Building an Ecosystem to Provide Sustainable eHealth Technical Capability for the Philippines

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Brief Biography of Presenting Author

Mr. Jose Eugenio Quesada is an Associate Professor at the Asia Pacific College in the Philippines. He is also Founder and President of Integrated Open Source Solutions. His current research focuses on customizing mobile technology for telemedicine and for improving healthcare delivery in the Philippines. His work has been published and presented at the Med-e-Tel conference in Luxembourg in 2012. He is heading the research and pilot implementation of eHealth projects with NGOs and government hospitals in Philippines.

Abstract Text:

There have been several eHealth technology initiatives that have been developed and have matured in the past few years that are designed for implementation in developing countries. They are built using Open Source software, are server based, and accessible through a web browser or mobile phone interface.

In order for a developing country such as the Philippines to take advantage and apply these readily available tools, an ecosystem has to be built to provide training, implementation, and support for deployment of these technologies in local health organizations.

Together with that, there should be commercial viability for Information Technology companies to provide the implementation and maintenance support for the health organizations that implement Health Information systems.

This ecosystem has to be in line with the government's national eHealth development plan for the country, and should be created in collaboration with the government.

The challenge comes in bringing together, and aligning the initiatives of the health care sector, the government, the academe, and the information technology industry, in order to create the local capacity and capability in implementing and maintaining these readily available Health Information Systems.

This paper focuses on some initiatives that have been done in the past few years, to bring together and align the various components required to build this ecosystem. In particular, it describes the initiative to implement the Sana Mobile technology platform, and the GNU Health, Health and Hospital Information System here in the Philippines.

The paper will discuss the challenges and lessons learned from our experience with customizing Sana for a pilot project in collaboration with two Non-Government Organizations. It will also discuss the on-going projects of Health Information System implementations with government health organizations. These are the Philippine Air Force General Hospital, the Department of Otorhinolaryngology of Philippine General Hospital, and Maybunga Barangay Health Center in Pasig City, Metro Manila, the health clinic of a Local Government Unit.

It will compare the outcomes with measures of success using the framework defined in The Role of Science, Technology and Innovation Policies and Instruments for a Paradigm Shift Towards Sustainable Development . It will then outline the future direction in applying what we have learned to the National eHealth plan of the Philippine government.

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Text Full Paper

Introduction and Purpose

The recent years has shown an increase in global health innovations in health related software built and developed in donor countries for application in Low or Middle Income Countries. This is evidenced by the growing number of events, literature, and research on eHealth in developed countries for developing countries (Lewis et al. 2012)

In the Philippines, currently classified as a lower middle income country (World Bank 2012), the government has already begun taking steps to make eHealth become a reality by passing a bill to institutionalize the Philippine National Health Research System (Philippine Congress 2012). A technical working group on Information Technology for Health was created in December of 2010, to study and provide standards for interoperability among disparate health information systems. (Aragona J. et al. 2012), and papers have been written describing the challenges to building a Philippine National Health Information System (Canlas 2009).

The challenges in applying the eHealth innovations created in donor countries to developing countries are many. They are similar in nature to North-South Collaborative Industrial Research and Development. (Wolfe and Inbal 2012) The challenges will be discussed in more detail in the next section of this paper.

The method that the author used in addressing the challenges was to become the point-person for bringing eHealth innovations from the donor country into the Academe and Industry (Quesada at al. 2012). The author also became involved in the government initiatives to formulate a national eHealth plan for the Philippines.

By becoming a single point of contact and facilitator for moving eHealth projects from a donor country to the academe and industry, the organizational difficulty associated with collaboration, and the individual approach of entrepreneurs in industry were significantly reduced (De Passe, Celi, 2012), and the transfer of technology was accomplished and applied in several projects with health organizations in the Philippines.

Purpose

The purpose of this paper is to show how the author addressed the various challenges in facilitating the transfer of technology from the donor country to the Philippines, and how the beginnings of an eco-system were formed that could provide the base of technical manpower to help push forward the national eHealth plan of the Philippine government.

Design and Methods

This paper will use as its framework, the major challenges that impede the development of North-South Collaborative Industrial Research and Development (CIRD) (Wolfe and Inbal 2012).

The major challenges that were identified are the following: (1) Lack of familiarity with needs and opportunities, (2) Difficulty finding appropriate partners, (3) Issues of trust , (4) Communication and coordination challenges and (5) Financing-related issues.

For the communication and coordination challenges, the following additional challenges were identified:
(i) language barriers, (ii) disparate time zones, (iii) geographic distance, (iv) the varied cultural norms (including workplace culture).

This paper looks at the Academe collaboration with local healthcare organizations through the Project Based Learning (PBL) track of Asia Pacific College (Quesada 2008)

It will discuss Academe collaboration with the I.T. industry, using as an example, the collaboration done between Asia Pacific College and Integrated Open source Solutions, in particular, with the Sana project technology transfer and implementation. (Quesada et al. 2012)

It will describe the collaboration of an Information Technology company with profit and non-profit healthcare organizations.

It will look at the research and innovation policies, among them, the following (Brito L. 2014):
– Ensure the knowledge cycle in society happens by building the critical mass in society through actions in Higher Education Institutions, and stronger partnerships between universities and industry are needed.
– Build Networks of Excellence, build ownership and commitment:
– Building Centres of Excellence that are embedded in the society;
– Build partnerships frameworks between the scientific community, Government, productive sector and civil society;
– Develop link between knowledge-technology and practical solutions to everyday problems;
– Developing local industry through promotion of partnerships and access to knowledge.

Results:

A. North-South collaboration between the Sana project at the Massachusetts Institute of Technology [MIT] and Asia Pacific College[APC] in the Philippines. The issues stated in the previous section were addressed in the following ways:

(1) Lack of familiarity with needs and opportunities: MIT sent a student intern to the Philippines in 2009 to do a study of the delivery of eHealth and Telemedicine services to the Philippines from a sustainability perspective (Kuan 2009) from this study, the needs and opportunities were identified on how to apply eHealth technology to the local Philippine setting.

(2) Difficulty finding appropriate partners: The North-South partnership was formed when the MIT Team presented their work at a Philippine MIT alumni meeting in 2009. From there, the MIT Team was able to get connected with the author, who was, and is still currently a professor at Asia Pacific College, a local college committed to bridging the academe and industry in the Philippines. (APC 2014)

(3) Issues of trust: The partnership between MIT and APC through the Sana project was strengthened when the founder of the Sana project visited the Philippines in late 2009 and met with the author. From that point onwards, an informal collaboration was begun, and the author pursued the development of the Sana project through the college, and through the Information Technology company that he founded (iOSS 2010). MIT sent two students on internship in 2010 to work with APC in identifying local Non-Government Organizations to work with, in order to pilot the Sana project. Once the two NGO's were identified, iOSS took on the project of customizing the Sana Mobile technology for the two NGO's (Quesada J 2012).

(4) Communication and coordination challenges:
(i) language barriers: The language barriers were addressed due to the fact that the Philippines uses English as its primary medium of communication, having been the only colony of the United States from 1901 to 1946 (Wikipedia, 2014). The author is proficient in speaking English because he grew up with speaking English at home, and studied and worked in the United States for several years before returning to the Philippines in 2001.
(ii) disparate time zones,: This issue was addressed through the use of the internet and email.
(iii) geographic distance: This issue was addressed primarily through the use of the internet to communicate, and through personal visits by the founder of Sana to the Philippines every so often.
(iv) the varied cultural norms (including workplace culture): This issue was addressed because of the author's exposure to the American culture throughout his life, and because the founder of the Sana project is a Filipino citizen working in the donor institution in the United States. Both the author and the founder of the Sana project are Filipinos, with a passion to help the Philippines through advancing the use of eHealth for the Philippine setting.

(5) Financing-related issues: This issue was addressed by finding and using local-counterpart funding through a not-for-profit organization that supported the goals of the Sana project in the Philippines. C.S. Foundation, a non-profit organization (CS Foundation, 2010), has supported the health related not-for-profit projects of the I.T. company founded by the author.

B. Academe collaboration with local healthcare organizations through the Project Based Learning [PBL] track of Asia Pacific College.

The Asia Pacific College Project Based Learning track was an initiative which was started in June of 2001. (Quesada J 2008). Through the PBL track, students were assigned clients in various industries and organizations, with the goal of building an Information Technology solution to address a specific need of the client organization.

It was through the PBL track that student groups, under the mentorship of the author were assigned clients in health care organizations. The following are the healthcare organizations that were assigned to student groups: the Philippine Air Force General Hospital [AFGH], The Department of Otorhinolaryngology of the Philippine General Hospital [PGH], and Maybunga Barangay Health Center in Pasig City, Metro Manila, a Local Government primary care clinic. Each healthcare organization had its own unique situation with regards to its path towards the use of eHEalth systems within their respective organizations.

The AFGH already had an existing I.T. vendor that was implementing an Enterprise Resource [ERP] software for the hospital operations. The issue with the software being implemented is that it was not tailored to hospital operations, and did not have a patient electronic medical record system. Because of this, there was a lack of support from the end users during the implementation of the system.

Upon initial data gathering by the students of the requirements of the hospital, the author decided to have the students study GNUHealth Open Source Health and Hospital Information System, and focus on implementing the patient medical records module with the records department of the hospital. The challenge the group faced was the size and complexity of GNUHealth, and their lack of knowledge and experience both in the health field, and in the technology that GNUHealth was built on top of.

Despite these challenges, the students pressed on in working with the client to define their requirements, and to map them with the functionality within GNUHealth. It turned out that the requirements of the records department were simple, and not as complex as the functionality offered by GNUHealth. What happened later on as the project progressed, was that the students and the author decided to build only the patient medical record system from scratch, using a framework to build the system quickly. This initial prototype would satisfy the requirements of the records department, and meet their immediate need for computerizing the records of the AFGH.

The challenges faced by the AFGH project were the low levels of Information Technology skills and capability of the staff and management of AFGH, and the lack of knowledge and expertise by the student group in the Healthcare field, and in the technology behind GNUHealth.

What was learned from the experience by both parties was that I.T. capability and skill needs to be built up over a period of time, and an organization cannot be expected to immediately adapt to a new and complex technology if it is not ready for it.

The Department of Otorhinolaryngology of the Philippine General Hospital was the second healthcare organization assigned to a student group. The Information Technology need of the department was the following: They wanted to capture information of patients quickly, to be able to take a picture of the patient and to take a picture of the diseased area, and be able to upload it to their existing electronic medical record system.

The author decided to have the student group customize and implement the Sana mobile telemedicine system for this project. It was fortunate that PGH had already begun implementation of OpenMRS as the patient Electronic Medical Record system to be used by all the departments in the hospital. The Sana system uses OpenMRS as its backend EMRS, and so Sana was the appropriate technology to implement with the PGH project.

Sana offered a quick and portable way to capture patient information, including taking pictures of the patient and the diseased area of the patient, and uploading the data to the OpenMRS system of the hospital. Initial requirements were gathered, and the students studied the Sana technology to familiarize themselves, in order to customize Sana for their client.

The results of the project were the following: The requirements of the department were documented by the students, but the project was not completed due to lack of time and experience in learning, customizing, and testing the Sana system to the requirements of the client. The project could have continued on to completion and implementation had there been more time and more professional expertise applied to the project.

Maybunga Barangay Health Center in Pasig City, Metro Manila was the third client assigned to a student group. The Health Center had felt an urgent need for an Electronic Medical Record system [EMRS], because it had been inundated by floodwaters during typhoon Ondoy in 2009, and the paper-based medical records of the patients in the clinic were severely damaged and destroyed. Because of that event, the staff, the doctors, and even the congressman of the district were very supportive of our proposal to implement the Sana system for the Health Center.

The students then began initial requirements gathering by documenting the various procedures which were being done at the Health Center. It was decided by the author and the student group that the team would focus on data gathering, customization, and implementation of the prenatal procedure of the clinic, as this was deemed important, and one of the main functions of the clinic.

The challenges the students faced were their unfamiliarity with the medical terminology for the prenatal procedure, and their lack of skill and knowledge in the Sana technology. After initial requirements were gathered and work done to customize the procedure, the project was not continued due to lack of time for the students to continue the project.

C. Academe collaboration with the Information Technology industry through APC's partnership and collaboration with Integrated Open Source Solutions [iOSS].

In 2008, the author started an Information Technology company in order to continue with the development and implementation of several student projects from the Asia Pacific College Project Based Learning track (JQITC 2008). Through this company, the author hired several of his students as interns and as regular staff.

From this starting point, the staff of the author gained professional experience in developing and implementing various information technology projects, including several for healthcare organizations. The author would assign interns from APC to his company so that they could learn and gain greater skills, knowledge, and confidence in building Information Technology systems.

It was through this pipeline of training students first in school, then as interns at the author's company, then hiring the most qualified students that a pipeline of trained technical manpower was established to service the needs of the local I.T. industry.

D. I.T. industry collaboration with for profit and not-for-profit healthcare organizations

In 2010, the author set up Integrated Open Source Solutions as a corporation, and operations of the company expanded into doing many I.T. projects, both in the healthcare and various other industries.

There were several health related projects that were developed and implemented by this company. Among them were: A hospital information system for a 25 bed provincial hospital, an electronic medical record system [EMRS] built from scratch for Noordhoff Craniofacial Foundation Philippines, Incorporated [NCFPI], a not-for-profit organization specializing in craniofacial operations (cleft palate, cleft lip), and the pilot implementation of Sana with two not-for-profit organizations: Center for Community Transformation, and Negros Women For Tomorrow Foundation.

The hospital information system was implemented for Our Lady of Rosary hospital located in Macabebe Pampanga. It was successfully implemented two years ago and has been in operation from then until now. Building and implementing this system gave iOSS experience in the business process of hospitals, and in building and implementing a hospital information system [HIS].

The EMRS built for NCFPI was written from scratch from the ground up. It is a multi-discipline EMRS, covering the following modules: patient information, parent/guardian information, family history, review of systems, diagnosis information, speech evaluation, pre-surgical orthodontics, dental, orthodontics, radiographs, intervention, and pediatric/medical. Each module was designed together with the doctor who specialized in the specific procedure, and met the requirements of the particular specialist.

The system was implemented in October of 2013, and as of January 2014, encoders have completed encoding over 1,000 records, or 50% of the patient records of NCFPI. Because of this project, iOSS has gained first hand experience with building a patient EMRS, and has gained some domain knowledge on the medical specializations that it implemented with NCFPI.

In 2010, MIT sent two students to pursue the Sana project together with iOSS in the Philippines. The outcome of the project was that there were two NGO's that were identified and tapped to pilot the Sana mobile telemedicine system. These two organizations were the Center for Community Transformation, and Negros Women For Tomorrow Foundation. The first eight months of the project were spent working with the doctors from both NGO's in order to arrive at a common procedure for entering patient information for hypertension. There were two procedures that were created: the first one was for the initial hypertension screening, and the second one was for

follow up hypertension check up. Once the common procedure was defined, the developers at iOSS created the procedures for the Sana app on the android mobile phone. After the development of the Sana app, the servers were configured for the backend EMRS (OpenMRS), and the SMS server (Kannel). The users from each organization were then trained on the use of the phone, and OpenMRS. Two android phones were lent to each NGO, and they tested the Sana system for two months within their respective organizations.

The pilot implementation in the two NGO's resulted in the following: Negros Women for Tomorrow Foundation decided to implement the Sana project on their own, as they had the necessary I.T. capability within their own organization. They asked iOSS to provide technical training on customizing, configuring, and implementing the Sana system. iOSS trained them in March of 2011, and has not gotten an update from NWTF since then.

The CCT implementation resulted in iOSS getting feedback from the users of the system. The main concerns were connectivity and uptime issues of the servers. The users were expecting "realtime" communication between the phones and the backend EMRS, but the issue was lack of cellphone signal in the sites where the users were operating in. The conclusion of the pilot was that the doctors and nurses found the Sana system very useful and promising for providing diagnosis in remote areas with no doctors, just as long as the questions in the procedures could be customized to their requirements, and the connectivity and uptime issues of the servers be addressed (iOSS 2011). The outcome of the pilot was that CCT said that it was not yet ready to implement the Sana Mobile telemedicine system within its organization.

Because of the experiences in the various health related information technology projects detailed above, iOSS was shortlisted for a project of the Navotas City local government to configure and implement the GNUHealth, hospital and health information system for a new hospital that they are currently in the process of constructing. The hospital will be completed by June of 2014, and the stakeholders would like the GNUHealth system already configured and ready for deployment together with the opening of the hospital.

There is an existing implementation of OpenMRS in the barangay health clinics of Navotas, and there are plans to interoperate GNUHealth with the OpenMRS systems by implementing a Health Information Exchange[HIE]. The HIE project will be funded by the Department of Health [DOH], together with the Department of Science and Technology [DOST] of the Philippine national government.

This is a great opportunity for iOSS, because it will be the first implementation of GNUHealth in the Philippines, and will serve as a model that other government hospitals can follow.

Conclusion

The road to building an ecosystem to provide eHealth technical capability in the Philippines has been a long, exciting and challenging, road. In a small way, the many challenges faced in building North-South collaboration, in having Academe work hand in hand with the healthcare industry, in making Academe collaborate with industry for eHealth projects, in providing opportunities for an I.T. company to gain working experience in building and implementing eHealth systems, have been faced by the author, together with the various organizations, staff, students, doctors, I.T. consultants that have worked with him in the various eHealth systems implemented through the years.

This work constitutes a base from which the various research and innovation policies can be applied and implemented: Building critical mass in society through actions in Higher Education Institutions, to make stronger partnerships between the academe and the industry; Building networks of excellence, ownership, and commitment, building partnerships between the global scientific community, and the local academe, government, I.T. industry, and NGO's in the Philippines; Developing the link between knowledge-technology and practical solutions to everyday problems in local healthcare organizations; and developing the local I.T. industry through the promotion of partnerships and access to knowledge (Brito L. 2014).

The author proposes that the organizational work that was started in 2009, and is already in place be strengthened through support and funding from both local and international organizations dedicated to making eHealth become a reality in developing countries like the Philippines. It will be a quicker path to expand the existing work that has already been accomplished rather than trying to establish a new network and path to collaboration across the different local and international organizations.

It is the sincerest hope and dream of the author to make eHealth become a reality for the majority of Filipinos who need and deserve access to healthcare services in the Philippines.

References :

Aragona J.,Caballes A., Consulta R., Crisostomo B.,Del Prete D., Duremdres M., Hartigan-Go K., Gako N.,Go E., Lallana E., Mapa D., Marcelo A., Matanguihan M., Matunog S., Ramos A., Soriano E., Soriano J.,Sumabat K.,Stolk S., Subido C., Tan C., Valdez C. (2012), ICT4H Technical Work Group Standards and Interoperability Subgroup: Draft - Standards and Interoperability As of 27 January, 2012 http://apc.csf.ph/jlquesada/ICT4H_TWG_Standards_27Jan2012.pdf. Accessed 21 January 2014

Asia Pacific College (2014) Vision Statement of Asia Pacific College http://www.apc.edu.ph/?q=mission_statement. Accessed 21 January 2014

Brito L.(2014), Technologies for Sustainable Development: A Way to Reduce Poverty?, The Role of Science, Technology and Innovation Policies and Instruments for a Paradigm Shift Towards Sustainable Development ISBN: 978-3-319-00638-3

Canlas R., (2009), Philippine Health Information System - Critical Challenges and Solutions http://www.scribd.com/doc/23761110/Philippine-Health-Information-System-Critical-Challenges-and-Solutions. Accessed 21 January 2014

CS Foundation, Inc. (2010), Mission Vision and Values http://csfoundation.csf.ph/2010/12/01/mission-vision-values/ Accessed 21 January 2014

DePasse J., Celi L.A., (2013) Editorial for International Journal for Quality in Health Care, Collaboration, capacity building, and co-creation as a new mantra in global health:The approach of Sana and the MGH Co-creation laboratories. http://intqhc.oxfordjournals.org/content/early/2013/11/12/intqhc.mzt077.full Accessed 21 January 2014

Integrated Open Source Solutions (2014). Mission and Vision http://ioss.com.ph/. Accessed 21 January 2014

Jose Quesada Information Technology Consulting (2008), Mission Vision and Values http://apc.csf.ph/jqitc/missionvision Accessed 21 January 2014

Kuan K. (2009), Delivery of eHealth and Telemedicine Services to thePhilippines From a Sustainability Perspective Summer 2009 http://www.scribd.com/doc/41192643/Deliver-of-eHealth-amp-Telemedicine-Services-to-the-Philippines-by-Katheine-Kuan. Accessed 21 January 2014

Lewis, T., Synowiec C., Lagomarsino G., & Schweitzer J. (2012). E-health in low- and middle-income countries: findings from the Center for Health Market Innovations, Bulletin of the World Health Organization ;90:332-340. doi: 10.2471/BLT.11.099820 http://www.who.int/bulletin/volumes/90/5/11-099820/en/. Accessed 21 January 2014.

Quesada, J.,Celi L., Moses C. (2012), Deploying Innovative Mobile-based Telemedicine Systems using Open Source tools in Resource-poor Areas of the Philippines, Jordanova M., Lievens F. (Eds.) Global Telemedicine and eHealth Updates: Knowledge Resources, Vol. 5, 2012 Publ. ISfTeH, Luxembourg, pp. 389-393, ISSN 1998-5509

Quesada J.E. (2008), A Description of the Project Based Learning Track of Asia Pacific College http://apc.csf.ph/jlquesada/APCs_Project_based_learning_track_feb07_2008.pdf Accessed 21 January 2014

Senate and House of Representatives of the Philippines in Congress (2012). Republic of the Philippines, Congress of the Philippines, [REPUBLIC ACT NO. 10532] AN ACT INSTITUTIONALIZING THE PHILIPPINE NATIONAL HEALTH RESEARCH SYSTEM, http://www.gov.ph/2013/05/07/republic-act-no-10532/. Accessed 21 January 2014

The World Bank (2012). Economic Indicators for the Philippines. http://data.worldbank.org/country/philippines. Accessed 21 January 2014

Wolfe Y., Inbal A.B. (2012), Innovating Together: Improving Bilateral Research and Collaboration for Development

http://socsci.tau.ac.il/government/images/PDFs/Tech4Dev_final.pdf. Accessed 21 January 2014

Wikipedia (2014), History of the Philippines
http://en.wikipedia.org/wiki/History_of_the_Philippines_%281898%E2%80%931946%29 Accessed 21 January 2014