

SCOPING STUDY ON THE USE OF TV WHITE SPACE IN PHILIPPINE EDUCATION

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ABSTRACT

The use of TV White Space (TVWS) is now an emerging trend to further bridge the digital divide, to transmit data over long distances and reach underserved rural communities. With this development, this study will provide an overview of the initiatives and implemented programs in relation to the use of TVWS as a relevant tool to bring education even to the remotest area of the country. As this is recognized as an emerging approach to education, this paper will look into the initiatives that have been done in some countries and draw out different experiences, lessons, key strengths and weaknesses of the use of TVWS to education and development of individuals. While the study presents the projects using TVWS in different parts of the world, the highlight is on the potentials of the technology in the Philippines for education and learning needs. The opportunities which the TVWS can offer in the sphere of education can be really unique but not without challenges. The Internet is a very democratic platform to know and learn about many things. But the usage of information gathered from the Internet must be carefully examined. People who will be using this information must be critical hence, for effective education a mere access to Internet is not enough. People must have critical thinking on the information that they come across.

Keywords: TV white space, ICT in education, technology and society, alternative learning system.

INTRODUCTION

The potential of using technology like the use of computers and Internet is seen to be unlimited. In the field of education, the use of computers and Internet is now being considered as a strategy to reach more people and make the learning environment more interesting and accessible. The use of TV White Space (TVWS) is likewise now an emerging trend to further bridge the digital divide, to transmit data over long distances and reach underserved rural communities. TV white spaces are “portions of spectrum left unused by broadcasting, also referred to as interleaved spectrum” (ITU, 2012). Simply put, they would be the unused channels in the broadcast spectrum, which were intentionally and strategically placed in between active channels to clearly distinguish signals. New radio and database technologies allow that spectrum to be used to transmit wireless Internet over distances up to ten kilometres. As a result, white spaces can be used to deploy broadband access and other mobile data technologies.

The idea of connecting people thru the Internet is now widely recognized as an exercise to people's right to freedom of opinion and expression. In 2011, the Special Rapporteur on Human Rights declared that disconnecting individuals from the Internet is a violation of human rights and goes against what is described in international law. The Special Rapporteur emphasizes that the Internet has a unique and transformative nature to enable individuals to exercise their freedom of expression and opinion and to promote the progress of society as a whole.

With this development, this study will provide an overview of the initiatives and implemented programs in relation to the use of TVWS as a relevant tool to bring education even to the remotest area of the country. As this is recognized as an emerging approach to education, this paper will look into the initiatives that have been done in some countries and draw out different experiences, lessons, key strengths and weaknesses of the use of TVWS to education and development of individuals.

RESEARCH OBJECTIVES

The concern of this study will look into the potential, strengths and challenges of TVWS in the field of education. This paper will analyze largely based on existing literature the possibilities and changes that the TV white space revolution will bring to the education sector.

Specifically, this paper will respond to the following:

1. Present cases of usage of TV white space in education;
2. Analyze the extent of usage of TV white space in education;
3. Determine the implications of using TV white space in education; and
4. Determine the possible problems in future educational programs using TVWS.

GUIDE QUESTIONS FOR THE SCOPING PAPER

1. What are the existing initiatives on TVWS in the country? Who initiated the project? What are the objectives in setting-up TVWS? Who are the target beneficiaries?
2. What are the benefits delivered to the beneficiaries? Are there any potential negative consequences?
3. What are the regulatory issues/factors to make this technology adaptable to communities?
4. What are the lessons learned?
5. What are the challenges and recommendations?

COUNTRY INITIATIVES ON THE APPLICATION OF TVWS

The use of Internet as an information infrastructure has been predicted and is now the current trend that makes communication and information-sharing more accessible. In less than a decade since the birth of Internet, people's capacity to connect with their loved ones and other people across the globe has increased. In comparison with a snail-mail or even airmail, email and other social networks like Skype, FB and other gets over distance and time, frontiers of other countries with a lightning speed. Thus, the Internet connects people regardless of distance. The potential of Internet is not only confined to "bringing people together" but it also has a great role in the education sector.

Now that we are living in the so-called information society the value for and of information has become more intense than before. For this reason, initiatives to use the internet in general in the education sector has been witnessed and because of further research and development the use of TVWS was considered as a platform to make Internet work even at rural areas to bring education in less than no time and at minimum costs. The level of Internet use varies from country to country, and the use of TVWS as well depends greatly on the country's priority and needs for its use. The proliferation of TVWS demonstrates that it can bridge the digital divide particularly in underserved areas. As explained by Director Paul Garnett of Microsoft's Technology Policy Group, "TV white spaces technology, when combined with other low-cost wireless technologies, such as Wi-Fi, offers a substantial opportunity for

businesses, consumers and governments around the world to improve the economics of broadband network deployment and service delivery" (cited in Parker, 2013). In Kenya, the first trials in using TV White Space included local schools, health clinic, government agriculture office and a library (Graham, 2013). For the white spaces project, the company is working with a Kenyan ISP, Indigo Telecom, and the Kenyan government. The ISP is installing wireless 'base stations' - or masts - that are solar-powered, to get round the lack of mains electricity. Microsoft has also funded another TVWS project in rural Limpopo, South Africa to help the government's goals of providing low-cost access to internet among majority of South Africans by 2020. Five schools are part of the project that is a mix of primary and secondary: Mountainview, Doasho, Mamabudusha, Mphetsebe and Ngwanalaka (Oxford, 2014). The schools have been equipped with a range of laptops and tablets along with training to use them in class. Other logistical support like education-related content, solar panels for device charging in places where electricity is nonexistent are also included.

Through a partnership between Philippine Department of Science and Technology's Information and Communication Technology Office (DOST-ICT Office), Department of Agriculture's Bureau of Fisheries and Aquatic Resources (DA-BFAR) and the U.S. Embassy Manila's United States Agency for International Development (USAID) TVWS was explored as a means to deliver broadband connectivity and facilitate mobile fisher folk registration in the remote municipalities of Talibon, Trinidad, Bien Unido, Ubay and Cralos P. Garcia. A TVWS base station was installed at a transmission tower at the DOTC Compound in Tubigon, Bohol to bring internet access to scattered populations all around the island who have either slow or non-existent network connectivity (Dynamic Spectrum Alliance, n.d.). The initiative aims at accessing the BFAR's Fisherfolk Registration System (FRS) directly from the field, enabling municipalities to immediately distribute critical IDs, certificates and licenses to the fishermen that need them. Additionally, field operatives from BFAR as well as the police force, and partner agencies will be able to rapidly monitor compliance.

In April 2011, the Technology Strategy Board of the UK government provided support to a consortium of six agencies in piloting a rural broadband trial network using TVWS to deploy broadband connectivity to a small rural community on the Isle of Bute, Scotland. Primarily, the project aimed to investigate and demonstrate the potentials of white space spectrum in providing broadband access to far-flung areas (Centre for White Space Communications, n.d.). One of the features of the project is the planning and installation of white space radio links to eight identified locations, from the local telephone exchange. It also included backhaul connectivity from the telephone exchange to the mainland and then on to BT's IP backbone to provide access to the Internet. Two months after, the Cambridge White Spaces Trial was launched to evaluate the technical capabilities of the technology and to discover potential end user applications and scenarios.

The consortium, consisting of agencies and institutions involved in telecommunication regulations and services, "explored and measured a range of applications, including rural wireless broadband, urban pop-up coverage and the emerging "machine-to-machine" communication, and found TVWS can be successfully utilized to help satisfy the rapidly accelerating demand for wireless connectivity" (Microsoft Research, n.d.). Meanwhile, in Singapore, the White Spaces Pilot Group (SWSPG) was established in April 2012 with support from Infocomm Development Authority (IDA), the Regulator of Singapore. The objective of the pilot group is to develop the Lion City to be the number one test-bed for piloting projects using TV white space, thereby accelerating the adoption of white spaces technologies not only in the local and national setting but to the international arena. With this

goal, they have started with 3 pilot projects that demonstrate the commercial use of TVWS. These include the collaboration between the Institute for Infocomm Research (I2R) and power Automation in National University of Singapore to allow the latter to meter the use of air conditioners and charge residents according to their usage; the Singapore Island Country Club where the club will use the new technology to optimize the connectivity and deploy smart sensors, which will help it monitor the moisture of the golf course and track golf buggies among other uses (SWSPG, n.d.). White Spaces technology will also be used by the Changi District around the airport. Vessels that will be anchored in Singapore will now be given a reliable alternative connectivity so they can access e-mail, Internet and voice communication services at a cheaper cost.

In September 2009, with Spectrum (SBI) launched the first TV White Space in Claudville Virginia thru the initiative of TDF Foundation who wanted to deliver the benefits of broadband access to a wider community beyond the computer lab. SBI deployed its network architecture through the bandwidth allocation software with off the shelf radio equipment to enable an innovative wireless solution that took advantage of available TV White Spaces channels (Spectrum Bridge, n.d.). These radios were set up at the schools as wells us business users in the community to create “middle mile” connections between the computer lab and the multiple Wi-Fi hot spots installed.

EXTENT OF USING TVWS IN EDUCATION

The use of TV White Space in as we saw from cases above varies from country to country. This is highly influenced by the fact that different countries have different priorities, capacities and resources. In the above cases, the idea of using TV White Space arose from the basic idea to connect people. But that need has also extended to other usage and potentials of TV White Space. TV White Space has been explored to bridge the gap in accessing information, help the government deliver social services and as a tool to monitor activities. One potential of TV White Space that is yet to be maximized is its usage to facilitate learning and education, whether in the formal or informal sector. There were already pilots of using TVWS in education but most of these are still in the initial phase and experimental stage. Initial experiences however showed challenges in setting-up the systems. There was a noted difficulty in facilitating connectivity especially for remote and marginalized communities.

BENEFITS AND OTHER CONSEQUENCES OF TVWS IN EDUCATION

TVWS offers opportunities to bring Internet at a better speed and quality. In fact, most of the pilots as mentioned above have provided feedback about how TVWS was maximized for various purposes. After the pilots or trials were implemented in different countries, many have recognized that TVWS has provided them better quality of Internet connection. The participating schools, which previously had slow or unreliable Internet connections, experienced high-speed broadband access for the first time. Teachers were able to use videos in their lesson plans, make Skype calls to other schools, update school websites, and send regular email updates to parents. Students could use educational videos for research. Because the service was better and faster, teachers and learners used the web to enrich the classroom experience. Most of the feedback also reiterates the promise of Internet in modern education. With TVWS, people get closer to each other so are teachers and students. Through TVWS, the information that is being transmitted thru face-to-face ways can now be done as well with the use of technology. With the use of TVWS exchange of knowledge is possible. As the modern world evolves and becomes more sophisticated so do are the learning institutions. To

help people adapt to this evolving systems of learning and education, the use of technology is inevitable. It is hoped that the complicated learning processes will be more efficient and practical with the use of technology and Internet. In the Philippines, TVWS has involved community fisher folks with the long-term objective to restore the health of the ecosystem through sustainable practices. The project was a partnership between the government and the fisher folks. With the provision of Internet thru TVWS to target municipalities, barangay halls will be transformed to e-knowledge hubs and will serve as mobile registration centers especially for fishermen located in remote areas. In the case of rural Limpopo in South Africa, the use of TVWS as a platform for learning is a very important tool to augment the lack of school materials or books. As expressed by the professor Mahlo Mokgalong, vice-chancellor and principal of the University of Limpopo, since there is shortage of materials in school, "the project will definitely benefit the learners in those schools and expose them to computer usage so that they can become true 21st century students and, eventually, valuable employees" (cited in Oxford, 2014).

Because of greater connectivity, students will be better equipped with knowledge and skills because they can now do research a lot easier now than before. As exclaimed by Beatrice Nderango, "Students will now be introduced to e-learning, they will be able to carry out the assignments, they'll be able to do a lot of research" (cited in Graham, 2013). She also believes that the wider community will benefit because the access to information will provide people new information on skills like the farmers who will be able to access the Internet will help them improve their skills and learn entrepreneurship.

THE PHILIPPINE EXPERIENCE IN USING TV WHITE SPACE

TV White Space potential in the Philippines cannot be underestimated as several efforts are being done to make use of internet and technologies in bringing service and education to the people who are hardly reach by internet. The use of TVWS in the country was implemented to aid connectivity and provision of social services to the people. One of the pilots of TV White Space is in Bohol. The DOST implemented the project pilot in Bohol using unused TV frequencies tapped to provide Internet connectivity to helped three earthquake-hit municipalities rise from the ruins of last year's magnitude 7.2 earthquake. The project was pursued in partnership with Filipino-Singaporean TVWS technology firm Nityo Infotech. Nityo Infotech funded the rollout and deployment of the TVWS technology in Bohol with an investments of about \$5 million (PhP225 million). This amount was allocated to set- up The 100 sites and other technical requirements of the pilot project. DOST Undersecretary Louis Casambre, head of the DOST's Information and Communications Technology Office (ICTO), said the successful installation of radio transmitters to provide connectivity to the municipalities of Tubigon, Ubay and Talibon, helped in emergency response and relief efforts after the earthquake.

The Internet connectivity provided by the TVWS technology continues to benefit local government units and national government agencies in delivering basic government services to the people of the three municipalities. The use of the TV White Space have helped a lot as a medium to provide information communication technology to rural areas that are not served by local telecommunication companies. The success of the pilot project in Bohol inspired another initiative of using TV White Space as a medium of connectivity. With UP Manila's- Telehealth Center telemedicine program, called the RxBox project, DOST collaborated with the implementers of the RxBox Project to work hand-in-hand in providing connectivity. The RxBox project aims to enhance the capabilities of health workers in the diagnosis, monitoring

and treatment of patients by providing a device, the RxBox, which can capture, store and transmit a patient's physiologic data. The above illustrations and experiences on how TVWS was utilized opens opportunities and window for more application in other fields especially in education. In the Philippines, this is a great potential to address challenge of providing quality education or learning programs especially in the remote areas of the country.

POTENTIALS OF TVWS IN THE PHILIPPINES FOR EDUCATION AND LEARNING NEEDS

The Philippines is not only popular as one of the disaster-hit countries (CRED, cited in Whiteman, 2014) in the world but also being known now as the social media capital of the world. According to digital experts, Philippines is now leading as the social media of the world despite the generally slow internet connection in the country. According to TIME, Makati City and Pasig are the two "selfie capitals" of the world (Wilson, 2014). According to global statistics on parameters such as population VS internet and mobile users, number of hours spent in the internet, and social media use and platform, the Philippines shows a considerable time that an average Filipino can spend time in using Internet and social media in our lives. This trend of Internet use in the country is likely to encourage the use of Internet and relevant technologies in other fields to be able to provide services to the people. For a developing economy like the Philippines, one of the challenges that the country face is the need to provide quality learning programs that will bring about a quality education to its people. Currently, Philippines are a home to approximately 100 million people with an average GDP per capita of US\$4682. Given this population, the Philippines have more than 6 million young people who are out of education due to circumstances beyond their control. As a result many students drop out of school or at most, perform poorly academically.

In addition, official reports show that roughly six out of ten young people who are of secondary school- age actually receive formal education while others are either working or remain idle. Due to the combined high dropout rate and poor achievement rate among secondary public school students, only four out of ten students who are in school actually graduate (UNESCO, 2009). For every 100 students that enter the formal education system at Grade 1, only 66 graduate from Grade 6 while only 43 graduate from 4th year high school. The rates of youth who cannot attend schools due to various reasons are increasing every year. In response to the situation, the Philippine government thru its national agencies especially the Department of Education (DepEd) have designed programs that utilizes Internet and computer use. By virtue of Executive Order No. 356, the DepEd has to implement the Alternative Learning System, "to protect and promote the right of all citizens to quality basic education and to promote the right of all citizens to quality basic education and such education should be accessible to all". Such education shall also include alternative learning system for out-of school youth and adult-learners.

With the above mandate, DepEd has developed and currently implementing programs various programs, including the Accreditation and Equivalency Program (a self-paced alternative learning/non-formal program that allows learners to proceed with their basic education and prepare them to take the Accreditation and Equivalency Certification Exam, which if they pass, serves as an equivalent to the High School diploma.

To innovate on delivering educational service to school-age Filipinos, and increase reach of Filipinos who were out-of school youth, the Department of Education has ventured in CICT and BALS through the Eskwela Project to concretize the use of information technology.

These efforts on technology integration and Internet use have offered an exciting and useful tool in the education sector. The implementation of the project, included design interactive Learning Modules, training workshops and setting up of the technical aspect of the project. The effectiveness of the Eskwela Project depends on relevant factors like technical capacity, financial input but especially community ownership. Community ownership means the people in the community has participated from the preparation phase up to the implementation and monitoring phase. Policy directives and support is also crucial in the process. In this way, the government and other stakeholders have a more binding responsibility to deliver education service to the people.

LESSONS, CHALLENGES AND RECOMMENDATIONS

The opportunities which the TVWS can offer in the sphere of education can be really unique but not without challenges. The Internet is a very democratic platform to know and learn about many things. But the usage of information gathered from the Internet must be carefully examined. People who will be using this information must be critical hence, for effective education a mere access to Internet is not enough. People must have critical thinking on the information that they come across. The use of TVWS is not only limited to the idea that information is available to people. It also is important to know how to process this information and be able to use this to achieve our cognitive, social and economic goals. There has to be ways to make this information practical and responding to the learning needs of people. The potential of TV White Space to provide coverage for a given area is considered to be cost effective and therefore being encouraged to be utilized in countries that would like to bridge the gap of connectivity and learning. Mobility of knowledge is now seen as becoming less and less difficult to people but this is without challenge. Transmission of knowledge is just one aspect that the TV White Space can provide but it there still a concern to ensure how quality of learning may take place to every individual and how will this result to the over-all goal of bringing about multiple learning objectives.

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