# Overview and Instructions

Using feedback received in the concept note phase, notified applicants will begin preliminary application development. Please build off your [concept note](https://wiki.digitalsquare.io/images/b/b0/Concept_Note_Template_FINAL.doc) to create your technical application in this document. *Please delete all “Instructions for the applicant” prior to submitting the application for review.* [Please delete highlighted text fields, update with supporting information for the given category.] You may expand upon these requirements to include diagrams and other elements that will further describe the project. Should you have questions about the guidance provided in this document, please reach out to your Digital Square point of contact or digitalsquare@path.org for additional guidance.

**The preliminary application should contain only this document.** During the application finalization step, following the application co-creation and comment period, the full application package must include the cost application, consisting of a [detailed budget](https://wiki.digitalsquare.io/images/0/0c/Sample_Detailed_Budget.xlsx) and [budget narrative](https://wiki.digitalsquare.io/images/1/11/Budget_Narrative_Template_FINAL.doc).

The technical application must be written clearly and define all work, deliverables, and timelines of performance to eliminate ambiguity. Any acronyms used must be spelled out and technical jargon should be minimized in favor of commonly understood terms.

During the preliminary application co-creation step applicants, and other stakeholders can continue to provide feedback, comments, and suggestions. Applicants may post iterations on the forum until the preliminary application comment period begins. Please indicate updates by saving the file with a version number at the end of the file name or date (e.g., “ApplicationTitle\_v1”). As necessary, please revise the two-sentence overview, executive summary, and consortium team on the [OAP platform](https://proposals.digitalsquare.io) application page.

In the application finalization phase, please bear in mind that the technical application and cost application are complementary documents. The programmatic relevance of elements of cost such as level of effort (LOE), equipment, travel, and subawards or consultants, which should include consortium members, must be demonstrated by the scope of work (SOW).

Following the investment decision by the [Governing Board](https://wiki.digitalsquare.io/index.php/Governing_Board) or funder, finalization of the SOW will be an iterative process between your organization and PATH prior to execution of a subaward. Once agreement on the SOW is reached, the SOW and other supporting documents will be incorporated into the agreement between your organization and PATH.

*For an introduction to vernacular, please review the* [*Grants and Contracts Basics.*](https://wiki.digitalsquare.io/index.php/Grants_and_Contracts_Basics) *Please navigate to* [*procurement processes*](https://wiki.digitalsquare.io/index.php/Procurement_Processes) *for more information on funder investment mechanisms. For more information on the overall process for selected applicants, please review the* [*investment process for global goods*](https://wiki.digitalsquare.io/index.php/Global_Good_Investment_Process)*.*

# mADX on FHIR on Android

## Two-Sentence Overview

Most mobile health reporting is generated server side or in a HMIS. Our goal is to provide a standardized way for health apps to make real-time reports accessible to health workers offline for better decision making. We will create a set of open source libraries, expanding [HAPI FHIR](http://hapifhir.io/) and CQL tools, to enable Android based apps to quickly generate health reports offline using a standards based approach defined in the mADX Profile.

## High-Level Budget Summary

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Work Package 1 Develop a Minimum Viable Product** | **Work Package 2 Develop a user interface that allows users to view the generated measureReports in Android** | **Total Cost (USD)** |
| **Total Project Costs** | $77,250 | $41,650 | **$118,900** |

## Executive Summary

The digital health ecosystem is rapidly maturing with mobile solutions that support the capture of health services delivered by frontline health workers. While data collection in these apps is quite mature, in-app reporting is still very limited with most solutions limited to pushing reports into a Health Management Information System (HMIS) from the central system.

There are two major problems that we aim to address. First, the majority of mobile frontline health systems push report generation to a central system that requires internet connectivity instead of providing the capability to generate reports at the point of service. This results in frontline health workers not having access to up-to-date reports offline for decision making. Second, developing performant reporting on low powered mobile is technically challenging and, to date, a standards based approach to address this has not emerged.

Our goal is to develop an open source FHIR standards based reporting stack for offline generation of health reports on Android devices. We will use OpenSRP to implement a reference app using this approach. To achieve this we will adapt a reporting architecture we developed for OpenSRP in-app reporting.

## Consortium Team

Ona is a technical social enterprise focused on global health, based in the United States & Nairobi, Kenya. Ona was founded in 2013 and has been in operation for close to 6 years. The company has a 25-person development team which includes software developers, software architects and machine learning experts. Ona has extensive experience designing, developing and implementing health information systems that are used at national scale and integrate with existing government health information systems and open standards. Ona has developed numerous open source standard tools and libraries in the space that are used by mobile teams to add functionality to their existing technologies. Ona serves as the technical lead for the Open Smart Register Platform, having co-created the platform with the World Health Organization.

As an organization we have extensive experience developing digital health applications for mobile. We are the technical leads and main developers of OpenSRP - a digital health global good that provides service delivery support for frontline health workers. With OpenSRP we currently are supporting large implementations of OpenSRP in Tanzania with Jhpiego, with UNICEF in 5 countries in West Africa and with GAVI and Mastercard in Mauritania. Previously, we supported PATH to use OpenSRP to develop a national electronic immunization registry (EIR) in Zambia. For this we developed extensive in-app reporting, that was used to tally over 100 indicators which were then reported to DHIS2. This work forms the technical foundation for this proposal.

With Akros, Vital Wave and CHAI we are developing Reveal ([https://revealprecision.com](https://revealprecision.com/)) a next generation task based service delivery tool developed on top of OpenSRP. Reveal relies heavily on FHIR including supporting FHIR task, planDefinition and location resources. As part of the Reveal work, Ona is developing with Novel-T the geo-widget - an Android SDK that makes it possible to view locations and structures on map and link services to it by clicking on it. The Geo Widget a global good that is currently being adopted by DHIS2, CommCare and other popular digital health applications.

Lastly, for the past year we supported VillageReach to help develop a reporting stack using an open source enterprise analytics suite we developed called Canopy. In doing this we got hands on experience using the appropriate R4 FHIR reporting resources that are cited in this application including generating measures, measureReports and libraries. This work also included building organizational capacity in running HAPI FHIR as part of the Canopy stack.

### Proposed Project team

Craig Appl - Technical Lead and Project Manager

Craig has deep experience in developing health information systems used at multiple levels within the health system. He is responsible for running the OpenSRP technical communities, coordinating features across multiple vendors, organizations and implementations. Craig is active in multiple global communities including the Open Health Information Exchange, Open Logistics Management Information System, Open Smart Register Platform and Open Medical Record System. He led the collaboration with Village Reach and is proficient in the application of FHIR R4 reporting in real world contexts.

Samuel Githengi - Sr. Engineer

Samuel is a senior engineer and engineering team manager on the OpenSRP platform and has been actively developing the platform for multiple years. Samuel is responsible for architecting and delivering multiple new features on the OpenSRP platform, including the Reveal product, Mobile Stock Management and Peer-to-Peer sync. Sam is actively involved in the World Health Organization Computable Care Guidelines working group that’s focused on developing technologies that can deliver robust FHIR based reporting at scale.

Rodgers Andati - Sr. Engineer

Rodgers is the senior engineer who is responsible for the OpenSRP In-App Reporting product. Rodgers has over 5 years of experience developing mobile tools for multiple clients.

Peter Lubell-Doughtie - Technical Advisor

Peter is the Chief Technical Officer of Ona with decades of experience in developing cutting edge technologies and data science solutions.

Roger Wong – Design Lead

Roger is the Ona design lead who develops all interface and user experience solutions for the Ona team on the OpenSRP platform.

We are not currently collaborating with any partner organizations. We are **seeking collaboration** with groups that have in-app reporting needs to help validate the proposed FHIR based reporting standard we wish to develop. We will not require support in developing the prototype. If we validate the approach, we would want to work with other partners to adopt this approach.

## Background or Problem Statement

Each health ecosystem contains disparate technologies and tools that are used everyday to deliver care to clients. The great unifying factor is the enforcement of national standardized reports into a common platform. Historically, this has allowed program officers to ignore what technologies are deployed at the point of service, as long as the monthly reports are submitted on a regular basis. As a result, any given district has multiple mobile tools, surveys and electronic medical record systems collecting information on clients with each system defining the process for generating their reports.

OpenSRP is part of an ecosystem of mature bespoke mobile data collection tools that are deployed around the world. Our community has consistently invested in building and improving these technical solutions, but there is no standardized approach to generating reports in Android systems. At this time, a ministry could approve deploying three mobile tools for maternal health in a district and have three different reporting systems setup to feed the monthly reports into the health management information system. Each of these mobile deployments have their own way of collecting information, defining indicators and reporting them to the national system with quality controlled only when the information hits the health management information system.

The majority of mobile frontline health systems push report generation to a central system that requires internet connectivity instead of providing the capability to generate reports at the point of service. This results in a situation where frontline users, who are responsible for the day-to-day information collection, do not have the power to generate, check and analyze reports on their mobile device. This causes inefficiencies in the system that lead to less information, reporting lag and suboptimal information across the health system’s distributed points of service.

Our opinion is that there needs to be a fundamental shift in how reporting is done in mobile tools. These bespoke mobile solutions are currently setup as either standalone or paired solutions as defined in the maturity model in section 2.3 of the IHE QRPH CQL for ADX whitepaper. The fully integrated level of maturity is not achievable in the mobile solutions of today unless we restructure our bespoke mobile applications to support FHIR natively on an Android client so real-time analysis and monthly report generation is available on mobile devices.

Our proposal is to better empower frontline health workers to ensure they have the ability to generate in-app reporting and analysis when offline on their Android device using standardized report definitions that are created once at the central level. Our goal is to develop an open source FHIR standards based reporting stack for offline generation of health reports on Android devices. We will use OpenSRP to implement a reference app using this approach. To achieve this we will adapt a robust existing reporting architecture we developed for OpenSRP in-app reporting.

The Ona teams are located in both the United States and Nairobi, Kenya with the majority of software development occurring by our Kenyan team. This idea is experimental, but it builds off of our proven mobile reporting strategy that has been actively in use and under development for more than two years.

## Digital Health Technologies

The Open Smart Register Platform (OpenSRP) is a mobile data collection system that specializes in supporting reproductive, maternal and child health programs in numerous implementations across the globe. OpenSRP utilizes Android mobile devices for primary data collection at health facilities and in the field supporting community health workers. We propose to convert OpenSRP’s existing in-app reporting functionality from a custom module into open source native Android libraries that build off of HAPI FHIR and the myriad of open source Clinical Query Language tools that are available. These libraries will be well documented and made available as a global good so any vendors are able to add these features to their existing mobile applications opening up the ability to convert custom android data architectures into standardized FHIR compliant reports. Furthermore, these libraries will be able to support centrally defined resources, allowing for the same business logic to be run on the Android client, central level and even in a fully integrated health information exchange.

### Existing Functionality

OpenSRP functions as a point of care health application that tracks the care provided to clients. We provide the core features of any electronic medical record system natively on an Android device including the ability to register clients, establish relationships between clients, track the care provided to them, track tests and report on the transactions that have taken place in the system. Technically, we implement a native SQLite transactional database and with helper tables that are generated following the Extract, Transform, Load (ETL) paradigm for computing resource intensive reports on lightweight hardware.

OpenSRP has a custom in app reporting module that utilizes custom libraries for calculating indicators from the transactional database and representing them in local reporting tables. We developed this module due to implementation demands for providing rich reports at the offline point of service. Additionally, we have built the capability for each facility to generate, check and post their mandatory monthly reports from their tablet to the DHIS2 Health Management Information System (HMIS). These reports are compiled on a regular schedule utilizing background processes, presented in the Android interface so a user can review them, make edits and submit from the tablet to the centralized server, which then forwards them to the centralized HMIS. In other words, all indicator reporting is done by frontline managers in the Android client.

Once a form is saved, it is processed using post save actions that are coded right now in Java. Those actions convert the form and store it into transactional SQLite tables. These tables are queried on a regular schedule, the information is extracted, transformed and loaded into standardized reporting tables that are used to drive dashboards. Below is an illustrative diagram of this functionality



Figure: Current OpenSRP Reporting Architecture

### Conversion from a Custom Solution to FHIR and CQL

We propose to convert this process from custom business logic to utilize open FHIR standards and tooling. We will utilize FHIR resources for defining the reporting tables so reports are stored in the standard FHIR resources that are appropriate for reporting including the Measure, MeasureReport, Library and ValueSet resources. We will also convert the business logic that’s defined in the custom ETL process to utilize the CQL rules engine so that the transformation from the transactional database and the Measure business logic can utilize a common CQL library.

We will build off of the existing open source [HAPI FHIR Java libraries](https://github.com/jamesagnew/hapi-fhir) to store information as FHIR resources and will use the Java CQL tools provided by the [Database Consulting Group](https://github.com/DBCG) including the cql-engine and cqf-ruler. Our target is to develop a minimum viable product that implements an open source Android implementation of mADX on FHIR on Android and make these open source libraries available to be implemented by any mobile solution. We will deliver this to be a software development kit (SDK) that can be developed as an independent global good and added on to other mobile tools.

When developed, this will allow point of service mobile applications to overcome the barriers to implementing a fully integrated FHIR indicator reporting solution. It will also serve as a gateway for mobile applications to transition their bespoke data collection solutions toward storing information as modeled in FHIR.

## User Stories

This section defines the needs of three distinct users who will benefit from this project.

### Frontline Health Worker Using a Tablet

I’m a frontline health worker using an Android app to track the care provided to clients and I am responsible for providing a monthly report of my activities to the government’s health management information system. I want to generate my monthly reports on my tablet, make modifications offline and submit my report to the health management information system when internet becomes available.

### Program Officer

As a program officer, I want to be able to define the indicators in a simple and standards based approach so they can be used across multiple technical tools. I want to define the indicators once and have them seamlessly link to the data dictionary in multiple systems regardless of whether it’s using Android devices or electronic medical record systems. It is important for me to be enabled to define these indicators to cut down on the time required to check for errors if I have to hand the process off to developers.

### Android Technology Provider

As a technology provider, I want to reduce ambiguity in indicator definitions that I receive from my customers and the amount of time it takes to transition from narrative indicator definitions to implementation in my product. I want to build a dynamic reporting solution in my Android application that uses standards so I can reduce development time, costs and deliver more quickly for multiple customers in multiple contexts.

## Objectives and Activities

### Work package 1: Develop a Minimum Viable Product

#### Objective 1.1: Verify that Open Source Java Libraries can run efficiently on Android

##### Activity 1.1.1: Identify the core FHIR resources that are required for implementing FHIR on ADX in the Android client.

##### Activity 1.1.2: Build FHIR resources in Android using the work from the HAPI FHIR community.

##### Activity 1.1.3: Build, test and run the CQL Engine on Android.

##### Activity 1.1.4: Integrate these libraries with the OpenSRP Android client.

#### Objective 1.2: Develop and test an end-to-end prototype for an HIV or RMNCH workflow

##### Activity 1.2.1: Develop a sync mechanism of FHIR measureReports from Android to the HMIS.

##### Activity 1.2.2: Develop an end-to-end test that supports a basic HIV or RMNCH workflow from generating the transactional information to the Android client, generating a MeasureReport on the Android and pushing that report to the HMIS.

### Work package 2: Develop a user interface that allows users to view the generated measureReports in Android

This work package is dependent on success from work package 1.

#### Objective 2.1: Define User Experience Needs

##### Activity 2.1.1: Scope the user experience needs for displaying measures and measureReports to an end user on an Android device.

##### Activity 2.1.2: Define an information schema for converting measures and measureReports to something that is easy to consume by an end user.

##### Activity 2.1.3: Develop a generic user interface using the Android Model View Presenter pattern so all implementations could have a baseline of displaying the generated information to a user.

## Community Feedback

Ona is actively engaged with the Open Health Information Exchange communities as well as the World Health Organization’s Computable Care Guidelines working groups. We will continue these engagements, which require regular attendance at monthly meetings. We expect to present architecture and use cases at WHO CCG and receive constructive project and technical feedback from these working groups. We will work with these communities to present our project progress on a regular basis. Ona is the technical lead for the OpenSRP community and we will share our progress at weekly technical calls.

## Schedule

The following is a high-level work plan.

|  |  |  |
| --- | --- | --- |
| **Activity** | **Team****Location****Month/Quarter** | **Quarter** |
| Q | Q | Q | Q |
| 1 | 2 | 3 | 4 |
| 1.1.1  | Ona KE & US | x |   |   |   |
| 1.1.2 | Ona KE & US | x |  |  |  |
| 1.1.3 | Ona KE & US | x |  |  |  |
| Go/No-Go Decision on working on 1.1.4 | Ona KE & US | x |  |  |  |
| 1.1.4 | Ona KE & US |  | x |  |  |
| 1.2.1 | Ona KE & US |  | x |  |  |
| 1.2.2 | Ona KE & US |  | x |  |  |
| Go/No-Go Decision on Work Package 2 | Ona KE & US |  | x |  |  |
| 2.1.1 | Ona KE & US |  |  | x |  |
| 2.1.2 | Ona KE & US |  |  | x |  |
| 2.1.3 | Ona KE & US |  |  | x | x |
| Contract Wrap-up | Ona KE & US |  |  |  | x |
| OpenSRP Community Meetings | Ona KE & US | x | x | x | x |
| WHO CCG WG Meetings | Ona KE & US | x | x | x | x |
| Global Goods Monthly Meetings | Ona KE & US | x | x | x | x |
| Quarterly Reports | Ona KE & US | x | x | x | x |
| Maturity Matrix Eval | Ona KE & US |  |  |  | x |

##

## Deliverables

|  |  |
| --- | --- |
| **Deliverable**  | **Quarter Due** |
| Activity 1.1.1: OpenSRP wiki document defining resources used | Q1 |
| Activity 1.1.2: Source code available online on GitHub | Q1 |
| Activity 1.1.3: Source code available online on GitHub | Q1 |
| Go/No-go decision on working on 1.1.4 documented on the wiki | Q1 |
| Activity 1.1.4: Scoping Document | Q2 |
| Activity 1.1.4: Source code available on GitHub | Q2 |
| Activity 1.1.4: Sample app available and demonstration meeting | Q2 |
| Activity 1.2.1: Source code available on GitHub | Q2 |
| Activity 1.2.2: Workflow documented on wiki | Q2 |
| Activity 1.2.2: Source code available on GitHub | Q2 |
| Activity 1.2.2: Demonstration meeting | Q2 |
| Go/No-go decision on work package 2 documented on the wiki | Q2 |
| Activity 2.1.1: Scoping document available on the wiki with mock-ups | Q3 |
| Activity 2.1.2: Mapping document defined on the wiki | Q3 |
| Activity 2.1.3: Source code available on GitHub | Q4 |
| Activity 2.1.3: Demonstration meeting | Q4 |
| Matrix Evaluation | Q4 |

## Global Good Maturity Model Assessment

Please find our updated global good maturity model assessment on our wiki: [https://smartregister.atlassian.net/wiki/spaces/Documentation/pages/671580176/Global+Goods+Self+Assessment](https://smartregister.atlassian.net/wiki/spaces/Documentation/pages/671580176/Global%2BGoods%2BSelf%2BAssessment)

# Appendix 1 - Curriculum Vitae for Key Staff

**CRAIG APPL, MPH**

cappl@ona.io

# SUMMARY STATEMENT

* Craig Appl, MPH, is the mHealth Technical Lead for Ona Systems Inc. As the mHealth technical Lead, he provides technical leadership for the overall design, development, and implementation of the mHealth platforms managed by Ona systems across multiple country programs and awards.
* Mr. Appl works closely with the global OpenSRP teams and partners on the design, development and implementation of OpenSRP and other systems. He has a wealth of experience in field implementation, solution architecture and project management.
* Prior to his work at Ona, Craig was the Senior Technical Advisor for Health Information Systems at I-TECH where he designed and lead a team that implemented the national scale OpenHIE platform and iSantéPlus clinic application. His experience ranges from managing global software development teams to small scale implementations in Nepal and Uganda. He has an MPH from Johns Hopkins University with a certificate in Public Health Informatics.

# PROFESSIONAL EXPERIENCE

## ***Ona January 2018 - Present*** *mHealth Technical Lead*

* Providing technical oversight, management and strategic leadership related to the development and maintenance of Ona’s mHealth technologies.
* Translating functional requirements across projects to technical requirements for OpenSRP and related platforms.
* Managing the technical roadmap for numerous platforms and working with the engineering teams to ensure their success
* Integrating, communicating and building the global OpenSRP technology community

## ***International Training and Education Center for Health (I-TECH) Center, University of Washington (UW), Department of Global Health, Seattle, WA, September 2016 – January 2018*** *Senior Technical Advisor for Health Informatics*

* Planned, developed, supported and delivered a nationwide transition from the legacy iSanté clinic EMR to iSantéPlus (OpenMRS) in Haiti.
* In partnership with SolDevelo and I-TECH Haiti, developed core integrations on the OpenMRS platform that were globally functional including, integration with a local and national fingerprint server, integration with OpenHIE, integration with Mirth for automated retries when the internet becomes available.
* Planned, developed and implemented OpenHIE in Haiti to support the exchange of information from each iSantéPlus clinic to other clinics and stakeholders.
* Defined requirements, developed and implemented a national laboratory order and result exchange with multiple national and regional laboratories in Haiti using IHE profiles.
* Managed multiple development teams and contracts in Haiti and Poland.
* Planned, architected and piloted an electronic immunisation system (Kenya Immunisation Platform) in Kenya using OpenSRP
* Defined patient record interoperability standards in both Kenya and Haiti to ensure patient records are available at all levels of the health ecosystem, including automatic retries when internet becomes available at the point of service
* Liaise with local and government officials in both Kenya and Haiti to support ministry of health and CDC initiatives.
* Developed online content related to Health Information Systems in conjunction with the UW Department of Global Health E-Learning program.
* Supported national health information system strategic planning in partnership with the CDC and Guyana Ministry of Public Health.
* Developed technical proposals, supported grant development and provided deep technical expertise across I-TECH’s global portfolio.

## ***Grameen Foundation US, Seattle, Washington June 2015 – September 2016*** *Lead Technical Program Manager*

* Proactively managed the full development pipeline from defining end user requirements, scoping technical needs, managing distributed software development teams, delivering the solution and supporting field implementations.
* Defined the MOTECH program and product strategy within the global health field, which required an assessment of functions, limitations, challenges and opportunities when connecting deployed technologies in the field. This resulted in shifting MOTECH from a developer platform to an end user configurable platform.
* Advised donors, partners and other stakeholders on technical strategies, architectures and applicability of open source technologies to solve real world problems in field implementations.
* Supported in country capacity building for field deployments in Nepal and Mozambique, ensuring the continued use of the MOTECH platform by local team members.
* Wrote detailed grant proposals and participated in co-creation groups with other organizations who aim to support point of service interoperability.
* Championed the use of interoperable health information systems including identifying appropriate point-to-point (API) and standards based connections.
* Engaged with the OpenHIE implementer community to provide an implementers perspective when connecting the point of service to high level infrastructure systems.
* Scoped, developed and delivered robust connections to CommCare, ODK, Ona.io, KoboToolbox, OpenMRS/Bahmni, RapidPro, OpenLMIS, DHIS2 and numerous reporting systems.
* Connected individuals from the diverse disciplines of computer science, IT services, subject matter experts, logisticians and behavior change experts.
* Actively managed vendor contracts in the US, Poland and India, ensured the appropriate level of support, performed due diligence and provided actionable feedback across multiple cultures.

## ***Deerwalk Institute of Technology Kathmandu, Nepal June 2014 – April 2015***

### *Adjunct Professor*

* Created and executed a project management curriculum that spans four years to supplement the BSc in Computer Science and Information Technology curriculum taught at DWIT.
* Mentored the Information Technology club that is responsible for the IT infrastructure of the school. This team is actively developed networking services for the student body including a file sharing system and 24 PC computer lab.
* Taught project management an average of 10 teaching hours per week.
* Helped individual students improve entrepreneurial ideas in my office hours (5 hours per week).

## ***Deerwalk Inc. Kathmandu, Nepal June 2014 – April 2015***

### *Data Analyst*

* Analyzed the time differences of big data analytical processes with MSSQL, Hadoop and R.
* Manipulated 40+GB of customer data to prepare it to be entered into a Hadoop environment.
* Evaluated Amazon Web Services solutions to identify the best scalable environment to process big data with R including EC2 clustering, S3 and Elastic Map Reduce.
* Gained experience with data manipulation using R's data frames, data.table package, ff and ffbase packages.

## ***Friends of Maiti Nepal Kathmandu, Nepal July 2013 – June 2015***

### *IT Projects Manager*

* Assisted in the development, pretesting and implementation of multiple data collection tools.
* Created the first open source human trafficking concept dictionary that allows organizations to share a common definition of trafficking related data (​SurvivorMIS)​
* Digitized a paper based system by implementing OpenMRS to track rehabilitation outcomes and standardize workflows.
* Proposed, scoped and implemented a missing person system in CommCare that reduced a paper based process from one week to a matter of minutes.
* Deployed 43 CommCare handsets across 15 field offices, 12 surveillance posts and 16 outreach workers that allowed for the collection and retrieval of missing person information across the country. ● Ensured compliance with local laws and regulations when collecting survivor information.
* Designed and implemented capacity building and quality improvement activities internally at Maiti Nepal.
* Provided guidance and discovered system constraints that addressed the ethical challenges when collecting information on survivors and missing persons.
* Actively interacted with numerous levels of team members (from the executive to the frontline worker) to ensure my projects continually progressed and were supported by the team.

## ***JHU Global mHealth Initiative Baltimore, Maryland December 2012 – June 2013***

### *Public Health Informatician*

* Documented the flow of information and core business of Maiti Nepal, an organization that combats sex trafficking of girls across Nepal.
* Identified literature and conducted literature reviews to support the project.
* Created and reported use cases, swim lane charts and other visual aids which clearly describe the movement of clients and girls through Maiti Nepal's service offerings.
* Identified and documented areas of improvement at the organizational level that could immediately streamline business processes and use information to improve the efficiency of the organization.
* Reported my findings to my academic advisor, and the executive officers of Maiti Nepal and Friends of Maiti Nepal.
* Managed data processing of collected data. Transformed, cleaned and analyzed the entire Management Information System (300,000 rows in a SQL database), ultimately suggesting technical solutions that could improve the depth and breadth of the system which translated into a full time position at Friends of Maiti Nepal for implementation of the recommendations.

## ***Defense Threat Reduction Agency Fort Belvoir, Virginia March 2009 – March 2012*** *Budget Analyst*

* Identified and improved financial team business processes and inefficiencies with available technical solutions.
* Created numerous algorithms and solutions using MS Excel, MS Access, SharePoint and Visual Basic programming that reduced contractor costs, input time and government manpower to accomplish standardized business processes.
* As a team leader, created training materials and trained team members in new business processes as the government transitioned from legacy accounting systems to the DAI.
* Supported and participated in programmatic reviews with senior management and external partners who were responsible for the appropriate allocation of resources of our organization.
* Interacted with financial managers in numerous government agencies, universities and businesses to ensure the funding was being spent as forecasted.

## ***Integrated Data Services Fort Belvoir, Virginia April 2008 – March***

***2009***

### *Business Analyst*

* Participated in focus group efforts to conduct data quality assessments to determine the health and quality of data in the core financial system and data coming from feeder systems into the core system, which collectively mapped workflows and data definitions as well as timelines, deadline dates, and the necessary resources required to accurately improve the automated software system.
* Scoped functional and technical requirements for the CCaR project management system and managed their development from idea to customer implementation.
* Created step-by-step training manuals and taught monthly user-centered functional system courses.

## ***Hope Clinic Lukuli Kampala Uganda September 2007 – February 2008***

### *Clinic Administrator*

* Front line manager of clinic operations for a non-profit organization with 17 team members.
* Managed employees, daily accounting and community programs organized through the clinic.
* Ensured the onsite dispensary was accurately managed and stocked to meet patient demands.
* Planned, procured and tracked commodities for the clinic including program specific commodities.
* Helped secure a grant from the US Embassy Small Grants Department that sustained the clinic's HIV community programs.

## ***Reach Out Mbuya Kampala, Uganda June 2006 – August 2007***

### *International Volunteer*

* Lead organization wide restructure of approximately 125 staff including personnel allocation, records management, and Information Technology procurement.
* Assisted in determining methodologies for collecting information and standardization of data for two research studies:

o “The Effects of Food Aid on HIV-Infected Patients in Kampala, Uganda” by Matthew

Burkey, Johns Hopkins University o “Validation of the new WHO Diagnostic Algorithm for Pulmonary Tuberculosis in HIV prevalent settings” by Dr. Janine Thoulass, Department of Medicine, Makerere University, Uganda

* Supervised, managed and reported monthly World Food Programme food subsistence distribution program to 1000+ recipients.
* Compiled and edited correspondence for quarterly donor reports that consolidated information from multiple input sources.

# EDUCATION

* 2013- MPH (Public Health Informatics); Johns Hopkins University Bloomberg School of Public Health, Baltimore, MD
* 2006- BS in Economics; George Mason University, Fairfax, VA

**SAMUEL GITHENGI WAWERU**

P.O. Box 8462-00200 sgithengi@ona.io

Nairobi, Kenya

+254 710885752

# CAREER OBJECTIVE

• To be a leading professional with strong analytical skills, problem solving skills, competent, upholding high moral standards and professional ethics, and always to continuously improve. Work in a dynamic environment where I will utilize my broad technical knowledge, excellent communication skills and team player skills to create innovative solutions to business challenges.

**PROFESSIONAL EXPERIENCE**

# Ona Oct 2017 — Present

## *Senior Software Engineer* Nairobi, Kenya

* Problem definition, analysis, requirement gathering, solutions development, solutions proposal for the company
* Developing with APIs and service based architectures
* Experience with databases and their integration into web and Android applications
* Develop proper documentation on solutions, user guides, processes and procedures during development and deployment

# Verve K.O 2015 — 2017

## *Head of Technical Hyperion P2B* Nairobi, Kenya

* Responsible for providing gap analysis, developing system architecture and design, and integrations between Hyperion P2B and other systems
* Provide solutions to technical issues whenever they arise and making the system more stable, faster and user friendly to users.
* Involved in the upgrade of Hyperion Plan to budget system from version 11.1.2.1 to 11.1.2.4
* Designed and implemented an ASO reporting cube to allow detailed reports.
* Customizations by developing a custom application developed using J2EE for capturing textual information for use in programme based budget.
* Performed integrations between Hyperion and other systems using FDMEE and ODI

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| **Verve K.O** | **2013 — 2017** |
| *Oracle Technical Consultant* | Nairobi, Kenya |

* Support in the deployment of Plan to budget system at National treasury
* Supporting and troubleshooting and resolution of technical issues
* Monitor backup and recovery procedures for the Oracle Essbase and Oracle 11g RDBMS databases for the budgeting System
* Monitor and maintain uptime of the system
* Set up and manage the work flow module for budget approval and promotion
* Configuring budget writeback to Ebusiness General Ledger (GL) after the budget has been approved and also data loading of the actual expenditure from GL to Hyperion planning for performance comparison
* Configuring and development of Web Analysis dashboards and ad-hoc grids
* Setting up User productivity Kit(UPK) for developing of interactive learning material for end users
* Installation, configuration and development of OBIEE 11g Dashboards and Analyses for top level executives

# Real Dynamics LTD Feb 2014 — Dec 2016

## *Software and Database consultant* Nairobi, Kenya

* Implemented application customization for TALO system which is a sales and logistics system for Toyota Kenya which was developed in Japan to adapt it to Kenya business process. I did the implementation and integration to SAP which hosts their financials.
* Implemented a body building module on TALO for the Hino department
* Role out of TALO application for the Toyota other brands CASE and YAMAHA

# Trademark East Africa Nov 2014 — Dec 2016

*Consultant* Nairobi, Kenya

• I was involved in developing a solution for Drug regulation for East Africa. The solution is for regulating premises, products, professionals, trade (internal, import and export) practicing in the medical industry in the region. This solution was developed using JBoss Seam Framework, Rich faces, JPA, Hibernate, EJB 3.0, Postgres database and runs on JBoss Application Server 6.0 and Apache 2.0 webserver. The portal which exposes the application to end users on the internet was done using LifeRay enterprise portal.

# Cellulant Kenya Ltd March 2012 — April 2013

## *Implementation Engineer* Nairobi, Kenya

* CIC Mobile development and implementation
* IM bank Mobile banking stabilization after an upgrade and migration
* IM merchant Aggregation solution design, integrations and deployment, this was a solution for the Banks Corporate Clients so that their customers could pay for good via the Banks Paybill number and the amount would be credited in real time to their bank Account, the solution would then post the payment details to the Corporate Financial system.
* Airtel Kenya airtime Integration for IM Bank and Barclays Kenya, where the bank customers could be able to top up Airtime from Mobile and Internet banking

# Oracle technologies April 2011 — June 2011

## *Software Developer* Nairobi, Kenya

* Migration of Sacco banking system (Front Office Sacco Activities-FOSA) from Oracle 6i forms to PHP
* Design and development of the dynamic Web User Interface for the application
* Database administration and performance tuning for the application

# EDUCATION

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| --- | --- |
| **BSc. Computer Science, Kenyatta University** | **2007-2011** |
| **K.C.S.E , Menengai High School** | **2002-2005** |

# DEVELOPMENT TOOLS

*Eclipse IDE, Netbeans IDE, Oracle Jdeveloper, Visual Studio, PL/SQL developer, Oracle Forms Developer*

**LANGUAGES**

English (Advanced), Swahili (Native)

# GEOGRAPHIC WORK EXPERIENCE

Kenya

**RODGERS ANDATI**

P.O. Box 30 – 50119 randati@ona.io

Lunza, Kenya

+254 715795302

# CAREER OBJECTIVE

• Develop and deliver cutting edge tools that support frontline workers in hard to work locations. Support scaled infrastructure and systems that meet real world needs. Build shared capacity in myself and my teams to ensure we function exceptionally and delivery consistent high quality solutions.

**PROFESSIONAL EXPERIENCE**

# Ona Apr 2019 — Present

## *Senior Software Engineer* Nairobi, Kenya

* Responsible for the OpenSRP In-App Reporting product, developing dynamic in app dashboards, reports and posting to DHIS2

# Mobile Decisioning 2014 — 2019

## *Software Engineer* Nairobi, Kenya

* I implemented and configured different VAS solutions. Coordinated integration activities between the VAS solutions with the core network, the LAN, the charging systems, the telecommunication companies, and the third party content providers.

# Nokia Research Center 2013

## *Software Developer* Nairobi, Kenya

* Worked on a project assigned to The University of Nairobi by Nokia called GameOn. I researched, refined requirements and developed applications to solve technological gaps of sports in Kenya.

# Pajat 2012

## *Software Testing Engineer* Nairobi, Kenya

* Developed automated tests for a product of Pajat Solutions called Poimapper using selenium and Java's JUnit testing framework.
* Wrote and updated the user manual for the web portal. This lead to quick adoption of the system by users and made user training much easier than before.

# EDUCATION

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| --- | --- |
| **Diploma. Computer Science, University of Nairobi** | **2010-2012** |
| **K.C.S.E , Booker Academy** | **2005-2008** |

# DEVELOPMENT TOOLS

*Python(proficient), Java(proficient), Clojure(Proficient), Php(expert) C++(prior experience), C(prior experience), JavaScript(proficient), C#(prior experience). Django, Spring, CodeIgniter, Bootstrap, PyCharm IDE, Eclipse, Linux, LAMP, Android SDK, Wordpress, Visual Studio, Windows Mobile, JQuery Mobile, Cordova, Google App Engine, USSD, SMS, Git, Qt. PostgreSQL, MySQL, SQLite*

**LANGUAGES**

English (Advanced), Swahili (Native)

# GEOGRAPHIC WORK EXPERIENCE

Kenya

**PETER B. LUBELL-DOUGHTIE**

WWW:peet.ldee.org peter@ona.io

SRC:github.com/pld

+1 1415-237-3837

**PROFESSIONAL EXPERIENCE**

# Ona Nov 2013 — Present

## *Founder and Chief Technology Officer* New York, NY

• Led technology strategy and grew the technology team as we built an SaaS product that doubled total and recurring company revenue year-over-year. Lead architect on voting software for the Libyan national election, global data collection products and deployments, technology used in the Ebola response. Managed general operations and team resources, negotiated contracts, and led financial management. Programmed in Clojure, ClojureScript, Om, Python, and R. Managed our global real time platform deployment on AWS and orchestration scripts in Ansible.

# Intent Media Nov 2012 — Nov 2013 *Lead Data Engineer* New York, NY

• Led the data engineering team in building a data platform for ETL (Extract Transform Load), analysis, and modeling at scale. Communicated the data teams roles, needs, and accomplishments to the executive team and the company. Programmed in Clojure, Cascalog, Java, Pig, and Ruby. Created distributed algorithms and models using Hadoop and Amazon Web Services.

# Columbia University, Modi Research Group Dec 2011 — Oct 2013

## *Senior Software Engineer* New York, NY

• Built semi-automated data analysis and management tools for energy infrastructure and development planning in Python and R. Developed web sites and web services in Python using Django for mobile (Android) data collection and management. Project managed remote teams and coordinated with corporate, non-profit, and government project partners.

# Helioid, Inc April 2008 — Oct 2013

*Founder* New York, NY

• Developed and integrated internet facing learning algorithms in Ruby. Responsible for business development and administration. Researched and implemented technologies in information retrieval, text analysis, statistics, and machine learning. Developed web applications, including REST-based API, in Ruby on Rails. Administered Linux server.

# Princeton University Oct 2008 — July 2009, 2011 — April 2012

*Consultant* Princeton, New Jersey

• Member of the CITP, reported to Edward Felton and Matthew Salganik. Collaborated with graduate students to create an online sociology laboratory. Developed a REST and XML based web service, as well as Ruby on Rails and Javascript web applications and plugins. Analyzed data using Ruby, Python, and R. Wrote algorithms for data processing in Ruby and C. Researched and created pairwise algorithms for processing large amounts of vote data to determine user preferences.

# Hall International Partners, LLC Jan 2008-Jan 2010

*Chief Technology Officer* West Tisbury, Massachusetts

• Hall International Partners offered financial advisory services, specializing in wealth management. Managed technology assets and asset acquisition. Led strategy for information security and internet presence, including web application development in Ruby on Rails.

# Mobile Input Devices and systems, Inc April, 2008 — June 2009

## *Managing Engineer* Alameda, CA

• Participated in strategic planning and business development. Managed software development of chorded typing glove and typing pad, written in C and Assembly. Implemented and maintained website in Ruby on Rails.

# Self Employed May 2006— May 2008

*Consultant* New York, NY

• Advised on requirements for secure web applications. Maintained web applications in Ruby on Rails. Wrote programmer evaluation tests for Ruby, Ruby on Rails, and JavaScript. Recommended additions and modifications to existing internet products and services. Developed and implemented websites and content management systems in PHP and Ruby, often with custom SQL. Edited graphics and layouts using Adobe Photoshop and Adobe Illustrator..

# Netsprout, Inc May 2006 — Nov 2007

*Lead Developer* San Francisco, CA

• Team management, client interaction, individual and collaborative development. Developed high availability internet applications in Ruby on Rails, AJAX, Actionscript, PHP, and JSP. Developed client side applications in Java. Designed, tested, and implemented databases. Administered redundant Linux servers. Developed transcoding systems using FFMPEG. Developed Ruby on Rails plug-ins. Performed code and performance testing. Developed XML API and RSS feeds..

# The Gnostic Magazine Jan 2006 — June 2007

*Founder* San Francisco, CA

• Founded philosophy and arts magazine. Managed the release of issues and business development. Developed a collaborative community based website with active discussion groups and online upload capabilities. Created online magazine issues using Flash, Adobe Illustrator, Adobe Photoshop, and Adobe InDesign.

# Stanford University June 2006 — Dec 2006

## *Research Assistant* Stanford, CA

• Compiled summaries and distilled relevant information from academic papers and relevant books. Organized this information in databases, flow charts, and text summaries. Presented and reported the information.

**EDUCATION**

# University of Amsterdam 2011

*MSc, Artificial intelligence, Cum Launde* **Amsterdam, Netherlands** *Track: Learning Systems, Thesis: Learning to Rank from Relevance Feedback*

# Stanford University 2006

*BS, Symbolic Systems* **Stanford, CA** *Concentration: Decision Making and Rationality*

**CURRENT PROJECTS**

• Ona: https://ona.io/

# RECENT PROJECTS

* ADMM: https://github.com/intentmedia/admm
* Bamboo: https://github.com/pld/bamboo
* Helioid: http://www.helioid.com/
* All Our Ideas: http://www.allourideas.org/

**ACADEMIC EXPERIENCE IEEE Transactions on Neural Networks and Learning Systems March 2014-Present Reviewer**

* Reviewed 3 manuscripts for 2014 and so far 1 for 2015.

# Stanford University Jan 2006 — June 2007

## *Undergraduate Research Grant Recipient* Stanford, CA

• Developed a genetic programming based algorithm that evolved agent communication systems. Reviewed literature on multi-agent communication and evolutionary computation. Wrote paper detailing results. Primary advisor Nils Nilsson. Secondary advisor John Koza.

# PUBLICATIONS

* Lubell-Doughtie, P. and Sondag, J. Practical Distributed Classification using the Alternating Direction Method of Multipliers Algorithm. IEEE *BigData, 2013.*
* Lubell-Doughtie, P. et al. Improving Data Collection and Monitoring through Real-time Data Analysis. *ACM DEV,* 2013..
* Lubell-Doughtie, P. and Hamilton, K. Helioid at TREC-Legal 2011: Learning to Rank from Relevance Feedback for e-Discovery. *Proceedings of the 2011 Text REtrieval Conference,* 2012.
* Lubell-Doughtie, P. and Hofmann, K. Learning to Rank from Relevance Feedback for e-Discovery. ECIR 2012 - 34th *European Conference on Information Retrieval,* 2012.
* Lubell-Doughtie, P. and Hofmann, K. Improving Result Diversity using Probabilistic Latent Semantic Analysis. *DIR 2011 - Dutch-Belgian Information Retrieval Workshop,* 2011.
* Lubell-Doughtie, P.B. Using Genetic Programming to Evolve a General Purpose Sorting Network for Comparable Data Sets. *Genetic Algorithms and Genetic Programming at Stanford 2003,* 2003.

# PRESENTATIONS

Geo for Good User Summit 2015, Google Headquarters, Mountain View, California, USA.

PyConZA 2014, First Keynote, Writing Python Code to Decide an Election, Johannesburg, South Africa.

Mobile Technologies and their Intersection with Global Health, Mount Sinai Global Health Program 2014, New York, USA.

IEEE Big Data 2013, Industry Track, Santa Clara, USA.

Startup Track at the Society of Scholarly Publishers (SSP) 2012, Washington D.C., USA.

DataDev Workshop at Mobila Data Management 2012, Bangalore, India.

# COMPUTER SKILLS

* *Programming Languages:*C, C++, Clojure(Script), Java, JavaScript, Lisp, Perl, PHP, Pig,Python, Ruby, SH, SQL. Some use of ASM, Awk, Objective C, Smalltalk.
* *Statistical Packages:*iPython, Matlab, Pandas, R. Some use of Mathematica, RPy, RSRuby.
* *Software:*Ansible, Apache, AWS, Cascalog, Django, EMR, Hadoop, ImageMagick, Lemur (In-dri), Lucene, Mahout, Mongrel, Monit, MySQL, Nginx, Om, React, RoR, Sqlite, Thin, Unicorn,VCS. • *Operating Systems:*Android, Linux, Mac OS, Solaris, UNIX, Windows

# LANGUAGES

English (Native), Spanish (Advanced), French (Fluent), Arabic(Intermediate), Chinese(Mandarin)(Basic), Dutch (Basic)

# GEOGRAPHIC WORK EXPERIENCE

Haiti, Kenya, India, Libya, Netherlands, South Africa,Nigeria, Somalia, Syria, Tunisia, Turkey, USA

**Roger Wong**

**PROFESSIONAL EXPERIENCE**

**Ona Jan 2014 — Present**

*Founder* Washington DC

* Led design on a platform used by thousands of people worldwide.
* Designed and piloted features from client work, large organizations and individual users

*OpenSRP, Design Researcher and User Interface Designer (2014 — 2016)*

*Client: Thrive Consortium*

* Led design of app and system for frontline health workers.
* Worked on a scalable user interface that works across many health contexts including Bangladesh, Indonesia, and Pakistan.

*Western Kenya Community Development Dashboard, User Interface Designer (2014)*

*Client: World Bank*

* Designed a web-based dashboard used to understand progress of investments made into areas in Western Kenya.

*Brazil Adolescent Health Facility Assessment Tool, User Interface Designer (2014)*

*Client: World Health Organization*

* Designed a tool for health facility supervisors and regional health directors to understand data coming from the field regarding the quality of health facilities.

*mSpray, User Interface Designer (2014) C*lient: Akros

* Designed a mobile interfaced that visualized the progress of indoor residual spraying campaigns meant to reduce malaria.

*Vitamin A Supplementation Dashboard (2014) Client: HKI*

* Designed a dashboard that visualized the progress of vitamin A supplementation camps across three African countries.

*Map Your World Form Builder (2015)*

*Client: Map Your World*

* Integrated a form builder into the Map Your World website.
* Designed the tool in a way that was accessible to new users and users that had experience with previous generation interface.

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| **The Earth Institute, Columbia University** | **2012 — 2014** |
| *Senior Design Manager* | New York, NY |

*Formhub, User Interface Designer (2012-2014)*

*Client: Sustainable Engineering Lab, Columbia University*

* Designed a tool to collect and visualize data.
* Used in major programs including for the Nigeria MDG Information System.

*Dristhi, User Interface Designer (2012-2014)*

*Client: Wellcome Trust*

* Designed a tool for frontline health workers in Karnataka, India.
* Led design workshops and conducted research with users in the field.

*Network Planner, User Interface Designer (2014)*

*Client: Sustainable Engineering Lab, Columbia University*

* Designed tool used for infrastructure planning based on optimization algorithm taking factors such as population, demand, and accessibility into account.

*Nigeria MDG Information System, User Interface Designer (2014)*

*Client: Nigeria Ministry of Health*

* Led design of tool used to track the location and features of 300,000+ health, water and education facilities across Nigeria.

**Grande Labs, Inc 2011 — 2012**

*Founder and Creative Director*

*DishFreely, Designer (2011-2012) Client: Various*

• Created an iOS app to help specific groups of eaters such as health-conscious, gluten-free, and vegetarian eaters to find and track dishes and restaurants that meet their needs

**And Partners 2010 — 2011**

*Senior Interactive Designer*

*Various Clients, Designer (2010-2011) Client: Various*

* Designed the interactive systems in the Hearst App Lab including a touch screen interactive media explorer and app presentation system.
* Created interfaces for various web projects.

**Frog Design 2008 — 2010**

*Senior Designer*

*Various Clients, Designer (2008-2010)*

*Client: Various*

* Led design for major telecom client
* Worked on user interfaces that worked across media including TV, mobile phone, smartphone, computer, and tablet.
* Designed data visualizations for various clients.

**EDUCATION**

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| **Portfolio Center***Design Media Architecture and Art Direction Certificate* | **2007** |
| **University of Maryland, College Park***Bachelors of Science in Supply Chain Management and Logistics, and Marketing* | **2004** |

**OTHER PROFESSIONAL EXPERIENCES**

Done design and creative strategy experience for clients including: AT& T; Coca-Cola; Comcast; VCorporation; Hearst Corporation.

**LANGUAGES**

English (Native), Chinese (Mandarin (Basic)

**GEOGRAPHIC WORK EXPERIENCE**

India, Indonesia, Pakistan, Nigeria, Kenya, USA, Bangladesh