for education may be broadly classified as investment in equipment and infrastructure; application software and e-resources; and human capital that can enhance education service provision. More specifically, Sarvi, et al. (2015) identified the following areas of partnership pertaining to ICT for education services:

- providing connectivity to the education sector to be used for online educational services and web based applications;
- providing application software (HR, Finance, Educational MIS, etc.);
- providing fit-for-purpose online communication systems;
- providing ICT hardware and software for learners, educators and administrators;
- providing learners with access to repositories of digital knowledge and other resources;
- making educational resources, tools, and information electronically accessible for learners and educators to use and adapt; and
- providing learners with access to online, distance learning courses to help them complete subjects, courses, or programs and to meet the growing demand for education;
- offering pre-service and in-service professional development opportunities to educators; school, college, or university managers and administrators;

- managing online professional development systems for educators and administrators;

In India, the government and the private sector created partnership on managing the use of educational technology (ICT) to enhance quality of education in 17,000 schools across India. ICT has been used to develop the capacity of students in ICT skills via computer-aided learning. The private partner invested capital in hardware and services, set up computer laboratories in schools, provided multimedia content, trained teachers in using this ICT learning resource and in managing the laboratory, and conducted overall project monitoring and management. Indian government also partnered with the private sector to provide tablets that costd less than US$ 35 for higher education students. In Samoa the private partner took the responsibility of designing, building, operating, repairing and maintaining School net network and equipment for a period of 3 years.

In Pakistan the private partners were responsible for providing the campus building, computers, and a laboratory with computers. The private partner which is a multi-stakeholder consortium of companies in Philippines took the responsibility of providing access to the Internet to all computer laboratories of public high schools together with the required hardware and software through corporate social responsibility (CSR) funds. The private partners also supported the provision of training teachers on how to do research and teach using the internet, and training for teachers on basic ICT maintenance and troubleshooting. A company called Telkom Indonesia has also provided access to the necessary broadband and internet in the process of building the capacity of teachers through training.

In Australia, the government funded the building of network and invited private companies to invest and provide technical expertise and resources. The share of the private sector ownership constituted 49 percent. The government started with the initial investment of USD $3.4 billion from the expected total project cost of USD $30 billion with the rest to come from private companies and the issuing of government bonds (Zhen-Wei Qiang, 2010). The National PPP Model in Switzerland to connect schools to the Net demonstrated that the Federal government collaborated with provinces and the private sector in order to: a) improve access to free broadband Internet connection; b) to promote the use of ICT in classroom through provision of

computer hardware and software at discounted prices; and c) providing training for teachers for the promotion of ICT in the classroom (Petko). The private sector purely engaged in creating connection to communication infrastructure, building school infrastructure and providing technical support. The public sector was engaged in the provision of training to teachers. Both private and public sectors were engaged in the provision of educational software, in the provision of services and building portal (Petko,).

During the emergence of grid computing the initiative was driven by the private sector. Through collaborative partnerships between private and public sector research and education enterprises, it was possible to provide access to high-quality video conferencing facilities, large-scale distributed meetings and collaboration, and synchronous interactive sessions from multiple locations for research seminars, lectures, tutorials, and training. These technological innovations had the potential to enable large-scale resource sharing and to bring people, computing systems, and information resources together through collaborative partnerships between private and public sector research and education enterprises. The development of Open Access (www.openj-gate.com) as a means of disseminating findings from government-funded research is being supported by Informatics India, a private enterprise. Similar research databases serving the mutual purposes of universities and the private sector exist in the West.

Competitive subsidy or cost-sharing mechanisms are one type of PPP model applied in the expansion of ICT infrastructure. Examples include 20-year concession in France to build and operate a backbone network and to construct a broadband wireless network with the costs being shared between the public and private sectors. The Eastern African Submarine Cable System (EASCY), a project to build a submarine fiber-optic cable that will stretch from South Africa to Sudan with connections to all the countries along its route, is an example of a different type of PPP. EASCY is owned by a consortium of private operators but financed by development finance institutions with no subsidies or support from governments. The partnership has ensured that the cable will be operated on an open-access basis, allowing all operators and service providers in the region to obtain access to affordable capacity by having access to competing cables and providers of capacity (Zhen-Wei Qiang, 2010).

National Research and Education Networks (NRENs) is also another prominent initiative which has been established in many African countries through partnerships and collaboration. The primary mission of an NREN is to act on behalf of the higher education community in providing advanced information technology (IT) and communications services for connecting academic institutions to each other's networks, and to each other's resources, both nationally and globally. It also provides access for their members to academic and scientific resources and to support collaboration in teaching, learning, and research with provision of access to very high bandwidth. Through this infrastructure consortium of Universities conduct bulk purchase of commodity Internet access from ISPs, software licenses, library subscriptions, cloud computing services, and even computing hardware.

The NRENs are being established through partnerships among universities and research institutes which are considered as members. Operational expenses of NRENs is being covered by fees and service charges from their members, while the government covers major capital expenses for initial setup and later upgrades (with possible donor support). The private sector is also expected to exploit this opportunity through partnership in the provision of services, or even investment for mutual benefit. One area is utilizing 'idle fiber' in telecommunications networks for education purpose at a reduced cost. In addition, commercial banks, digital equipment and software companies can establish partnership with the government to construct affordable financing instruments to enable institutions establish NRENs and for students and faculty to access NREN resources (Foley, 2016).

3.2 Incentive mechanisms

The private sector attains the most efficient limits in its pursuit of profit and PPP approach should allow powerful incentive to attract the private parties and motivate them to strive for these efficiency limits (McGrath, 2015). Governments in Africa like that of Uganda used financial incentives and competition to drive innovation, expand access and keep down prices (Farlam, 2005). Providing subsidy support was also another mechanism that the government used for increased coverage of telecommunication services in Uganda (Ibid.). The government also provides a guarantee for the loan. The private sector is also allowed to generate revenue through charging user fees for the lease period. In some projects the government also makes regular

payments to the private sector based on its performance throughout the contract period. If the private sector underperforms, its payment would be reduced accordingly (McGrath, 2015). Private companies also make high profit from new partnerships. For example, in the case of Switzerland the government urged the private companies to supply their hardware and software products at a discounted price to the school community and provided with coordinated access to the school market. This significantly increased the demand for their products and thus, the profit they make through increased revenue (Petko,).

3.3 Monitoring

Monitoring of the adequacy and quality of the ICT infrastructure and services can be conducted by the private sector, by the government and a third party (e.g. donor). End users have also a role in the monitoring process and can provided their feedback based on their usage experience of the ICT infrastructure and service. Such monitoring allows for gradual adjustment of partnership details when necessary to adapt to changing situations (Sarvi, et al., 2015).

3.4 Sustainability

The technical infrastructure that has been developed (i.e. hardware, software, networks, and peripherals) requires regular investment in order to ensure that technical support, maintenance, and updating (Petko). For example, due to the speed of technological innovation, computers installed at the beginning of the program were overdue for replacement five years later. Therefore, sustainability is quite important for such kind of initiatives.

Once the infrastructure and ICT based services are built through partnership the government can take over the projects and support them through providing subsidy to any cost incurred in maintaining and sustaining the infrastructure and the services. Building the capacity of instructors and students on how to manage and use the ICT infrastructure also contributes to the sustainability of the project. The demand driven nature of the projects also ensured its sustainability. As far as there is adequate demand for the infrastructure and the service, it was possible to introduce some income generating schemes that can cover recurrent and equipment replacement costs. But it must be affordable so that it attracts more users and increase

access to ICT in higher education. Assessing and minimizing the risk of both public and private partners is also another mechanism of sustaining the project. It is also learned that a robust regulatory framework and policies together with good governance are often the crucial preconditions for successful PPP development in the ICT for education partnership (Sarvi, et al., 2015).

3.5 Challenges

Lack of awareness on PPP concept among the different sectors of the country is the major factor contributing to the limited or absence of PPP initiatives in developing nations including Ethiopia. Policies, regulations and legislations may be prohibitive for designing, formulation and implementation of PPPs (Asubonteng, 2011).

PPP approach has its own problem which includes lack of sustainability and limited contribution towards building in-house capacity. The private sector may also compromise the quality of the ICT infrastructure and services, e.g., through sub-optimal hardware configurations, poor ICT support to the learning processes and outcomes. PPP approach doesn't help and by passes the issue of the reform of the public system by handling over the task to the party.

The same 'weak/dysfunctional' public system is reflected in the lack of effective monitoring of the private party (McGrath, 2015). PPPs may lead to government authorities' loss of control to some degree and may result in the government's loss of accountability and reputation in case of failures to deliver the related public services (Ibid.).

Organizational complexity, the complexity of organizing a project, arises when high number of partners is involved. Early agreements to demarcate clear areas of responsibility and protocols for decision-making are extremely important (Petko).Budget cut from the side of the federal government creates major disappointment among partners which results in submission of uncoordinated proposals and requests from all sides. It may also result in additional danger of reduction in services at the end of the project (Petko,).

Rapid transformation or change of the technology during the project period is another major challenge for the IT infrastructure and the training provided

for instructors. Computers become smaller, faster and more ubiquitous; cell phones and media players significantly transform allowing learning to become much more mobile; convergence between traditional media and the Internet; etc. Such transformations require continuous revisions and updates which impact the smooth running of joint projects.

3.5 Critical Success Factors

Establishing transparent and sound regulatory framework, commitment symmetry, common goal symmetry, intensive communication, converging working cultures, individual excellence, importance, interdependence, investment, information, integration, institutionalization, and integrity are identified as major success factors (Sami et al., 2002 and Kanter, 1994 as cited by Jamali, 2004). It is also argued that the four Cs of **C**ompatibility, **C**apability, **C**ommitment and **C**ontrol as critical for successful pre-selection of alliance partners (Hagen, 2002 as cited by Jamali, 2004). Trusting relationships between the parties based on a shared vision is also considered as a key characteristics of successful PPP. In the case of Swiss PPP model trusting relationship among partners was created by providing all the participants the opportunity to present themselves as socially responsible in the public eye. In addition, the positive publicity obtained by all actors was a core element of the initiative's "win-win" strategy. Several media events were held to promote public awareness of the initiative (Petko,).

Experiences demonstrate that partnerships that have been most successful in Africa have been characterized by thorough planning, good communication, strong commitment from both parties and effective monitoring, regulation and enforcement by government (Farlam, 2005).

4. Conclusion and Recommendation

From the review of experiences of various countries pertaining to PPP in ICT for education, it is learned that the partnership is playing significant role in the areas of ICT infrastructure building, development of educational software and e-resources and in building the human capital that enhances ICT based educational services, more specifically, providing access to affordable connectivity, hardware, software, electronic information, e-learning, etc. for learners, educators and administrators. It is also learned that different incentives have been provided to the private sector to involve and become

committed in PPP initiatives. The incentives could be provided in the form of finance, price reduction, subsidy support, guarantee for the loan, allowing the private sector to charge fees, etc. The performance of PPP projects is commonly monitored by the private sector, by the government or a third party. From the experiences, it is also learned that sustainability of PPP initiatives is ensured through provision of subsidy, user training, income generating opportunity, risk minimization scheme and appropriate regulatory and policy framework. Given all the benefits of PPP for ICT in education, there are challenges faced which are mainly caused by lack of awareness, lack of sustainability, compromise in quality by the private sector, weak/dysfunctional public system, budget cuts by the government and fast technological change.

Some of recommendations made that make PPP interventions successful include sound regulatory framework, common goal symmetry, intensive communication, high commitment, converging work cultures, individual excellence, institutionalization, trusting relationship, integrity, effective and monitoring. Provision of better financial assistance to the private sector is expected from the government when it comes to ICT related investments (Kuppusamy, et al., 2009). Financial institutions may not be willing to finance ICT related initiatives carried out by the private sector (Kuppusamy, et al., 2009). Therefore, the government should increase financing opportunities to the private sector in the area by creating legal system that allows financial institutions to obtain and enforce security and by establishing a risk-sharing loan programs and the financial institutions (Kuppusamy, et al., 2009). A risk-sharing loan programs must be established by the government and the financial institution so that the risk is shared between the government and the financial institution when the project which is financed through loan fails (Ibid.). The government may also provide support for financial institutions to provide more equity and venture capital programs (Ibid.).

In addition, the public sector is expected to set standards; monitor product safety, efficacy and quality; ensure adequate access to the products and services (Jamali, 2004).

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