

Report and Call to Action

30-31st October, 2018

Gaborone, Botswana

co-Hosted by:

University of Botswana eHealth Research Unit,

Botswana Institute for Technology Research and Innovation (BITRI),

Ministry of Health and Wellness,

Ministry of Transport and Communications







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Introduction and Background

The government of Botswana (GoB) spends considerable revenue on healthcare provision constituting about 15% of the national Gross Domestic Product (GDP), despite the outcomes not being commensurate with the level of spending [1]. As a result, the Botswana Ministry of Health and Wellness (MoHW) is looking at Electronic Health (e-Health) as a sustainable way to deliver cost savings, better patient outcomes, and greater accessibility to healthcare for all [1]. This is in line with the World Health Organisation (WHO) policy on Universal Health Coverage, which ensures that everyone, everywhere can access essential quality health services without facing financial hardship [2]. One of the pillars of Botswana's Vision 2036 is that "Botswana will be a moral, tolerant and inclusive society that provides opportunities for all" [3].

Simply put, e-Health refers to healthcare practice supported by electronic processes and communication. The healthcare sector in Botswana comprise of a complex network of public and autonomous private sector. For the past decade, the MoHW in Botswana had an influx of well-intentioned health information systems (HIS) implementations in both the public and private sector. Discussions around the status of e-Health and Health Informatics in Botswana are usually coordinated through conferences and workshops with key stakeholders.

In March 2018, the Ministry of Transport and Communication in Botswana hosted the 13th IST -Africa Conference where one of the sub-themes and sessions was mHealth, eHealth and Health Information Systems which was coordinated by the University of Botswana (UB) e-Health Research Unit. Following discussions at the IST-Africa mHealth, eHealth and Health Information Systems session, the UB e-Health Research Unit decided to organize a follow up workshop with the Ministry of Health and Wellness (MoHW), Botswana Institute for Technology Research and Innovation (BITRI) and the Ministry of Transport and Communication (MTC) under the theme "The Promise of Open Source Technology to Sustainable eHealth Solutions".

The above mentioned workshop was to explore alternative solutions towards provision of customized e-Health services, reduction of expenditure on healthcare technologies and also building local capacity to support local e-Health platforms. Open Source software are freely available and customizable to suit the local context. Countries around the globe utilise Open Source technologies for various sectors including healthcare. Examples include Kenya, Ghana, Uganda and South Africa to name a few. A consensus was made to invite guest speakers from other African countries to share their experiences working with Open Source e-Health platforms, challenges and successes in their implementation of Open Source technologies for healthcare. This would provide a benchmarking platform for local stakeholders towards appreciating the potential of Open Source technologies in health. Key speakers were identified across the continent working with Open Source technologies for e-Health in their respective countries.

e-Health Workshop Objectives

The objective of the 2nd e-Health Workshop under the theme "*The Promise of Open Source Technologies to Sustainable e-Health Solutions*", was to appreciate trends in eHealth technology solutions across Africa, stimulate discussions around Open Source solutions for health, expose attendees to available Open Source eHealth solutions and document recommendations for consideration by the Botswana government. The workshop sought to attract audience from government, academia and private sector, to share varied levels of experience and advancement around Open Source eHealth issues.

Workshop Speakers

Speakers	Bio-Sketch
	Steven Wanyee Macharia, MSc, is a biomedical informatics specialist with over 20 years years experience designing, developing, implementing, supporting, maintaining and meaningfully using digital health interventions in clinical research and health service delivery in low and medium income countries. Born in Kenya and currently working out of Nairobi, Steven's work in digital health has seen him support direct service delivery as well as top level planning, management, strategy and policy functions in the health sector. His work has seen him directly work in and support more than 10 countries across Africa. Globally, he has worked with leading multi-agency donor and development organizations including WHO, World Bank, USAID, CDC, GIZ, DFiD among others. He serves on several global informatics initiatives including the Digital Health and Interoperability Working Group of the Health Data Collaboratives mechanism, Health Informatics Association (KeHIA). He is an active core member of the OpenMRS and OpenHIE Communities Of Practice and serves on several Ministry of Health Working Groups across East Africa. Steven is a holder of a Master's degree in software engineering and post graduate training in health informatics
	Cynthia Antwi-Dodoo is an international technology for development professional with 12 years' experience in designing and delivering programs, in low resource multicultural and multi-sectoral settings. She has a passion for developing and finding innovative solutions. Excellent skills systems development expertise with proven ability to deliver health technology solutions from conception, development, pilot, and scale. Proven ability to develop and manage partnerships and advocacy. Keen interest in working in transformational spaces where technology is used to improve lives and patient outcomes. She Possesses a PgD in Medical Informatics (UKZN), BCom Business Informatics (UNISA),PMP and PRINCE2 Practioner.

Luis Falcón, M.D., B.Sc, holds a degree in Computer Science and Mathematics from the California State University (USA) and in Medicine from IUCS, Buenos Aires (Argentina). Dr Falcon is a social, animal rights and free software activist. He is the founder of GNU Solidario, a nonprofit organization that delivers Health and Education with Free Software. Dr. Falcon is the author of GNU Health, the award winning Free/Libre Health and Hospital Information System. He is a guest speaker at national and international conferences about Free Software, eHealth and Social Medicine. Dr Falcon currently lives in the Canary Islands, Spain.
Prof. Irina Zlotnikova currently is a Full Professor and HoD in the Department of Computer Science and Information Systems. She holds a ScD in Theory and Methodology of Computer Science Education (Doctor of Pedagogical Sciences, Moscow, Russia, 2005), a PhD in Solid-State Electronics, Nano- and Microelectronics (Candidate of Technical Sciences, Voronezh, Russia) and a Masters' Degree in Radiophysics and Electronics (Voronezh, Russia). Irina Zlotnikova has been working in African countries (Rwanda, Uganda, Tanzania and Botswana) since 2006. She acquired the following qualifications: ScD (Moscow State Open University of Education, Moscow, Russia), PhD (Voronezh State University, Voronezh, Russia) and Engineer Degree (BSc+MSc) (Voronezh State University, Voronezh, Russia). Her research interests include IT-Enabled Transformation, Information Systems Research, E- learning, Comparative Education, ICT Educational Policies, Business Informatics. She has more than 60 recognized publications in the areas of her specialization. She is a member of the PMI.
Prof. Lakshmi Narasimhan is presently a Senior Vice-President, Srikar & Associates International Inc., USA, and a full professor of Computer Science at the University of Botswana. He has published over 380 papers in the areas of Software Engineering, Information security and Information Engineering and related case studies extensively. In particular, his research interests are in computer architecture, parallel and distributed computing, software testing, data mining, Software process, asset management systems and Standards, and information management & fusion and their extensive case studies and performance evaluations. His papers have appeared in such archival journals as the various IEEE Transactions and IEE Proceedings. He has also been the technical chair of two other conferences and has been on the technical panel of over 80 leading International Conferences. Lakshmi has won competitive research funding to the tune of US\$8 million. He has consulted to a number of industries and educational institutions on various IT and Software Engineering projects, including Boeing Aerospace and DoD. Prof. Narasimhan is a Senior Member of the IEEE & ACM, Fellow of ACS, IEAust and IEE (UK). He is a Technical Member of various Standards bodies such as, ISO, ANSI and IEEE. Lakshmi is an IEEE Distinguished Visitor and an ACM Distinguished Speaker.

Workshop Proceedings

Day 1 - 30th October, 2018

Session Chair - Mr. Kagiso Ndlovu (University of Botswana)

Mr Ndlovu Coordinates the UB e-Health Research Unit which is a collaboration between the Department of Computer Science, Faculty of Health Sciences and Faculty of Medicine at the University of Botswana. The UB e-Health Research Unit seeks to foster e-Health Research and Capacity Building initiatives around e-Health at the University of Botswana, working with key stakeholders including the Ministry of Health and Wellness, the Botswana Institute for Technology Research and Innovation (BITRI) and the Botswana-UPenn Partnership (BUP) among others. One Open Source platforms for research housed at the UB e-Health Research Unit is **REDCap**, short for Research Electronic Data Capture, which currently hosts over 90 research and operational projects.

Welcome speaker - Professor David Norris (University of Botswana Vice Chancellor)

The Vice Chancellor of the University of Botswana (UB), Professor David Norris welcomed the stakeholders and workshop participants and in his welcome address, he emphasised the vision and mission of UB as follows;

Vision - "To be a leading centre of academic excellence in Africa and the world."

He highlighted that UB seeks to promote learning and teaching, create a vision positioning the University as research intensive institution, upholding internationalization, interdisciplinary education and research. He pointed that UB endeavors to develop into premier research center, increase its internal and external funding opportunities, develop a research niche area for excellence and pointed out e-Health as one ideal niche opportunity for UB to leverage on.

In his concluding welcome remarks, Professor Norris cited the e-Health workshop goals as follows:

- 1. Stimulate discussion around Open Source technologies for health,
- 2. Document recommendations for consideration by the Botswana government,
- 3. Identify capacity building opportunities for UB, and
- 4. Identify Open Source solutions for the government, the private sector and University of Botswana to leverage on for their e-Health initiatives
- 5. Strengthen partnerships with the public and private sector around e-Health and identify means for e-Health data sharing across public-private entities.

Keynote Speaker - Dr. Sebusang Sebusang (Executive Director, Technologies - Botswana Institute for Technologies Research and Innovation)



Dr. Sebusang Sebusang described BITRI's mandate as a research and development arm of the government, mandated with leading technology solutions to transform lives of Batswana. He pointed out 2 major areas for BITRI's efforts

- 1. Natural resources and Materials
- 2. Technologies including electronic communication and information systems.

He further pointed out that BITRI has been working on e-Health for more than 4 years and has identified current problems in the healthcare system include shortage of clinicians, long queues at hospitals, inadequate keeping of patient records at healthcare facilities among others. Sebusang pointed to e-Health as an alternative to alleviating space issues especially for medical records and also remote access of medical information..

According to Sebusang, for e-health to work, there is need for increased human resource as facilities, especially Health Informaticians and getting senior management's buy-in for e-Health adoption and use. There are numerous benefits BITRI sees with e-health including helping improve rural health management; monitoring of non communicable diseases (NCDs) and provision of quality healthcare. Patient tracking could be enabled through e-Health systems, an important aspect. Data access for anyone in the system is also important as it fosters adoption of interoperable e-Health systems. Patient tracking could allow identification of key admitting diagnoses and could help remotely address problems through e-Health technologies. There is need to invest through our country and Africa across platforms that communicate and share data in a meaningful way. A concern about ehealth is not being able to pay for the system, as in past there have been shut downs in areas due to this. Open sourcing can help prevent this problem. BITRI believes there needs to be a culture of nurturing of health skills among new information technology (IT) graduates. BITRI has started a 2 year program that helps integrate graduate skills. One primary concern that needs to be addressed is capturing of patient data.

Session Title	eHealth in Botswana now and the future
Session Presenter	Mr. Sinka Matengu (Ministry of Health and Wellness)
Session summary	 MoHW has a draft e-Health strategy initiated in 2016 and expected to run through 2020. The goal of the e-Health Strategy is to facilitate: Better access to healthcare through e-Health, Improvement of health outcomes, Better customer satisfaction, Quick access to health information, Monitoring and Evaluation of e-Health systems Overall cost savings for healthcare services MoHW embarked in a systems decommissioning exercise to reduce e-Health systems from the initial 37+ to the current 14 and the goal is to remain with 3 core e-Health systems. Current key challenges in the healthcare system which needs to be addressed include: Supporting community, citizens and health surveillance; Enabling e-Health workers to deliver quality care; Enable hospital clinicians to deliver quality care, Strengthening healthcare systems as well as management, Development of an e-Health national program. There are several projects in progress to try alleviate some concerns including complex networks for data collection, legacy systems and independent health information systems which are not interoperable. There is the need to innovative approaches towards the country's healthcare utilizing smart devices that empower clinicians and allow user-friendly capturing of data. Current health information system challenges could be addressed through devices that are continually connected to a reliable connectivity that is also secure.
Major Takeaways	MoHW needs manpower - There will be numerous positions for Health Informaticians in the new MoHW structure, estimated at around 400 positions country-wide. Also there is need for funding for hardware and Internet across healthcare facilities – Health Informatics unit currently has no budget but 2019 budget is being drafted to provide funding for manpower and hardware and connectivity needs. Another problem that needs to be addressed is to cultivate data driven culture within the Ministry of Health and Wellness. <i>"Data is the new OIL".</i> Questions from the audience included - How does private sector work with Ministry of health and Wellness in terms of sharing healthcare

	data? – What systems does private sector have to store health data and how is MoHW planning to engage private sector in the future? Minister of transport and communication response – In Botswana internet connections are available to offices and hospitals. All health facilities are connected to the network, the problem is that not all are activated because MoHW needs to do this at every facility. There are 1500 sites that have potential connectivity only remote villages are not connected it may require an alternate not fiber optic connectivity. The Director at MTC will be initiating a Program to educate Telecoms providers regarding the internet service expectations and response to assist when problems arise with their service provision.
Action items identified	A suggested solution to augment health informatics personnel was for UB to develop a full Health Informatics Program and offer short courses to up-skill in-service personnel. A suggestion from audience was for MoHW to consider TV Whitespace connectivity to augment the traditional broadband internet at healthcare facilities. Suggestion for consideration included - MoHW needs to prioritise interoperability with private healthcare systems - It has to be clear as to who owns the healthcare record between MoHW and Private sector – Comprehensive policy needs to be established. Audience suggestion there needs to be a policy on cloud computing as it comes with new opportunities and benefits, security of cloud based platforms should be looked into., currently security is questionable per the ministry official, however policies and laws are being developed currently to address cyber security and protection of

Session Title	Open Source Enabled Applications for Health: Challenges and Opportunities
Session Presenter	Dr Malatsi Galani (BIUST)
Session summary	Coordination of efforts is the biggest challenge, software is not the problem. There are myriad of issues around software and EHR. Healthcare lags behind finance, telecoms and business in IT. Biggest issues for integration of e-Health include: interoperability and use by providers. Another problem is competing facilities – private system

	and public system do not share data. MoHW must implement open transparency between these as well as insurers, laboratories, hospital and providers. Solution is to come up with governmental standards, requirements, and adopting openness in respect to the source code may help.
Major Takeaways	Problems with open source systems include - there are so many open source software systems hence uptake has been slow. Many example of a free open source were provided. One well used is Vista open source for the VA in the US. Misconceptions exist regarding open source: 1) Open source does not necessarily mean free because you need to have people to work on it and continually upgrade the system. 2) Open Source is not free or Shareware. 3)
Action items identified	Need to adopt/adapt/develop local e-Health systems that are Open Source and tailored for Botswana. Open Source can generate revenue and even create employment opportunities.

Session Title	Open Source Applications for health: Challenges and Opportunities.
Session Presenter	Prof. Irina Zlotnikova (BIUST)
Session summary	 Some barriers to developing local e-Health solutions in Botswana entail: Low level of IT skills among healthcare workers, Negative attitude towards IT and health informatics as a career, Negative attitude towards Open Sources by decision makers <i>(mostly prefer to outsource)</i> Lack of awareness regarding Open Source technologies Lack of interoperability among the healthcare systems, Open Source requires the know-how and in most cases, local providers don't have the required skill set. Opportunities: With Open Source, there is no need to develop solutions from scratch There is no need to pay upfront fees, Open Source can be easily customized, Open Source adaptability allows providers and clinicians to create on mobile based e-Health applications and interoperate with other electronic medical record systems (EMRs).

Major Takeaways	 For every commercial eHealth solution, there is an equivalent Open Source platform.
	 Major problem in Botswana is that there is a lack of trust in local graduates and institutions.
Action items identified	- Establish an Open Source community in Botswana.
	 UB to collaborate with MoHW to strengthen University- Industry collaboration and enhance graduate employability in IT and Health Informatics.

Session Title	OpenMRS Country Experiences on Open Source e-Health solutions
Session Presenter	Mrs. Cynthia Antwi-Dodoo (OpenMRS Technical Program Manager)
Session summary	Gave an extensive description of Open Source platform (OpenMRS) being used in 3037 sites, many around Africa including many different programs offering research, clinical, insurance billing, financing specific disease programs. OpenMRS offers a large community for remote assistance once adopted. Tanzania Ministry of Health is an excellent example of use of OpenMRS as well as a large hospital in India.
Major Takeaways	How to get national eHealth program started – need bold strategy, from the government - "What problem is the government looking to solve with OpenMRS?" "Where would they like to apply its use" There is need to know how will it be used, and commitment level. Build an ecosystem of programmers and designers to sustain, and need vision from MoHW. For Botswana, the biggest government mistake was allowing outsourcing for IT solutions versus investing in local talent.
Action items identified	 Suggestion for building health IT manpower capacity Young students, entrepreneurs to participate in OpenMRS programs currently hosted by Google: Google Code In <u>https://codein.withgoogle.com/</u>, and Google Summer of Code. <u>https://google.github.io/gsocguides/student/</u> MoHW to work more closely with OpenHIE <u>https://ohie.org/</u> to resolve the interoperability challenges the ministry is currently facing. Find new ways for external funding if internal is not available for training and system development.

Session Title	Embracing E health at Sedilega Hospital-private sector perspective
Session Presenter	Dr. Shakil Rasul (Sidilega Private Hospital)
Session summary	Sidilega Private Hospital is new in Gaborone Block 7 and offers 110 multi-specialties and will be completely paperless.
	Sidilega offers a full biometric system offering improved healthcare quality services, access, decreased costs, reduced medical tourism, less space needs and increased privacy, easier reimbursement, and better patient tracking. Challenges in Botwana's e-Health landscape include high cost of IT systems which are commercial, high maintenance and service costs, lack of interoperability, lack of of healthcare protocols, shortage of IT health professionals, cyber security threats, and inadequate laws regarding patient privacy.
	One thing unique at Sidilega is separation of HR, Accounts and Patient systems. All systems are interoperable and are redundant across 3 sites.
Major Takeaways	Facilities should seek to reduce system downtime, offer selective view of data by employees, and should not allow data storage on devices.
Action items identified	Primary needs for eHealth are laws and policies for protection of patient information, need for research collaborations, laws determining who owns patient information and health data sharing needs to be decided/legislative/agreed-upon.

Session Title	Australian ehealth personally controlled electronic health record
Session Presenter	Mr. David Kinyua (Thamani Economics Consulting - Botswana)
Session summary	Provided an overview of the Australian effort towards an electronic health record system that is now currently legislated as an opt-out system as opposed to an opt-in voluntary system. Essential to establish overall strategy and operational framework and the regulatory atmosphere to guide implementation of digital health initiatives.
	Suggest establish a Botswana agency for digital health strategy and planning. There is need for government to establish control over

	digital health policy, determine appropriate technologies, build people and capacity, and manage risks.			
	3 strategic areas of focus were discussed in relation to how digital health can transform them – i) access to services through initiatives such as call lines, web informationals, health directory, ii) new models of care – such as telehealth, co-locating health services, integrated healthcare, open source adoption, and iii) the role of primary health care in the context of Botswana since primary health care provides improved health outcomes, improves equity and lower health expenditure due to its preventative nature. Botswana should adopt clear strategies to enable these transformations. The session provided an exercise on how a digital health strategy should be developed with a focus on these 7 areas - Governance, regulations and controls , Technology and communication , People and capability in digital, Information and data, Financial sustainability, Diely means and controls and controls and controls and capability and accessing the area for the context of an exercise of the set of the set of the communication and data.			
Major Takeaways	 Australia was able to achieve a unified digital health record system due to government intervention which was legislated therefore authoritative. Botswana should explore empowering digital health transformation by establishing a digital health agency or by strengthening the Health Informatics Unit within MoHW. The digital health strategy should be authoritative in its focus on digital health transformation 			
Action items identified	 Review the digital health strategy toward a more authoritative source of policy direction. Form a digital health agency that will be responsible for the digital health mandate. 			

Session Title	GNU open source health initiatives				
Session Presenter	Dr Luis Falcon (GNU Solidario - Spain)				
Session summary	Discussed GNU health theoretical framework and e-Health systems used in Spain and around the world including free software specifically developed for developing economies.				
Major Takeaways	GNU Health Federation offers solutions that are autonomous, distributed, heterogenous, scalable and secure. GNU Health offers a comprehensive EMR compliant with HL7 FHIR Standard, offering unique PUID.				
Action items identified	UB eHealth Research Unit to kick-off collaboration talks and options with GNU Solidario and advise MoHW on next steps beyond the initial pilot.				

Day 2: 31st October, 2018

Session Chair - Dr. Aubrey Mokotedi (Botswana Institute for Technology Research and Innovation)

Aubrey, enjoys seeing research and software development being transformed into real-world solutions. Aubrey currently works as a researcher under the Information Systems and Technology Division at BITRI where he is part of a team which undertakes research and develops ICT solutions to address national needs in various key sectors including healthcare, education, agriculture and tourism.

Keynote Speaker - Dr. Morrison Sinvula (Deputy Permanent Secretary - Health Services Management Department - Ministry of Health and Wellness)



Dr Sinvula shared a clinical perspective to the e-Health landscape in Botswana. Having been in the healthcare sector for sometime, Sinvula appreciate the challenges our healthcare system faces in terms of information systems that are not robust, and are non-interoperable. The Ministry of Health and wellness is currently in a transition to deliver Healthcare Services and bring back Primary Health Care. There is a proposal for Doctors to run their services as General Practitioners in the villages and report to the Ministry of Health and Wellness. They shall be expected to deliver the following:

- 1. The total Population of a Village
- 2. Number of Elderly, Young and Under 5s.
- 3. Total Number of Pregnant women
- 4. Population number of people with Cancer Stratified according to the disease pattern
- 5. Total number of HIV positive patients and how many are on ARVs
- 6. How many have we suppressed the virus and how many are Hypertensive.

The private sector is disjoint from the public sector in their implementation of health information systems. There is a lot of expired drugs that are being destroyed because we procure without "BEING INFORMED". It's time we work "SMART" and utilize the few that we have "SMARTLY". Dr. Sinvula alluded that MoHW sees eHealth as a platform to improve outcomes and service delivery. Patient history is crucial for better continuity of care and that could be achieved with robust health information systems. Health Information systems should inform daily clinical processes and assist clinicians in their routine care. The Ministry of Health and Wellness shall continue to deliver health guided by

the e-Health strategy. Robust eHealth systems could reduce over dependence on South-Africa. Batswana Healthcare givers need to be empowered. It's high time that the e-Health Strategy is "IMPLEMENTED". There is promise of mobile telemedicine in Botswana. MoHW once piloted mobile telemedicine project for cervical cancer screening and the results were positive, something which led to consideration for national scale across Botswana. Dr Sinvula gave a scenario where he once remotely supported an operation procedure through a mobile phone. It is possible and it is being practiced even today, all that is needed is formal procedures and regulations to make it secure and efficient. Workshops such as this should be held regularly where various stakeholders (government, private sector and academia) convene to share challenges and opportunities that lie in terms
convene to share challenges and opportunities that lie in terms of improving our healthcare sector.

Session Title	The Promise of Open Source to sustainable e-Health solution, what has worked and what does not worked				
Session Presenter	Steven Wanyee (InteliSOFT)				
Session summary	 Kenya has an integrated Health Information Management System that houses data from 5 Different data sources. The Ministry Of Health in Kenya owns ALL the data. Back up is housed at the University of Nairobi.Kenya uses the following applications (among several others): OpenMRS (called KenyaEMR by MOH) for its national EMR DHIS2 eHospital powered by Bahmni which is an easy-to-use EMR & hospital system. It combines and enhances existing Open Source products into a single solution. *PS: The MOH is establishing its Digital Health Atlas which through a public portal will provide comprehensive information. 				
Major Takeaways	 The MoHW in Botswana need to conduct an assessment to categorize the different ways in which digital and mobile technologies are being used to support programmatic and health system needs. It is recommended that this process be supported by WHO using the Digital Health Atlas (DHA). A Health Information System (HIS) interoperability capability assessment should be conducted. MEASURE Evaluation are well positioned to support the MoHW in this activity. 				

Action items identified	IMPORTANT LESSONS LEARNT BY KENYA ⁴
	1. When designing a comprehensive HIMS design with the End
	User in Minu
	2. Understand the existing e-Health ecosystem
	Design for Scale and Build for Sustainability
	 We are living in an era that is Data driven for Decision Making Purposes
	5. There are available Open Standards, Open data, Open Source applications and Open Innovations
	 Issues of Privacy need to be addressed and Collaborative efforts are very crucial.
	Essential skills and competency in healthcare workers to meaningfully use digital health is very crucial
	 Enabling environment, leadership and governance is very critical
	We need a senior political CHAMPION to advocate for ICT use in health care.

Session Title	Open Source in Botswana - Government VS Private					
Session Presenter	Mr. Selefo Sabone					
Session summary	The Government and Private sectors do not seem to have intentions of going Open Source. Government: Paralysis, no Support for Open Source, no Skills to					
	support Open Source, Leadership hesitant Private sector: See no opportunity for Open Source, Tenders clearly not for for Open Source, Less informed on opportunities for Open Source.					
Major Takeaways	 Decision Makers to inform themselves on Open Source Private sector and academia to continue advocacy for Open Source Need for policy on Open Source technologies Policy that ensures analysis for alternative solutions 					
Action items identified	There is a strong need for PRESSURE GROUPS to present interests to the government and make the position to use Open Source favorable.					

⁴ https://digitalprinciples.org

Post e-Health Workshop Survey

A survey instrument was administered to all the e-Health workshop participants. The purpose of the survey was to get feedback from participants on workshop deliberations and any suggestions for improvement as we plan for the 3rd e-Health workshop in 2019. A total 25 responses came through and a summary of responses from sampled questions as follows;

Organizations responded to the survey:

- University of Botswana
- Ministry of Health and Wellness
- Botho University
- Botswana International University of Science and Technology (BIUST)
- IntelliSOFT Consulting Limited
- OpenMRS
- Focus Surveys
- Botswana Institute for Technology Research and Innovation (BITRI)
- Department of Information Technology (DIT)
- Peek Vision Limited
- Botswana-Upenn Partnership
- Thamani Economics Consulting & Mjenzi Cloud
- Sidilega Private Hospital
- University of California Berkeley
- Banaba-Kgwale Association

How did you learn about the 2nd eHealth workshop co-hosted by UB, BITRI, MoHW and MTC?



What is your take/view on the workshop theme, "The Promise of Open Source to Sustainable eHealth Solutions"?



On a scale of 1-5, how would you rate relevance of the theme to addressing today's eHealth challenges?





What is your overall rating on the relevance of this workshop?

Do you think Botswana is ready to fully adopt Open Source eHealth solutions?



Any recommendations you would like to put forward to Botswana Ministry of Health and Wellness regarding adoption of eHealth Open Source solutions.

- Consult all relevant stakeholders broadly to identify a more appropriate adoption model or architecture.
- Do not leave out academia in this journey. Feedback from research output should form part be used by the ministry for guidance on possible options out there and both their pros and cons.
- Provide leadership and guidance.
- To think open source.
- It's Economically reasonable.

- Train health practitioners on the use of ICT and specifically eHealth Open Source solutions; raise awareness on OSS; increase the number if Health Informatics specialists in MoHW.
- Implement DHIS, PIMS or OpenEHR.
- Practice the principles for digital development.
- Be guided by the building blocks for digital health solutions.
- To embrace open source and also create an environment where startup tech companies can gain access and mine existing data.
- BITRI SYSTEMS that are there.
- Open Source Software is a viable and credible alternative to proprietary software
- We need the right workforce to operate our systems, people who have public health at heart not just someone who has the skills of operating a system. We want a workforce which would be able to analyse patient medical records and interpret what the data given means for the health care system, and there is less workforce on Health Informatics fraternity hence jeopardizing the status of rightful use of EMR's which includes Open source solutions.
- This is because Botswana does not have a policy that guides organisations on how to manage data.
- To form a committee that will always attend such workshops, the committee comprised of influential people with different expertise such as IT personnel, clinicians, patients, private sector institutions. The committee will be responsible to analyse solutions presented to them and see if the government can adopt those.
- I hope MoHW should adopt OpenMRS
- The draft strategy should be clear about adopting open source technologies.
- Improves access to healthcare or a quick access to health information.
- Improves monitoring and evaluation.
- Helps the community know how to collaborate, communicate and contribute towards one goal.

- Make research software and its source code more discoverable, reusable and transparent, with the desired objective to improve its quality and sustainability.
- There has to be collaboration with the private sector if this is succeed.
- Moved ahead very fast, assess every system in use within the ministry with the view of developing and migrating to open source platforms.
- Add flexibility and innovation to their health IT infrastructure while still using legacy solutions.
- Work with other stakeholders closely. It was evident that the ministry of health presenter was not aware of the access points/connectivity that the ministry of infrastructure reported to be in place at hospitals around the country.
- Engage NGOs, especially those that are educating children.

Any recommendations on ehealth interoperability steps for Botswana?

- I assume these have been developed by various developers, with no set standards in terms of data definitions. Therefore attaining 100% interoperability might remain a serious challenge. But perhaps the Health Ministry should establish the main set of modules for our public health system modules as core, with an provision for interfacing with extra modules that address specific needs as and when these are needed.
- Keep on exploring ways of interoperability
- Relevant policies and standards need to be inplace. Role of national governance
- Reduce the number of HIS
- Develop platforms that can link up these numerous systems
- Start with a country wide assessment using the recently published HIS interoperability maturity tookit. Let the results of that guide the country's investment in interoperability.
- This one goes to the government, If we don't formulate a regulation which allows the private sector to share their patient's data then we will never have the right numbers in our healthcare system. the data from private practitioners and private hospitals remain useless because its not used to add into what the government has, this same data we ignoring is where our answers on health care system planning are.
- I think most of them were discussed in the presentations.

- Every open source software must be able to communicate with each other, policies must be in place and framework must be developed for software's to be inter-operable.
- Take advantage of universities and other research institutions to develop the necessary ecosystem to help make interoperability possible.
- Look at the Kenyan story in the way they are handling interoperability.
- Instill positive attitude, skills & training on it's people.
- Create a conducive environment.
- Conduct open source workshops for the relevant people (upper management).
- It is evident that more than one system can be used within the ministry, what is important is how they are integrated to operate in synergy.
- Focus on patient-empowerment services, Self-training systems; Web-based selfmanagement; Chronic disease self-management; Hybrid nurses and self-managing systems; Dedicated self-management systems

What do you expect the 2019 eHealth workshop to be like? e.g. topics of discussion, stakeholder engagements

- Start ups and open source opportunities in eHealth
- More citizen focused eHealth technologies.
- New Age Health Information Management -Action Community for E-health Excellence
- I would love to see all institutions which offers programs in the health care sector participating in this workshop, especially those which deals with health data and EMR's. There is a huge gap between the HI industry and the students/ upcoming graduates because there are not aware of the trends in the fraternity, it's important to fully capacitate the future users of these systems.
- Well done to the planning team, however maybe in the next eHealth workshop there would be right stakeholders invited so as to answer certain questions triggered in the presentations and can only be answered by them.
- Decision makers should be involved, topics that are around plans and implementation of e-health solutions must be at the heart of every workshop.

- Should invite more stakeholders
- Continue the strategy update Progress from the local systems and their use and changes
- Lessons from elsewhere on adoption of digital health solutions
- Demos on how these system works and how they can be managed.
- Invite relevant people e.g. top management from ministry of health and end users e.g doctors from Princess Marina.
- Have topics on cyber security specific to healthcare and have the law fraternity give its stand on legislation with respect to eHealth
- I expect for the conference to lean towards already implemented solutions or soon-to-be implemented solutions and adopting their workflow.
- One important area I would like to be included in the next workshop should be "What the ministry has experienced in transitioning to open source platforms"
- Further opportunities for directed networking and collaboration.
- Advances in techniques, services, and applications dedicated to a global approach of eHealth, including a regard on federated aspects considering the mobility of population, the cross-nations agreements, and the new information technology tools
- Google Developers Gaborone & PyData and BamabaKgwale Association as stakeholders with more than 20 active softwares, some developed by children.

Recommendations

- ICT is not appreciated yet in Botswana and the starting point is to take ICT seriously. Companies seem to prefer proprietary software compared to OSS.OSS need to be taught. There is a need to create an enabling environment. The country needs to adopt the 6 Building Blocks for Digital Health.
- 2. As a country, we need to assess and ask ourselves why the rate of adoption of Open Source solutions is very low.
- Open Source groups need to be very active i.e. hackathons, Developers circles and PyData. As a country, we need to start ADVERTISING & ADVOCATING for Open Source platforms.
- 4. Users seem to be having a Very Bad attitude towards ICT use. There is a need to advocate for change.
- 5. Let us not reinvent the wheel but assess the existing environment and come up with a long standing solution.
- 6. The country needs to establish a TALENT PIPELINE and look for skills set and train now.
- 7. There is a need for a collaborative effort to look at Open Source software, critique the code, study their vulnerability and its limitations.
- 8. Things have changed tremendously because of computer networks. There is a need to prove to the government that Open Source solutions work. There is a need to demonstrate that there is capability.
- 9. There is a need for collaboration between the Academia and the Professional environment. Botswana university graduates only know theory.
- 10. Universities are waiting for PROBLEMS to be solved. The ministry should collaborate with training institutions on ICT problems that they need resolved.
- 11. There is a need to establish with the Ministry of Health and Wellness, how Open it is to Open Source platforms.
- 12. There is a need to stimulate Political willingness in advocating for Open Source use. Policies need to be put in place to demand use of technology in Health Care Delivery.
- 13. Workshops and awareness on Open Source are a must.
- 14. Pilot Test BITRI Remote Patient Monitoring System on a small scale.
- 15. MoHW should collaborate with UB in co-teaching of e-Health systems to nursing and medical students.
- 16. MoHW should collaborate with UB in co-teaching of e-Health systems to health professionals (in-service).

A Call to Action

Following this highly successful workshop and ensuing post workshop review discussions, below is a summary of 10 key points underpinning this Call to Action;

- The Ministry of Health and Wellness and its partners, is strongly advised to provide firm leadership, foundation and a conducive environment to culturally integrate, promote adherence to and continuous practice of the nine Principles for Digital Development⁵;1) Design with the user, 2) Understand the existing ecosystem, 3) Design for scale, 4) Build for sustainability, 5) Be data driven, 6) Use Open Standards, Open Data, Open Source, and Open Innovation, 7) Reuse and Improve, 8) Address Privacy and Security, and 9) Be Collaborative.
- The MOH&W working closely with UB and BITRI to immediately identify and define opportunities to immediately commence practical activities which can include the following;
 - New development and implementation of an open source digital health solution.
 - Enhancement of existing solutions (e.g. OpenMRS that is currently being used by the National TB program).
 - Establishment of relevant and clearly defined Health Informatics internship programs structured around key areas jointly identified by the MoHW, UB, BITRI and other partners.
- 3. The MoHW will ensure that the eHealth strategy that is still under development is comprehensively reviewed and updated using this report. Additional support required including from external partners like the Health Data Collaboratives will be appropriately sought.
- 4. The MoHW with its partners including the local USAID Mission will make a request to MEASURE Evaluation to support it conduct a baseline assessment to determine the country's Health Information System interoperability capability maturity, and hence capacity to implement interoperable systems.
- 5. The University of Botswana in collaboration with BITRI and MoHW will immediately commence on re-activating the Botswana Health Informatics Association. An offer has already been made from the Health Informatics in Africa (HELINA http://www.helina-online.org) and the African Alliance of Digital Health Networks (https://www.africanalliance.digital/home-english) to support this process. Related to this will be relevant initiatives to start communities of practice formed around the digital health solutions that will naturally emerge as key MoHW investments including OpenMRS (OpenMRS Botswana community of practice), OpenHIE, etc. The OpenMRS global community has already offered to help create a page for Botswana on the global website similar to for example Kenya's (https://talk.openmrs.org/c/local/kenya).
- 6. The MoHW will establish a framework to promote better partnership and interaction between the public and private health sectors on matters regarding digital health investments. This partnership framework will be comprehensive to ensure effective

⁵ https://digitalprinciples.org

inclusion of academia, research institutions, health service delivery practitioners and all other key constituents within the health sector ecosystem including strategic engagements of key partners outside Botswana.

- 7. The MoHW will commence on an exercise to support and facilitate registration, assessment, planning, monitoring, coordination, and planning for digital health deployments. This is recognized as a critical activity consistent with the Ministry's plans to strengthen governance of digital health implementations. The Ministry has already started conversations with WHO to get this process underway.
- 8. There is urgent need to conduct a cost benefit analysis for e-Health systems in Botswana
- 9. There is a need to conduct a utilization survey of Botswana's eHealth systems
- 10. There is urgent need to have the MoHW Data Warehouse fully functional and populated with data with all e-Health systems
- 11. There is urgent need for Human resource capacity development and advocacy. These include Health Informaticians.

Conclusion

An inclusive partnership framework with strong MoHW leadership needs to be established. Participation needs to be proactively maximized through an elaborate stakeholder mapping process that should result in identification of key actors in the health sector. These include; Government, private health sector (service delivery, TELCOMS, private companies, etc), academia and research institutions. The government continues to make huge investments in the healthcare sector but with less achieved in having robust health information systems. The private and public sector are not in sync and everyone handles patient data without the knowledge of what happens next door. The need for proper regulation of eHealth systems and framework for systems interoperability cannot be overemphasized. The time is now to explore alternative solutions that have proved to work in other similar settings. Even before anything else, there is need to have a robust national e-Health strategy to guide all e-Health initiatives. Moreover, the government needs to build confidence and strong relationships with local institutions such as universities, research entities and the private sector. There should be engagements through formalized collaborations towards solving local challenges with a pool of local experts. MoHW should work with all key stakeholders to capacitate the Health Informatics Unit. Universities should offer Health Informatics as a Degree and even at a Master's level. As a country we need to build a pool of local Health Informaticians to assist address the current e-Health challenges in the public and private sectors. Health Informatics should not be confused to Information Technology as the two are different.

Presentations Snapshots







Open Source Enabled Applications for Health: Challenges and Opportunities

Malatsi Galani, Ph.D.

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October 2018



Open Source in Botswana

Government vs Private Sector

31st October 2018

www.retentionrange.co.bw

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References

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- 2. <u>https://www.who.int/healthsystems/universal_health_coverage/en/</u>
- 3. Vision 2036, Prosperity of all (2016), Govt of Botswana
- 4. https://digitalprinciples.org
- 5. <u>https://www.measureevaluation.org/resources/tools/health-information-systems-interoperability-toolkit</u>

Appendices

Workshop Program



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	Day	One			Day	IWO		
	TUESDAY 30 th	OCTOBER 2018			WEDNESDAY 31	OCTOBER 2018		
	Morning Session Chair : Mr Kagi Venue : UB Faculty of	n : 09:00 - 12:50 so Ndlovu (UB) Medicine Audito	rium	Ch	Morning Session air : Mr. Sinka Matengu (He Venue : UB Faculty of	n : 09:00 - 12:50 ealth Informatics U Medicine Auditor	Jnit, MoHW) ium	
08:00 - 08:30	Registration Process			08:00 - 08:30	0 Registration Process			
08:30-08:40	Welcome Remarks: Professor David Norris, UB Vice Chancellor			08:30 - 09:00	Keynote Address			
08:40 - 09:00	Keynote Address : Dr. Sebusang Sebusang, Executive Director, Technologies, BITRI		09:00 - 09:40	Open Source Enabled Applications for Health :	Dr. Malatsi Galani and Prof. Irina	Department of Computer Science and Information		
09:00 - 09:30	e-Health in Botswana –	Ms. Malebogo	Acting IT Manager, Ministry of		Challenges and Opportunities	Zlotnikova	Systems, BIUST, Botswana	
09:30 - 10:00	Now and The Future Commercial eHealth Solutions Versus Open Source – The	Mr. Steven Wanyee	Digital Health Solution	09:40 - 10:10	Smart Open Source Information Infrastructure Design For Epidemiology	Prof. Lakshmi Narasimhan	Department of Computer Science, UB, Botswana	
	Promise of Open Source to Sustainable eHealth Solution	Macharia	Kenya	10:10-10:40	Tea Break			
10:00 - 10:30	Tea Break		10:40 - 11:10	Open Source Tool for eHealth Research	Mr. Kagiso Ndlovu	Department of Computer Science, UB, Botswana		
10:30 - 11:00	Country Experiences on Open Source e-Health Solutions	Ms. Cynthia Antwi-Dodoo	Specialist, Kenya	11:10-11:40	Introduction to Scientific	Ms. Tebogo Seipone	Department of Computer	
11:00 - 11:30	Embracing OpenMRS at MoHW, Botswana	Mr. Titi Tsholofelo	OpenMRS Expert, Ministry of Health and Wellness, Botswana	11:40 - 13:00	Writing using Littex Science, UB, Botsw Walk in sessions (Stall Visit/Rotations)		Julence, Ob, botswana	
11:30 - 12:00	Open Source eHealth Solutions	Mr. Shreshth	Health Informatician, ITECH,	13:00 - 14:00	Lunch Break			
	at ITECH	Dr. Shakil Rasul	Medical Health Informatician.	A	ternoon Session: 14:00 - 17:00	Chair : Representative, MTC		
12:00 - 12:30	Hospital – The Private Sector Approach	Di. Sheki kesu	Sedilega Private Hospital, Botswana		Panel Discussion and	All Speakers	Way forward based on all talks	
12:30 - 14:00	Lunch Break and Poster Session	Walk-Ins		14.00 - 16.00	ResolutionsyRecommendations	Rep, Academia	way forward based on all talks	
Aft	ernoon Session: 14:00 – 1700	Chair : Dr. Aubrey Phe	eto Mokotedi (BITRI)			Rep(UB, BIUST, Botho, Limko), Private Sector Reps		
14:00 - 14:30	GNU Open Source Health Initiatives – How can Botswana Benefit?	Dr. Luis Falcon	President, GNU Solidario, Spain	16:00 - 16:10	Workshop Closing Remarks	Prof. J.R. Atlhapheng	Dean, Faculty of Science, UB, Botswana	
14:30 - 15:00	Australian eHealth Personally Controlled Electronic Health	Mr. David Kinyua	Management Consultant and Economist, Thamani Economics	16:00 - 16:30	Afternoon Tea			
		1	Consulting Botswana					
15:00 - 16:00	Record (PCEHR)	All Speakers	Based on the day's deliberations					

Workshop Flyer



Workshop Photo Gallery









Acknowledgements

Special thanks to the organizing committee of the second e-Health workshop co-hosted by Ministry of Health and Wellness, Ministry of Transport and Communication, University of Botswana and the Botswana Institute for Technology Research and Innovation. The workshop brought together experts from the private sector, academia and public sector to share experiences and thoughts around Open Source solutions for e-Health and how that could be leveraged for the context of Botswana. Special thanks to the Vice Chancellor of the University of Botswana, Professor David Norris, for allowing us to host the 2nd e-Health Workshop at the University of Botswana Teaching Hospital Auditorium. We would also like to express great appreciation to our keynote speakers Dr. Sebusang Sebusang from BITRI and Dr. Morrison Sinvula from MoHW. Special thanks to our guest speakers from Kenya, Ghana and Spain who saw it fit to leave their respective countries and commit their efforts towards supporting this workshop. Lastly, participants from across private and public sector as well as academia who attended and contributed immensely in discussions are highly appreciated, without their participation, the workshop would have not been a success.

Endorsed: 16 November, 2018

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