

# CareCR (AFYA Client Registry)

## Two-Sentence Overview.

The goal of the project is to develop Care client registry with online/offline capabilities while leveraging functionalities from existing open source tools like Medic CR, which is an open source tool Rasello has experience using and obtained an understanding to now cover gaps of function for a reliable open source client registry version as Care CR, noted gaps include but not limited to advanced configuration of matching attributes – extending from the list in Medic CR which will consequently improve deterministic matching.

Rasello's expertise in open source tools and technologies, application of principles of digital development and adherence to Open HIE guidelines will ensure to achieve effective and efficient functioning of Care CR, globally beneficial to in countries with limited health interventions.

## Executive Summary

The investment from Digital square will go towards the adoption of tools and technologies in health client registry, contextualizing technology across standard health practice as guided by eHealth Architecture Principles, open HIE architecture specification. The processes will include requirements and functionality elicitation, installation and deployment strategizing and documentation, quality assurance, testing and creating necessary means for building capacity among government officials, local technology teams and health workers in order to connect the underserved to better health outcomes.

The goal of the project is to develop an open-source and standards-compliant client registry being “Registration as a service” that will allow effective registration and unique identification of patient's information. Rasello will develop the client registry leveraging knowledge from existing works, software, tools, products and experience in implementation of existing tools such as the use of Medic CR, a master patient index tool base tool used to develop the National Health Client Registry - Tanzania. In Rasello's work with the Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC), we have been able to identify the identification gap, and disperse data locations across horizontal system (of general services, providing prevention and care for prevailing health problem) and of vertical programmes ( for specific health conditions). We have been able to understand the need for community ownership and lead a collaborative team in successful conceptualization, development and guidance to deployment procedures.

Rasello's organization expertise will contribute to achieving the overall project goal from the experience with MoHCDGEC in the development of National Health Client registry (NHCR), PATH organization in the development of an Administrative area Registry System (ARes), through which Rasello has learnt efficient development methodologies and techniques for registries. Rasello will work along with IntelliSOFT expertise in digital health technology, to ensure further success of Open HIE compliant client registry. IntelliSOFT Consulting Limited has relevant expertise in Client Registries from 8 years ago when one of the Principals led a team that developed and implemented as a proof of concept, Kenya's first attempt at establishing a health identifier. The project, the National Unique Patient Identifier (NUPI) was funded by PEPFAR through CDC and implemented by I-TECH Kenya and successfully demonstrated multiple methods of effectively and consistently identifying subjects of care in a national HIV program. IntelliSOFT was also engaged by Management Sciences for Health Tanzania to provide technical assistance for development

of the Software Requirements Specifications for the National Health Client Registry (NHCR). At a global level, IntelliSOFT is an active member of the Open HIE Community of Practice including the Client Registry sub-community.

## Consortium Team

The consortium is open to meaningful collaboration to ensure PATH's objectives are reached and potential capability gaps assessed have been covered, subsequently feeding to the goal of connecting the world to better health.

**Rasello** is a global technology company with 5+ years of experience in analytical, database management and communication software, creating Software as a Service (SaaS) and Platform as a Service (PaaS) solutions tailored towards an organization's system needs in emerging markets with successes in public authorities, healthcare, telecommunications, insurance, education, and non-profit organizations. Rasello's solutions range from open source to proprietary custom solutions, web-based applications, mobile applications, together with dynamic reporting, and analytics solutions. For development of the client registry, Rasello will take lead to oversee the overall project based and development-based work, project management, funds management, coordinate work between consortium members, serving as an intermediary to stakeholder.

**IntelliSOFT** Consulting Limited is a Kenyan company locally owned with +8 years of experience in development, implementation and use of Information, Communications and Technology (ICT) in the health sector. As a technology firm, IntelliSOFT has deliberately focused on designing, developing, implementing, supporting and maintaining digital health solutions, particularly in Low to Medium-Income Countries. IntelliSOFT Consulting specialises in supporting the realisation and continuous optimisation of business performance and productivity (including health outcomes) through effective implementation of technology agnostic digital health solutions appropriately optimised for the implementation context. We do this through appropriate application of technical and data standards throughout the software development process of our digital health solutions. Our approach and current focus is "health as an enterprise" aimed at strengthening the entire health system. Our current primary focus is data systems for research for health and for patient and population management.

### **Profile of relevant experience and examples of related work.**

With an extensive experience in developing health systems and partnering with international organization such as PATH, ICAP, University of California Berkeley, Cardno etc. to implement mHealth and eHealth projects, Rasello understand the landscape in data base management and quality in health systems. In this section, we describe our consortium's technical and managerial capabilities through demonstrating our experience in; expertise and experience in health care sector and relevant experience in health information system (HIS).

The following is an illustrative list of engagements undertaken by Rasello and our partner IntelliSOFT all of which demonstrate our consortium's ability to successfully complete the assignment.

**Organization:** MDH in collaboration with Ministry of Health Community Development, Gender, Elderly and Children (MoHCDGEC)

**Implementation:** Web based system and service

**Service Provided:** National Health Client Registry (NHCR)

**Contact Name:** Daniel Sanga **Title:** IT Project Expert

**Email:** dsanga@mdh-tz.org

**Funding source:** Centers for Disease Control and Prevention (CDC)

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**Brief Description:**

Rasello is developing a National Health Client Registry a digital tool designed to assist in uniquely identifying individuals who access healthcare services at different health facilities in Tanzania, the system implements client matching and de-duplication algorithms to facilitate client identification across healthcare organizations in Tanzania. The system is integrated with external national system databased via the Health Information Mediator (HIM) linking it to PoS systems and other person management/identity systems like NIDA, RITA, NHIF etc. to further improve accuracy of the stored client information.

**Organization:** PATH International, Tanzania

**Implementation:** Web based system

**Service Provided:** Administrative Area Registry System (AReS)

**Contact Name:** Henry Mwanyika

**Title:** Regional Director – Digital Health Africa

**Email:** [hmwanyika@path.org](mailto:hmwanyika@path.org)

**Funding Source:** Bill and Melinda Gates Foundation

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**Brief Description:**

Rasello developed a system aimed to facilitate the continual update and accessibility of administrative area lists and boundaries such as hamlets, villages, wards, districts, and regions. AReS system is a single reliable, accessible and continually updated source of administrative area data that can be accessed by multiple sectors including health, water and sanitation, education, natural resources, agriculture, postal services and election administration.

AReS serves the purpose to digitize the process of establishment of a new administrative area together with management of the administrative areas database which includes the list of the areas together with their respective geographical maps.

The project focused on developing a system that

- Digitizes the process of establishment of administrative areas.
- Manages and maintains the list and geographical maps of all administrative areas in the country
- Provides access of the data and information on administrative areas to all other national and program systems

**Organization:** ICAP

**Implementation:** Web based system and mobile application

**Service Provided:** Fikia app

**Contact Name:** Emmanuel Mpinga

**Title:** Data Manager

**Email:** [emm2288@cumc.columbia.edu](mailto:emm2288@cumc.columbia.edu)

**Funding source:** Centers for Disease Control and Prevention (CDC)

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**Brief Description:**

Rasello has developed an android application for ICAP Tanzania to replace the current paper-based system. The android application enables ICAP staff on the ground capture data and get GPS location of the area data is captured while avoiding errors and ensuring completeness of the

information captured. The data is captured in both online (connected to the internet and when disconnected) and allows the user to upload the data captured with the main database online for reporting and analytics purpose when connected to the internet. The system also allows biometrics authentication using a biometrics device which ensures correct identity of individuals together with reducing the chances for forgery of authentication using credentials.

**Organization:** American International Health Alliance (AIHA) in collaboration with Tanzania Nursing and Midwifery Council

**Implementation:** Web based system

**Service Provided:** Tanzania Nursing and Midwifery Management Information System

**Contact Name:** Sally Chalamila

**Email:** [chalamila.sally@gmail.com](mailto:chalamila.sally@gmail.com)

**Funding source:** USAID

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**Brief Description:**

Rasello developed a database for Tanzania's Nursing and Midwifery Council that stores data and information about nurses from their registration stage at college levels to when they retire or leave their jobs as nurses. The database covers nurses practicing at both public and private facilities in the country while catering for all levels including midwives.

The project aims achieved:

- Building a national database for nurses and midwives
- Digitize the nurse registration process from school level to practice level
- Allowing a nurse to update CPD information during practice period
- Enable nurses to update their area of practice, education and maintain activity status of a nurse
- Provide authorized associate external organizations with capacity to export data and upload bulk complementary data
- Reporting capability according recipient hierarchy, and allowing configuration of reporting components
- Capacitate the system to generate nurse certificates and nurse card IDs

**Organization:** Cardno Tanzania PPP

**Implementation:** Web based system, Short Code & USSD mobile application

**Service Provided:** Healthy Pregnancy Healthy Baby System

**Contact Name:** Janita Ferentinos

**Email/phone:** +255 (784) 780 800

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**Brief Description:**

Rasello developed a scheduled messaging system that aims to improve healthy pregnancies and healthy newborn babies. The system allows pregnant women and mothers of new-born to register for the service through USSD and SMS. After registration, subscribers are sent health content to educate them on pregnancies and new-born and send them reminders on vaccinations and health check-ups.

In addition to the content disseminated, analytics for system are provided to the system owners, showing insights on the subscribers, areas they are from etc.

**Organization:** UC Berkeley in collaboration with HPON

**Implementation:** Web based system and mobile application

**Service Provided:** AFYA II System

**Contact Name:** Sandra McCoy      **Title:** Associate Professor in Residence, Epidemiology

**Email:** [smccoy@berkeley.edu](mailto:smccoy@berkeley.edu)

**Funding source:** University of California, Berkeley

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**Brief Description:**

Rasello developed a fingerprints biometrics android application for UC Berkeley's research study on impact of cash reimbursement on adherence to care for HIV Patients. The android application developed enables registration of the research participants and capturing of the participants fingerprints biometrics data. The application is used on pharmacy visits where research participants scan their fingerprints during their monthly visits where they receive money through their mobile money wallets (M-Pesa, Tigo Pesa, Airtel Money, ZPesa and HaloPesa). The android application captures data which is later on visualized on an analytics dashboard enabling UC Berkeley to have a real time information on the participants enrolment, mobile money disbursement together with participants pharmacy visit trends

**Organization:** A collaboration amongst Safaricom, GSMA, Savannah Informatics, Ask-A-Doc, Carepay and IntelliSOFT

**Implementation:** Mobile Based system

**Service Provided:** Mobile-based Digital Health Passport

**Contact Name:** Violet Wandaho      **Title:** Product Manager, Safaricom PLC

**E-mail:** [vwnjuguna@safaricom.co.ke](mailto:vwnjuguna@safaricom.co.ke)

**Funding source:** Safaricom, GSMA, Savannah Informatics, Ask-A-Doc, CarePay and IntelliSOFT

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**Brief Description:**

AfyaMoja is a mobile-based patient health records platform that enables patients to move with their health records. The profile linked to a subscriber's mobile number (MSISDN), enables the patient to use their mobile phone to access their own medical history, as well as share varying amounts of medical history in real-time with medical practitioners and health facilities to improve diagnosis and treatment.

**Organization:** Family Health International (FHI 360)

**Implementation:** Web Based System

**Service Provided:** Cross Border Health Digital Solution (CBH DS)

**Contact Name:** Dorothy Muroki      **Title:** Country Representative/Project Director, FHI 360, Kenya

**Email:** [DMuroki@fhi360.org](mailto:DMuroki@fhi360.org)

**Funding source:** United States Agency for International Development (USAID)

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**Brief Description:**

IntelliSOFT has been contracted to design, customize and deploy technology to strengthen the cross- border health system through the Cross-border Health Unit (CBHU) model to enable continuous and real-time generation and sharing of health information between health facilities and support the continuum of care for HIV, TB, FP/RH and MNCH for mobile cross-border populations. This entails enhancements of existing digital solutions across both Kenya & Uganda specifically customizing Kenya EMR and Uganda EMR at cross-border facilities to enable tracing of mobile patients thereby reducing cases of Lost-To-Follow-Up. The project aims at interconnection of health facilities and health systems to enable applicable data sharing across selected border facilities (within and across borders) in the cross-border areas and enhancing linkage with local, national and regional data warehouses including DHIS2 and other EMRS in use in the selected facilities.

**Organization:** International Training and Education Center for Health (I-TECH)

**Implementation:** Web Based system

**Service Provided:** iSantéPlus Haiti

**Contact Name:** Jan Flowers      **Title:** Faculty Co-lead, I-TECH

**E-mail:** [jflow2@uw.edu](mailto:jflow2@uw.edu)

**Funding source:** Centers for Disease Control and Prevention (CDC)

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**Brief Description:**

IntelliSOFT is supporting the I-TECH Haiti team and its local partner, CHARESS, with software development on the CDC-funded Haiti HIS project, focusing specifically on the development of PEPFAR and Haiti Ministry of Health (MOH) reports for the iSantéPlus (OpenMRS) release. ISantéPlus is currently piloted in Haiti. It is connected to the Système d'Échange d'Information Sanitaire Haïtien (SEDISH), which is powered by Open Health Information Exchange (OpenHIE). OpenELIS is now interoperable with iSantéPlus using international standards for data transfer and identification.

**Qualifications of key members of the proposed project team**

**TECHNICAL LEAD: PUSPA RAJ BHATTARAI**

**SUMMARY**

*Puspa has over 16 years' experience in software development focusing on web application development, mobile application development, database programming, SMS & USSD Systems.*

*Prior to co-founding Rasello, Puspa was an IT Expert for the United Nations Development Program (UNDP). Puspa holds a bachelor's degree in business studies, Finance, and a Master's Degree in Computer Applications, Computer Science.*

**PERSONAL INFORMATION**

COUNTRY:  
Nepal

D.O.B:  
14/12/1979

CONTACT:  
[puspa@rasello.com](mailto:puspa@rasello.com)  
+977 985-1217090

**SKILLS & EXPERTISE**

.NET, XML, JavaScript, HTML, PHP, Oracle, PL/SQL Development, T-SQL, iPhone Application Development, SQL, Microsoft SQL Server, Software Development, Databases, MySQL, Agile Web Development, JSON, OOP, Subversion, Integration, Web Applications, Oracle, AJAX, CSS, JSP, Apache, ETL, Data Warehousing, Java Enterprise Edition, Software Engineering, jQuery, SSRS, Tomcat, VB.NET, Design Patterns, REST, Web Services, Spring, Database Design, ASP.NET, C#, MVC, PostgreSQL, Git, Web Development, PL/SQL, SOAP, Eclipse, IIS, Scrum, Visual Studio, UML.

**LANGUAGES**

English	Hindi
Swahili	Nepali

**QUALIFICATIONS**

**Sikkim Manipal University of Health, Medical and Technological Sciences, 2003 – 2006**  
Master's in computer application (MCA), Computer Science

**Tribhuvan University, 1999 – 2002**  
Bachelor of Business Studies, Finance

**Tribhuvan University, 1996 – 1998**  
Proficiency Certificate in Business Administration, Accounting and Finance

**WORK EXPERIENCE**

**CTO, Rasello**

- [June 2016 – Present]
- o Successful execution of Rasello's business mission through development and deployment of the Company's web presence.
  - o Envisioning the Company's service offerings as a web-based business, leading implementation of web applications with mobile integrations, and planning for risk and growth.
  - o Identify opportunities and risks for delivering the Company's services as a web-based business, including identification of competitive services, opportunities for innovation, and assessment of marketplace obstacles and technical hurdles to the business success.
  - o Identify technology trends and evolving social behavior that may support or impede the success of business.
  - o Review current best practices for the selected web framework and establish the initial architecture for the application.
  - o Maintain up-to-date knowledge of technology standards, industry trends, emerging technologies, and software development best practices.

**IT Expert, United Nations Development Program (UNDP)**

- [February 2010 – May 2016]
- o Designed a system for the TCCIA that aims to reduce Non-Tariff Barriers (NTBs). The system was selected by the ICC World Chambers Federation as one of the five most innovative projects undertaken by chambers of commerce and industry from around the world.
  - o Develop, manage, and update MIS and Networking implementation.
  - o Coordinate database management functions with other information system areas and advise management on planning the database environment.
  - o Development and management of website and web application.
  - o Design, update, and maintenance of SME (Small and Medium Entrepreneurs), SMS (short Messaging System).
  - o Provide and maintain membership Database over the website and propose for possible options of making.

**Engineer, D2Hawkeye Services Pvt. Ltd (Subsidiary of Verisk Health Inc. Waltham, MA)**

- [October 2007 – February 2010]
- o Data analysis of Managed Care, Health Care, and Insurance Administration.
  - o Responsible for designing and developing reports and reporting systems using various SQL reporting applications including SQL Server and Oracle.
  - o Mentor team members in ETL, Data Model, and Data delivery components of the Data Warehouse.
  - o Ongoing research into new technologies and end user tools to enhance the productivity and quality of the team.

**Programmer, Sai Computer**

- [January 2004 – September 2009]
- o Software design, development, implementation, and maintenance for commercial manufacturing and service sectors using VB .NET, SQL, Oracle.

**Part-time Lecturer, College for Professional Studies**

- [February 2006 – February 2009]
- o Teaching Oracle, SQL and DBMS according to the syllabus of University in College for Professional Studies.
  - o Involved in student recruitment, interviewing, induction, projects and counselling.



## LEAD SOFTWARE ENGINEER : AYUB SHRESTHA

### SUMMARY

Ayub holds a Bachelor of Engineering from Kantipur Engineering College and has 5+ years' experience as a Senior Engineer at Rasello. Prior to working with Rasello, Ayub was a Junior Engineer at Ariya Web Services. He is trained in HTML, PHP, Laravel, CSS etc.

### PERSONAL INFORMATION

COUNTRY:  
Nepal

D.O.B:  
14/01/1991

CONTACT:  
[ayub@rasello.com](mailto:ayub@rasello.com)  
+977 984-1145155

### SKILLS & EXPERTISE

PHP, Laravel, PostgreSQL, Vuejs

HTML, JavaScript and CSS

Windows Server

Advanced Java Course – **Aryan Education, Baneshwor**

### LANGUAGES

English  
Nepali

Newari  
Hindi

### QUALIFICATIONS

**Kantipur Engineering College – Affiliated to Tribhuvan University, 2008 – 2012**

B.E (Computer Engineering; Division: First

**Caspian Valley College, Affiliated to H.S.E.B, Lalitpur, 2005 – 2007**

Intermediate; Division: First

**Pushpa Sadan Boarding High School – Affiliated to HMG, Kathmandu, 2004**

S.L.C; Division: First

### WORK EXPERIENCE

#### Senior Engineer, Rasello Pvt. Ltd

[July 2014– Present]

- Determine and identify high-level functional and technical requirements on the basis of interactions with the user and knowledge of enterprise architecture.
- Develop software by studying information needs.
- Work closely with other developers, UX designers, business and system analysts.
- Determine operational feasibility by evaluating analysis, problem definition, requirements, solution development, and proposed solutions.
- Document and demonstrate solutions by developing documentation, flowcharts, layouts, diagrams, charts, code comments and clear code.
- Support and coach software engineers.

#### Junior Engineer, Ariya Web Services

[July 2013 – June 2014]

- Provide engineering support to the engineering team: submitting documentation, ensuring change order are logged and submitted.
- Review plans, maps, specifications, cost estimates, and other work for accuracy, presentation, and conformance with established engineering practices.

#### Experience at Haze Soft Pvt. Ltd

[6 months | 2013 ]

Code PHP, WordPress.



## SOFTWARE ENGINEER: ABHISEK LAMSAL

### SUMMARY

Abhisek holds a Bachelor in Electronics and Communication Engineering from Janakpur Engineering College (Nepal), **with over 5 years' experience as a Software Engineer and Development.**

Prior to joining Rasello, Abhisek freelanced as an Android Developer for the ICT for Agriculture Project (IFA Krishi) and for the Disaster Nepal Project for the Thin Page Organization.

### PERSONAL INFORMATION

COUNTRY:  
Nepal

D.O.B:  
22/01/1992

CONTACT:  
[abhisek@rasello.com](mailto:abhisek@rasello.com)  
+977 982-3039339

### SKILLS & EXPERTISE

Advanced Android, Advanced Java, iOS, Spring MVC/Spring Boot, MySQL, PostgreSQL/PostGIS, MongoDB, Swift, Kotlin, RxJava, React Notice

Java Development Training – **Labanepal, Kathmandu**

C/C++ training – **Janakpur Engineering College**

Participated in TECHKRITI-2013 organized by the Robotics Association of Nepal

### LANGUAGES

English                      Nepali  
   Hindi

### QUALIFICATIONS

**Janakpur Engineering College, Nepal, 2010 – 2018**  
Bachelor in Electronics and Communication Engineering

**Amrit Science Campus, Kathmandu, 2008 – 2010**  
Participated in the Electronics and Computer EXPO organized by BEX/BCT-067

### WORK EXPERIENCE

#### Senior Android Developer, Rasello Pvt. Ltd

[August 2016 – Present]

- Working on **Administrative Area Registry System (AREs)**, a system for recording and managing area change proposals and change in area hierarchies and GIS boundaries. The system is currently being built in Java 10, Spring Boot 2.0, PostgreSQL, PostGIS and Vue.
- Worked on **SmartCell Android Application** as lead developer. A utility application for Smart Telecom GSM users utilizing RxJava, Google FCM messaging, Retrofit Networking library, Butter Knife View binding and Active Android ORM.
- Developed **ICAP mHealth project**. A survey JS client application for generating dynamic survey forms from json structure and collecting data. It utilizes fingerprint matching, Retrofit2 and Sugar ORM.
- Worked on **Warmline CMS Application** for voice and text messaging employing Sinch WebRTC, Firebase Cloud Messaging and Crasg reporting and Volley Networking library.
- Developed **RasSMPP**. An SMPP gateway for receiving and sending SMS messages to/from celcoms, using SMPP protocol, in Spring framework using Spring MVC, Spring Security, Spring Data and Thymeleaf.

#### Freelance Android Developer

[October 2015 – March 2016]

- Worked as a freelance android developer for the ICT for Agriculture Project (IFA Krishi) for The Nation Smiles organization which is a project involving Information Technology in the agriculture sector.
- Developed Disaster Nepal. An android application for disaster risk management and control app for the Thin Page Organization.

#### Java and Android Developer

Worked as a Java and Android Developer in Edumech Technology Private Limited, Mid-Baneshwor for 4 months. Worked on a Spring MVC and MongoDB based project which uses Spring Data MongoDB as persistence API and Thymeleaf as a templating engine.

## QC ENGINEER: KRISHA SHRESTHA

### SUMMARY

Krishna holds a Master of Science in Computer Science and Information Technology from Tribhuvan University.

Krishna's experience lies in system interface evaluation, operational requirements and performance requirements of overall systems. She has **over 4 years' experience as a QC Engineer.**

### PERSONAL INFORMATION

COUNTRY:  
Nepal

D.O.B:  
02/11/1987

CONTACT:  
[krisha@rasello.com](mailto:krisha@rasello.com)  
+977 984-1534651

### SKILLS & EXPERTISE

HTML, CSS, PHP, QA

### LANGUAGES

English  
Nepali

Newari  
Hindi

### QUALIFICATIONS

**Tribhuvan University, Kathmandu, 2015 - Present**  
MSc in Computer Science and Information Technology

**Kantipur Engineering College, Lalitpur, 2014**  
B.E (Computer Engineering): Division: First

**Amar Singh H.S.S – Affiliated to H.S.E.B, 2010**  
Intermediate, Division: First

### WORK EXPERIENCE

#### QC (Quality Check) Engineer, Rasello Pvt. Ltd

[March 2016– Present]

- Plan and direct activities concerned with development, application, and maintenance of quality standards for software or application.
- Create detailed, comprehensive, and well-structured test plans and test cases.
- Estimate, prioritize, plan, and coordinate testing activities.
- Track all issues or bugs present in the systems and work with developers to fix them.
- Check and test all functionalities of the systems to ensure it stands up to the clients requirements.
- Coordinate with the Project Manager regarding work performance and provide technical support to the Project Manager.
- Prepare a user manual and user guide of the system or application.
- List all feedback and suggestions requested by the clients and Project Manager in order to work on the tasks.

#### Intern, Manakamana Development Bank

[June – August 2014]

- Handle ATM cards.
- Prepare daily reports of ATM in different branches of the bank.
- Monitor problems on ATM machines and troubleshoot.

## UI/UX DESIGNER: RAZEENA SHRESTHA

### SUMMARY

Razeena holds a Bachelor of Science in Computer Science and Information Technology from Tribhuvan University in Nepal. Prior to joining Rasello, Razeena trained in Java and Web Development. She has **over 2 years' experience in UI/UX Design.**

### PERSONAL INFORMATION

COUNTRY:  
Nepal

D.O.B:  
05/08/1996

CONTACT:  
[razeena@rasello.com](mailto:razeena@rasello.com)  
+977 981-0107201

### SKILLS & EXPERTISE

Java, HTML, CSS, JavaScript, Bootstrap, Python, MySQL, MS Access, MS Office, Photoshop, Fireworks, Illustrator

### LANGUAGES

English                      Nepali

### QUALIFICATIONS

**Asian College of Higher Studies, Tribhuvan University, 2017**  
BSc in Computer Science and Information Technology

**MOHIHSS, 2013**  
High School Certification

**Balkuni Higher Secondary School, 2011**  
S.L.C

### WORK EXPERIENCE

#### UI/UX Designer, Rasello Pvt. Ltd

[March 2018– Present]

- o Develop UI mock-ups and prototypes that clearly illustrate how sites function and look like.
- o Develop Graphic User Interface elements like Menu's, Tabs, Widgets, Sliders.
- o Identify and troubleshoot UX problems (e.g., responsiveness)
- o Adhere to style standards on fonts, images, colors, buttons, etc.

#### Trainee, IT Training Nepal (ITN)

[2017]

Basic Java Training – Desktop application / Basic Web Application.

#### Trainee, Cgnus Foundation

[2 months - 2017]

HTML, CSS, JavaScript, Bootstrap.

#### Trainee, ACHS College

[5 weeks - 2017]

Personality Development.

#### Trainee, Microsoft Innovation Centre Nepal

[5 days – App dev. Camp -2016]

C-Sharp.

#### Trainee, Rasello Pvt. Ltd

[3 months – 2017]

Web Development.

## PROJECT MANAGER: JOAN MNENEY

### SUMMARY

Joan holds a bachelor's in commerce Degree for Information Systems from the University of Cape Town. She has **over 5 years' experience in Project Management, Business and System Analysis.**

She is an active PMI Member with experience in Stakeholder Management, Communication Management, Scope Management, and has worked on National ICT projects in TZ.

As Senior Projects Manager and Strategy Lead, Joan represented Rasello at a World Bank funded program called XL Africa to engage in an in-depth analysis of Rasello. Joan engaged with some of the best entrepreneurs and investors from Africa, Europe, and North America.

### PERSONAL INFORMATION

COUNTRY:  
Tanzania

D.O.B:  
04/10/1992

CONTACT:  
[jdm@rasello.com](mailto:jdm@rasello.com)  
+255 715 770 331

### SKILLS & EXPERTISE

Project Management Institute (PMI – Member)

**Project Management Tools:** Trello, Jira, Confluence, Slack, Smartsheet, MS Project

**System Development Tools:** C#, SQL, AngularJS, Web API

**Business Intelligence Tools:** IBM COGNOS and QlikView

**Business Analysis Tools:** MS Visio, Lucid Charts, Balsamiq, BBPMN

### LANGUAGES

English Swahili

### QUALIFICATIONS

**University of Cape Town, South Africa, 2019**  
Advanced Project Management

**University of Cape Town, South Africa, 2019**  
Bachelor of Commerce (Honors) Information Systems

**University of Cape Town, South Africa, 2012 – 2014**  
Bachelor of Commerce (Information Systems)

**The Open University of Tanzania, 2009 – 2011**  
Desktop Publishing Software

### WORK EXPERIENCE

#### Head of Projects and Strategy Lead, Rasello Company Limited

[April 2019 – Present]

Managing a portfolio of software projects.

Leading in the process of proposal writing, presentation, and cost negotiation with potential clients.

Project Management and support in line with client's vision and strategy.

Software development project management using agile scrum methodology.

Leading in activity and resource planning, analysis, and managing project risks.

Estimating costs and budget development for client projects.

Managing and implementing internal projects to support the Company's vision.

Leading in the research of market trends and engaging with the technology team to improve on the existing projects and products developed.

#### Senior Project Manager, Rasello Company Limited

[September 2017 – March 2019]

Managing a portfolio of software projects.

Engaging with clients to gather requirements.

Leading in the prioritization of product requirements in collaboration with the client and Rasello Technology Team.

Leading in activity and resource planning, analysis, and managing project risks.

#### Project Portfolio:

**ICAP FIKIA System** – a system that converts their current paperwork to digital while improving the current process flows across their program activities for Columbia University Mailman School of Public Health (ICAP).

**Clients Lead Management System** for Vodacom Tanzania.

**HIV SMS System** for Henry Jackson Foundation Medical Research International (HJFMRI).

**FHI 360 Mobile** for Reproductive Health System (m4RH).

**AFYA II System** for University of California, Berkeley.

**FASTA TZ** for National AIDS Control Program (NACP).

#### Project Manager, Rasello Company Limited

[May 2016 – August 2017]

Engaging with clients to understand and capture the full technical requirements.

Analyzing and prioritizing client requirements in collaboration with client and Rasello Technology Team.

Coordinating user acceptance testing before handing over software products to clients.

Coordinating client training after product delivery.

#### Project Portfolio:

**Wazazi Nipendeni:** a national mHealth System developed for the Cardno mHealth Tanzania PPP.

**PIT MER System:** a monitoring and evaluation android application system for Plan International.

**Communication System** for National Blood Transfusion Service (NBTS) for regular communication with blood donors.

**National Feedback System** for the Ministry of Health Tanzania.

#### Intern, DOTNXT Cape Town

[November 2015 – December 2015]

Participated in user experience mapping for 2 retail stores, namely Shoprite and Checkers.

The exercise sought to determine the efficient use of technology when interacting with customers from different customer profiles.

## BUSINESS SYSTEM ANALYST: SUZAN MABUSI

### SUMMARY

Suzan holds a Bachelor of Science Degree in Computer Science and Business Computing from the University of Cape Town. She was awarded the Ernst Young Academic Achievement Award for outstanding achievement in Information Systems.

Suzan has over **3 years' experience in business and system analysis, project management and product development.**

She is engaged in stakeholder management, communication management, scope management and work on national level and international ICT projects in Tanzania.

### PERSONAL INFORMATION

COUNTRY:  
Tanzania

D.O.B:  
20/09/1996

CONTACT:  
[sbm@rasello.com](mailto:sbm@rasello.com)  
+255 789 018 147

### SKILLS & EXPERTISE

IT: Web Programming, Web Designing

ERP: ES Fundamentals with SAP

**Project Management Tools:** Trello, Jira, Confluence, Slack, Smartsheet, MS Project System

**Development Tools:** Java, MySQL, HTML5+CSS

**Business Intelligence Tools:** Tableau

**Business Analysis Tools:** MS Visio, Lucid Charts, BPMN

Ernst&Young Academic Achievement Award for outstanding achievement in Information Systems, 2018

Head of Design & Creativity Dept. of the Youth on Spotlight (YOS), 2013/2014

### LANGUAGES

English Swahili

### QUALIFICATIONS

**University of Cape Town (UCT), 2020**

Business System Analysis

**University of Cape Town (UCT), 2016 – 2018**

Bachelor of Science in Computer Science and Business Computing

**Marian Girls High School, 2013 – 2015**

Specialized in Physics, Chemistry, Advanced Mathematics, and General Studies

**Canossa Secondary & High School, 2009 – 2012**

Studied: Physics, Chemistry, Mathematics, Biology, Geography, History, Civics, English, Kiswahili, and Bible Knowledge

### WORK EXPERIENCE

#### Business System Analyst, Rasello Company Limited

[February 2019 – Present]

- o Managing agile projects throughout Software Development Life Cycle (SDLC).
- o Requirement gathering and analysis.
- o Supporting development and testing process improvements.
- o Identifying development potential in existing accounts.
- o Detailing business analysis, problems, opportunities, and solutions to clients.
- o Facilitating market analysis.
- o Provide technical and business advice in proposal writing.

#### Project Portfolio:

1. **National Health Client Registry** for MoHCDGEC.
2. **Management Information System (MIS)** for AAR.
3. **Tanzania's Nursing and Midwifery Council** for AIHA.
4. **Chukua Hatua App** for OXFAM.
5. **Tanzania Supply Chain Portal.**
6. **RASXP**, data collection analysis and management system.

#### Lab Coordinator, UCT Ubunifu Lab

[August – November 2018]

- o Facilitate student engagement with available tech and gadgets.
- o Coordinate laboratory sessions for School of IT students (senior and junior).
- o Monitor lab sessions.
- o Ideation on technology improvements for the School of IT.

#### Ambassador of Shelnnovates Initiative under SAP Next-Gen and Female Quotient

[August – November 2018]

- o Represent SAP and Female Quotient initiatives of the University of Cape Town.
- o Participate and organize female engagement in technology initiatives and manage practical engagement of female School of IT students.
- o Mentoring female IT students.
- o Organize IT functions and ensuring female participation.

#### Lab Coordinator, UCT Ubunifu Lab

[June – July 2018]

- o Design and development of website.
- o Prototyping of blockchain mobile application.

## BUSINESS ANALYST: NIKEETA TAPOL

### SUMMARY

Nikeeta holds a Master in Business Administration (MBA) degree from Kathmandu University School of Management in Nepal. She has experience as a Content Writer for various companies and is currently working for Rasello as the Project Manager where she works with the projects team to assure service and quality of products.

### PERSONAL INFORMATION

COUNTRY:  
Nepal

D.O.B:  
23/11/1992

CONTACT:  
[nikeeta@rasello.com](mailto:nikeeta@rasello.com)  
+977 984-3768793

### SKILLS & EXPERTISE

MS Office, JIRA, Gantt Charts, Report Writing, Procurement Management, Technology Management

### LANGUAGES

English  
Newari

Nepali  
Hindi

### QUALIFICATIONS

**Kathmandu University School of Management, 2017 – 2019**  
MBA, Project Management (Specialization Course)

**Citizen College – Affiliated to Pokhara University, Lalitpur, 2016**  
Bachelor of Business Administration (BBA)

**Capital College and Research Centre, Lalitpur, 2010**  
Proficiency Certificate Level in Science (Physics, Chemistry, Biology, Math)

### WORK EXPERIENCE

#### Project Manager, Rasello Pvt. Ltd

[June 2019 – Present]

- Communicate and follow up with clients on specific projects and goals.
- Assist in the preparation of project plans, including task assignments.
- Evaluation, prioritization, and forecasting.
- Assist in identifying and assigning project risks and issues, and tracking of progress toward mitigation or resolution.
- Establish an environment of planned and unplanned collaboration and communication through status reports
- Bring ideas to management's attention to improve productivity, service, quality, policies and procedures, cost savings and utilization of company resources.

#### Content Writer, Glassdust Private Limited

[October 2018 – May 2019]

- Content writer for the ad agency where I was assigned with social media tasks.
- Responsible to determine the campaign brands that would run for social media as well as write in captions and capture creative ideas.
- Website content handling.

#### Content Writer & Social Media Manager, Rillmark Private Limited

[April 2017 – September 2017]

- Worked in a team with a supervisor – worked on various major projects for the company.
- Involved in creative activities including scripts for animated videos, event coverage videos, documentaries, letters, website content, and event management.
- Social Media handling.

#### Content Writer, IT Gamut Enterprises Private Limited

[October 2016 – March 2017]

- Senior and sole Content Writer for the organization, handling content for various websites, proposals, Facebook descriptions, cricket articles, e-portfolios and e-books.
- Sole column writer for cricinfonepal.com, where cricket news was updated daily. Handled Facebook pages for many projects as part of Digital Marketing working for their Content and Concept Development.



## CUSTOMER SUPPORT: ILHAM ISMAIL

### SUMMARY

Ilham holds a Bachelor of Arts in Geography and Social Science and currently is finalizing her Master of Science in Geographic Information Systems from the University of Dar es Salaam.

Ilham has **over 4 years of experience in working with GIS tools for remote mapping**. She participated in a malaria eliminating project in Zimbabwe.

### PERSONAL INFORMATION

COUNTRY:  
Tanzania

D.O.B:  
19/12/1992

CONTACT:  
[iim@rasello.com](mailto:iim@rasello.com)  
+255 714 438 318

### SKILLS & EXPERTISE

GIS Tools (JOSM Software), Java, Data Collection, Data Entry

### LANGUAGES

English                      Swahili

### QUALIFICATIONS

**The University of Dar es Salaam, 2015 - 2018**  
MSc in Geographic Information Systems (MGIS)

**The University of Dar es Salaam, 2012 – 2015**  
BA in Geography and Social Science (BAGEN)

**St. Matthew's High School, 2010 – 2012**  
Advance Level Certificate of Secondary Education

### WORK EXPERIENCE

#### GIS Analyst, Rasello Company Limited

[2019 – Present]

Currently working as a Business Analyst and GIS Expert at Rasello with focus on the below projects:

- **Administrative Area Registry System (ARes)**
  - Gathering business requirements.
  - Preparing project design and architecture of the system.
  - Geographical Data Analysis (shapefiles).
  - Evaluate the GIS Software and how to engage the application with the clients' needs.
- **Feedback System (MAONI) and Mobile for Reproductive Health (m4RH)**
  - Gathering business requirements.
  - Preparing project design and architecture of the system.
  - Project analysis.
  - Demonstration of the project to the clients.

#### Field Excursion, TAFORI

[2017 – 2018]

Participated on the research project monitoring of miombo trees of kitulagembe forest, data collection and processing using GIS tools.

#### Ramani Huria Project

[2016 – 2017]

Participated in a malaria eliminating project using GIS tools (JOSM Software) on data collection for the assessment of malaria in Zimbabwe.

#### TANESCO

[2016 – 2017]

Conducted power supply field project with TANESCO on data collection using GIS tools (GPS and quantum GIS).

#### Bukoba Earthquake Mapping (Ramani Huria)

[December 2016]

Participated on the assessment for Bukoba's earthquake disaster, field data collection using GPS, field papers, Google maps and data entry on web using Java Software for map production.



## DIGITAL HEALTH SPECIALIAST AND PROJECT LEAD: STEVEN WANYEE

### SUMMARY

He is an accomplished digital health expert with more than 18 years of first hand experience directly implementing digital health solutions across Africa in more than 10 countries. He led the team that conceptualized and implemented as a proof of concept, the first ever initiative on unique patient identification in Kenya called the National Unique Patient Identifier (NUPI). Steven will provide overall leadership of the team from IntellisOFT.

### PERSONAL INFORMATION

COUNTRY:  
Kenya

D.O.B:  
13/10/1973

CONTACT:  
Swanyee@intellisoftkenya.com  
+254 711 466 263

### SKILLS & EXPERTISE

Biomedical Informatics Specialist  
Master's degree in software engineering with a focus on health informatics

Post Graduate Diploma in health informatics.

Current PhD Candidate in Medical Informatics.

### LANGUAGES

English, Swahili

### QUALIFICATIONS

**University of Amsterdam, 2015 – Date**  
PhD candidate in Medical Informatics

**University of Liverpool, 2007 - 2010**  
Master's degree in information systems with a focus on digital health systems

**University of Washington, Seattle, WA, 2003 - 2004**  
Post-graduate Certificate Health Informatics and Health information Management

**University of Washington, Seattle, WA, 2002 - 2004**  
Associates of Applied Science Degree in Computer Information Systems

**University of Nairobi, 1999 - 2001**  
Diploma in Computing Information Systems

### WORK EXPERIENCE

#### IntelliSOFT Consulting Limited

[2011 – Present]

- o Co-founder and Director of Digital Health Solutions, Research and Innovation

#### International Technical Education Center for Health (I-TECH) at University of Washington

[2007 - 2008 and 2010 - 2012]

- o Implementation and Interoperability Manager

#### ICFI

[2009 – 2010]

- o Technical Adviser (Health Information Systems) seconded to the USAID funded Afya Info project,

#### AED (now under FHI360)

[2006 - 2007.

- o Monitoring and Evaluation Adviser on a USAID funded Small Grants Strengthening Program,

#### University of Nairobi, AIDS Care and Treatment Services (ACTS)

[2005 – 2006]

- o Project, Monitoring and Evaluation Adviser,

## BUSINESS ANALYST, ADMINISTRATION AND OPERATIONS LEAD: PETER ANAMPIU

### SUMMARY

Business Analyst, Administration and Operations Lead: Peter is an experienced business analyst who has acquired immense experience of over 10 years and expertise in the hospitality and health sectors developing and implementing enterprise level systems. He will also bring his expertise in supporting administration and operations aspects of the project.

### PERSONAL INFORMATION

COUNTRY:  
Kenya

D.O.B:  
18/06/1976

CONTACT:  
peter@intellisoftkenya.com  
+254 770 221 007

### SKILLS & EXPERTISE

Business Analyst

Bachelor of Science, Information  
Technology

Microsoft Certified Solution  
Developer (MCSD) Training,

Microsoft Certified Systems Engineer  
(MCSE) Training.

### LANGUAGES

English, Swahili

### QUALIFICATIONS

**Institute of Advanced Technology (IAT), 2008**  
Microsoft Certified Solution Developer (MCSD) Training

**Institute of Advanced Technology (IAT), 1999**  
Microsoft Certified Systems Engineer (MCSE) Training

**United States International University - Africa, 1998**  
BSc. Management Information Systems (MIS)

### WORK EXPERIENCE

#### IntelliSOFT Consulting Limited

[2008– Present]

- Co-Founder and Business Analyst

#### Heritage Group of Hotels

[2008 – 2018]

- Ecommerce Manager
  - Headed the Group eCommerce Strategy, as a cross functional facilitator extending the capability of the Hotel Group to exploit new and existing web and mobile technology to grow sales, enhance marketing activity and brand building. Overall responsible for systems design, development, procurement, implementation and management of the eCommerce infrastructure including all web assets. It is notable that this eCommerce operation has in years achieved annual turnover in excess of \$ 2 million, and this of course within the prevailing macroeconomic constraints of the tourism industry

#### United Nations Agency for Human Settlement (UN-HABITAT), Nairobi, Kenya

[2003 – 2008]

- Grants Database Project Manager
  - Project Manager in the successful development and implementation of the web-based Grant Management Information System (GMIS). This was a centralized management system to track and maintain the core financial and substantive information on all projects and grants that have been negotiated with Donors. This intranet application, developed on the Microsoft .Net platform, plays a key role in assisting management and staff effectively manage projects and report efficiently to donors on the use of funds negotiated grant agreements and use of funds.

## LEAD SOFTWARE DEVELOPER :KENNETH OCHIENG

### SUMMARY

Lead software developer): Ken is a senior software developer who has over 10 years of experience and expertise developing large scale digital health solutions. Ken is very well versed with OpenHIE and the global goods and has developed applications sitting on top several global goods within the East Africa Community region.

### PERSONAL INFORMATION

COUNTRY:  
Kenya

D.O.B:  
15-05-1984

CONTACT:  
kochieng@intellisoffkenya.com  
+254 723 862 719

### SKILLS & EXPERTISE

Software Developer  
Supporting Open Source Health-related technologies both as a developer and implementer.

### LANGUAGES

English, Swahili

### QUALIFICATIONS

**Maseno University, 2008**  
Bachelor of Science, Computer Science

### WORK EXPERIENCE

#### IntelliSOFT Consulting Limited

[2019– Present]

Lead Software Developer

- Taking the lead in software development and providing other technical input, testing and maintaining the Software solution.

#### IntelliSOFT Consulting Limited

[2016– 2019]

- Associate Software Development Consultant

#### ICAP in Kenya

[2018 - 2019]

Health Informatics Programmer

- Provided technical support in system development, set up, testing, implementation and maintenance of an Open-source point-of-care EMR System (IQCare) at a large referral hospital in Western Kenya to enhance monitoring and evaluation (M&E) activities within the HIV prevention, care and treatment program

#### KEMRI Wellcome Trust

[2015 - Dec 2017]

Senior Software Developer

- Successfully rebuilt the corporate Intranet from the ground up using SharePoint 2013
- Supported implementation of research systems (REDCap and OpenClinica) by offering technical support in testing, setup, troubleshooting and training.

#### KEMRI CGHR

[2012-2015]

Software Developer

- Customized, adapted and scaled an open-source EMR system, OpenMRS, for use at a large referral hospital in Western Kenya

## TECHNICAL PROJECT MANAGER :SUSAN GATHU

### SUMMARY

Technical Project Manager with more +4 years of experience successfully managing large digital health projects in East and Southern Africa. Susan has a strong technical and project management background I.

### PERSONAL INFORMATION

COUNTRY:  
Kenya

D.O.B:  
04/08/1992

CONTACT:  
sgathu@intellisoffkenya.com  
+254 713 096 666

### SKILLS & EXPERTISE

Technical Project Management

Bachelor of Science,  
Telecommunications

Diploma in Business Information  
Technology

Agile project

Management

Interpersonal relations, Technical Documentation, Quality Assurance, Risk, schedule, resource, change and scope management, Research and strategy development and Capacity building.

### LANGUAGES

English, Swahili

### QUALIFICATIONS

**University of Washington**, 2019  
Project Management for Global Health

**Strathmore University, Kenya**, 2018  
Project Management Professional

**Strathmore University, Kenya**, 2012- 2016  
BSc. Telecommunications

**Strathmore University, Kenya**, 2011- 2012  
Diploma in Business Information Management

### WORK EXPERIENCE

**IntelliSOFT Consulting Limited**  
[2019– Present]

Senior Project Manager

- o Responsible for defining goals for individual projects.
- o I ensure projects are effectively resourced and manage relationships with a wide range of audience, including internal and external project contributors.
- o I am responsible for managing the work of consultants, allocating and utilizing resources in an efficient manner, and maintaining a cooperative, motivated, and successful team.

**IntelliSOFT Consulting Limited**  
[2017– 2019]

Project Coordinator

- o Kept projects on schedule and within scope and budget towards high efficiencies and flawless execution through constructing detailed roadmaps and work plans, managing stakeholder engagement, teams and risks, monitor milestones, and communicate outcomes across a key stakeholder's audience.

**Ringier Kenya**  
[2016 – 2017]

Head of Account Management, Kenya

- o Presented digital strategies and creative work for the client's approval
- o Analysed digital campaign success and report on performance metrics.
- o Oversaw the various production stages of artwork & content material for use on clients' campaigns, ensuring timely delivery within budget.

**Yusudi LTD, Kenya**  
[2016]

Marketing Responsible

- o Established social media strategies that led to increased brand awareness on youth unemployment in Kenya.
- o Administered brand support, and outreach activities to ensure responsive, quality continuous feedback to all stakeholders.

**Mfariji Africa LTD, Kenya**  
[2015-2016]

Administrator

- o Cultivated marketing strategies to increase online traffic and on-ground brand awareness by 38%.
- o Ran fundraisers and campaigns to raise funds and awareness leading to 500+ girls in rural Kenya benefiting from the program

## Background or Problem Statement

### Project/ Work Context

The project processes will include requirements and functionality elicitation, installation and deployment strategizing and documentation, quality assurance, testing and creating necessary means for building capacity among government officials, local technology teams and health workers in order to connect the underserved to better health outcomes.

Rasello will follow agile development methodology applying SCRUM framework within the team for the development process. The project will follow standard procedures in project management and align tasks according to the outlined activities in the project phases. In this implementation a single sprint will last one week, and every iteration will be initiated by an iteration planning meeting. At the iteration planning meeting, tasks from the backlogs will be taken into consideration based on the priority and assigned to the appropriate engineer. Task progression will be tracked with daily stand-up sessions and moved through a predefined workflow. After an iteration is complete, there will be an iteration retrospective meeting with the team, and the team will discuss team performance, accomplishments, improvements, and slowdowns on the previous sprint. Internal team demos will be scheduled earlier in the development phase based on the team's discretion. Below is a discussion of the project management approach undertaken for the assignment.

**Tracking Progress:** JIRA will be used to track the progress of all the development tasks required to reach a fully functional system in the project period. A repository will be used to manage and track documentation versions and other records relevant to the project. At client preference, Rasello is able to setup a smartsheets page for team follow up of the workplan.

#### **Code Review:**

Bit Bucket will be used as the code repository which allows pull requests and proper code reviews before the code is merged into the working branch.

**Code Quality:** To ensure high quality and a software free of malicious code on development, Rasello will ensure use of secure code standards and enforce secure coding rules with a static code analyzer. Jenkins will be used to enforce code quality with a good amount of unit tests that will cover most of the code base, avoiding bugs and code smells (any characteristic in the source code of a program that possibly indicates a deeper problem).

**Build and Deployment:** Docker will be responsible for continuous build and integration of web-based information platform. Whenever a development branch is merged into the master branch, bamboo will automatically build and deploy to the development server. Artifacts for corresponding environments will also be generated and made available for deployment to these servers.

**QC Testing:** QC testing will be automated for UI testing. If necessary, manual testing will be carried out making sure all the functional requirements are met.

**Acceptance:** Once the system has passed QC and ready for UAT, pre-assigned UAT users will be able to test the application and communicate the approval on the feature they are testing. Rasello will also make sure that acceptance criteria on the original requirement are met.

**Implementation:** Deployment activities will be managed by a deployment checklist created by Rasello in order to comprehend what must be done next, so that no activity is missed out on any of the crucial steps of the deployment process, supported hand in hand by continuous server integration.

## Background information

Currently fast-growing health patient identifying information is distributed across multiple self-standing databases and systems, within and among organizations as separate data sources with multiple patient identifiers at country level. In different data stores of patient identifying information, there is a variation of attributes primarily used to identify a patient. The variation may depend on the choice of unique ID, names, contact details etc., resulting in difficulty to uniquely recognize the same patient across systems, or accurately matching the same client across systems. Disperse data stores subject patients to redundant records in multiple services, leading to ineffectiveness in continuity of care, challenges in population health management, poor data reference for country level health decisions and planning.

Care CR is currently not an implementation taking place but rather a conceptualized system for development to fit Open HIE standards and made universally available to countries needing its function. Rasello is currently working on implementation of National Client Registry to be used by MoHCDGEC Tanzania as a center for client identifying information for individuals accessing health services. Using this experience of development and implementation, Care CR will work to uniquely identify a patient using standardized data formats such as HL7 FHIR, likewise supporting interoperability with external government systems for validation of patient data, using outlined protocols and standards in open HIE specification, MLLP protocol. The Care CR will streamline patient information across multiple systems and maintain a unique patient profile, this after matching algorithms have been executed on a set of data using deterministic and probabilistic matching algorithms. An approach to substantial implementation of the client registry would be by centralizing the system at government level, in order to reach a larger health facility network in all resource settings.

Care CR will differ from Medic CR by its extended functions listed below, and likewise accounting for development gaps and challenges faced when using Medic CR alone as framework

- Implementation of probabilistic matching in addition to Soundex Matching, Pattern Matching and Name Variant Matching.
- Flexible addition of attributes used for matching, to match country name variant and relevant IDs
- Fully configuration capabilities for all matching algorithms. i.e. Deterministic configuration to individually merge client attributes to be used for the master profile. Probabilistic matching allowing an authorized user to choose a preferred method of matching and weightage for each attribute
- Provide continuous support for sustainability of the project in the long run via extensive and progressive involvement in the open HIE community
- Frequent document updating and public review from HIM and CR sub committees in the Open HIE, to ensure that system users and developers have latest updates.
- Configuration of patient profile attributes used for matching by activating/ deactivating an attribute meaningful for self-identifying information
- Inclusion of a comprehensive web application interface for an authorized user to access Care as an application apart from a service.

The below development gaps previously encountered will be accounted for in development of Care CR to achieve a globally efficient and effective CR. Listed in reference to Rasello's experience study on Medic CR, this Care CR will account for -, but not limited to:

- Use of updated and supported libraries to overcome various issues are faced due to old dependencies and libraries which limits the development
- Supporting seamless cross platform development implementation as opposed to independent use of Medic CR which seamlessly supports for windows platform development, while becoming strenuous for development on another operating system platforms.
- Code base optimization
- Supporting configurable attributes
- Implementing relevant and fully functional communication protocols and modules
- Implement adequate system securities measure.
- Http API is exposed only through SOAP and no security is implemented in the module, however in todays' technology progression JSON is more widely used and practical for implementation.
- Java, Kotlin is preferred as they are cross platform, robust in performance and abundance in libraries for any purpose. Use of statically typed language like Java, Kotlin, C# are preferred more as they help in enforcing the constructs and structure, scale easily and easy to maintain in the future although may be tricky when the data itself is dynamic in nature

## Digital Health Technologies

**MEDIC CR** is a master patient index developed under Mohawk College's Natural Sciences and Engineering Research Council of Canada (NSERC) grant to build and a test version of the pan-Canadian Electronic Health Record System blueprint as prescribed by Canada Health Infoway. Medic CR is a reference implementation project intended to assist developers in the development of Client Registry software, customer interfaces (as a test interface), in demonstration XDS infrastructures, or in staging environments.

**Health Level Seven, Fast Health Interoperability Resources (HL7 FHIR)**, is a standard describing data formats and elements and an application programming interface for exchanging electronic health records. The standard was created by the Health Level Seven International health-care standards organization

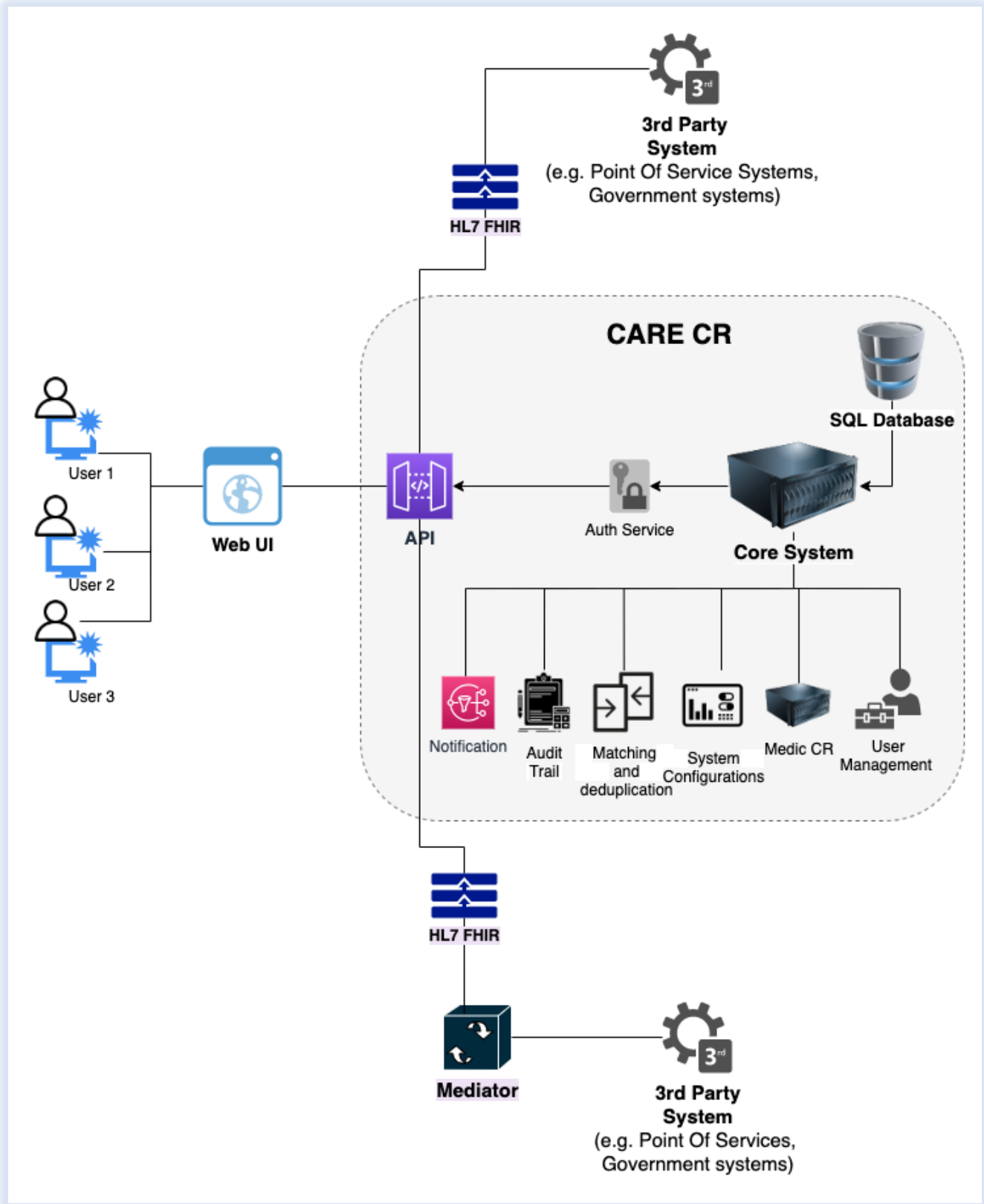
**MLLP protocol**, Minimal Lower Layer Protocol (MLLP) defines the leading and trailing delimiters for an HL7 message. These delimiters help the receiving application to determine the start and end of an HL7 message that uses Internet Protocol network as transport

**nHAPI**, HL7 Application Programming Interface, this will allow Microsoft. NET developers to easily use an HL7 2. x object model. This object model allows for parsing and encoding HL7 2.

**Open HIE Architecture Specification:** The project will leverage the OpenHIE architecture as the foundational architecture of the project and leverage the selected workflows from the OpenHIE workflow likewise aligning the workflows with the team. The OpenHIE architecture specification is founded on open standards, open data, open source and open innovation which augurs well for our approach and future plans for Care CR. More specifically, this will allow us to effectively engage and collaborate with others in the OpenHIE Community to solve the perennial unique patient identification problem irrespective of the digital health technology used by different implementers.



High level Care CR Architecture diagram



## Use Cases and User Stories

Below are system stories, categorized according to anticipated user cases/ modules:

1. Matching – the process of identifying similar in client profiles in Care CR database
  - a. Care CR should be able to perform deterministic and probabilistic matching algorithm on a dataset to identify duplicate profiles sent or stored in the system.
  - b. Care CR should be able to configure the rules and regulation that trigger the matching process between two and more records based on the statistical rules and procedures.
  - c. All the configurable components shall be dynamic with an interface so that an authorized user can set up the configuration from scratch.
  - d. Care CR shall have a default setup for the all matching configurations in the system.
  - e. Care CR shall have a default setup for every configuration, flexible and configurable by an authorized user
  - f. Care CR shall implement a blocking strategy for relevant parts f the system and functioning. E.g. when loading potential matches.
2. Deduplication – the process or resolving matches obtained in the data base with client details.
  - a. Care CR should obtain retrieve client details from the database with no duplication.
  - b. Care CR shall have an interface where an authorized user can view the list of the clients which have duplications.
  - c. The system shall allow an authorized user to view and compare the client profiles listed as conflicts and resolve accordingly by merging to identify all as person or declaring the profiles as representation of different people.
  - d. Care CR shall void and not delete the clients who are certified as dead.
3. Interoperability and System Interface – data exchange and system integration to other systems
  - a. Care CR should be able to exchange information with third party systems including legal entities, and country legal system for client validation so as the CR can maintain the most recent and accurate information of a client.
4. User Management – user roles and permissions
  - a. Care CR should enable core admin to create new user in the system and configure their roles and permissions.
  - b. Care CR should send password activation link to a new registered user active email address
  - c. Care CR should enable user to login using username (active email address) and password
  - d. Care CR should enable the users to reset their password

- e. Care CR should enable core admin to send reset link to a registered user so he or she can reset their password
  - f. Care CR should allow the authorized user to reset their password by sending a link to their registered email id.
  - g. Care CR should enable core admin to add new roles and permissions in the system which shall be configurable in the future.
  - h. Care CR should enable the authorized users to access the features in the system as provided to them by their roles and permissions.
5. Notification – system notifications to users and integrating systems
- a. Care CR should be able to send system notifications to third party systems informing on system connection status and feedback on requests made to the CR
  - b. Care CR should be able to send system notifications to a user informing on system connection status and feedback on requests made to the CR
6. User Interface (UI) – support of human computer interaction, the means by which the user and a computer system interact, in particular the use of input devices and software.
- a. Care CR UI should enable the authorized users to add, update, remove and view the details and configure accordingly.
  - b. Care CR UI should enable an authorized user to search and filter from any lists in the system applying search and browsing rules.
  - c. Care CR UI shall enable the users to view the client history information in detail.
  - d. Care CR UI shall allow for review and manual resolving of the client matches intervening incorrect matches.
  - e. Care CR UI shall allow a user to perform a single or multiple merge function on client profile deemed as possible matches.
7. Configuration – configurable components in the system including attributes
- a. Care CR shall allow the authorized users to enable and disable data attributes in client profile the attributes that used for client identifying information.
  - b. Care CR shall allow an authorized user to enable and disable certain attributes as required fields during the client entry.
  - c. Care CR shall allow the authorized users to enable and disable attributes used to compare profiles when deduplicating client records.
  - d. Care CR shall allow an authorized user to enable and disable attributes used as blocking strategy.
  - e. Care CR should allow an authorized user to configure system functions allowing a user to begin implementation from scratch.
8. Privacy and Security –
- a. Care CR should implement relevant privacy and security standards for data and system integrity for the integrating systems and listed users

9. Audit Trails – logging of all transactions and system activities by a user or a system.
  - a. The system should enable registered core user to view user logins and log out
  - b. The system should enable registered core user to view system activities by users of the system.
  - c. The system should enable registered core user to view errors incurred in the system on operation and update status accordingly.
  - d. The system should enable registered core user to view system transactional records.

## Objectives and Activities

### Work package 1: Analysis and Design

**Objective 1.1: To review and perform an in-depth study of the overall project to obtain a detailed understanding of the need and scope of work for the project and identify the direction the project will take through creation of the project strategy documents**

*Activity 1.1.1: Use case and user stories review*

*Activity 1.1.2: Requirement translation*

*Activity 1.1.3: Requirement analysis*

*Activity 1.1.4: Software requirement specification documenting*

**Objective 1.2: The goal is to derive comprehensive system and database design structures for Care CR following Open HIE guidelines stated in the open HIE architecture specifications in the design period of the project. Transforming requirements into complete and detailed system design specifications and once the design is approved, the development team will begin the development phase.**

*Activity 1.2.1: Functional design*

*Activity 1.2.2: System design Process*

*Activity 1.2.3: Database design Process*

*Activity 1.2.4: System design review*

*Activity 1.2.5: System design finalization*

*Activity 1.2.6: System design documenting*

*Activity 1.2.7: Database design documenting*

## Work package 2: Development

**Objective 2.1: Development of an open source-based client registry to support unique identification and management of client identifying information for all clients accessing health service in a country setup with limited health system infrastructure in a time frame of 9 months from project start.**

*Activity 2.1.1: Medic CR installation and running*

*Activity 2.1.2: Module definition*

*Activity 2.1.3: Interface definition*

*Activity 2.1.4: Program coding in reference to system module user stories*

*Activity 2.1.5: Code documentation*

*Activity 2.1.6: Configuration documenting*

*Activity 2.1.7: User and system manuals documenting*

**Objective 2.2: Testing of the developed client registry to eliminate obsolescence risk by ensuring Care CR function will serve functional and non-functional behaviors of the system according to Open HIE guidelines through sprint wise development process.**

*Activity 2.2.1: Sprint testing*

*Activity 2.2.2: Module system testing*

*Activity 2.2.3: Integration testing*

*Activity 2.2.4: User Acceptance Testing*

*Activity 2.2.5: Test documentation*

## Community Feedback

The consortium team will continue to engage with the broader digital health community and other international communities such as; the country stakeholders, other international members of community through active participation in OHIE community of practice, In addition the consortium will also annual community meetings such as conferences specifically on CR sub community and Open HIM community The Consortium team will leverage on best practices from the community, utilizing feedback, inputs and experiences shared to further support the teamwork and ideas.

The consortium team will leverage on best practices from the community, utilizing feedback, inputs and experiences shared to further support the teamwork and project's ideas.

The team will provide regular updates and reports guided by the community for decision making during its participation in activities such as conferences specifically in sub communities based on open client registry and open health information mediator community

## Schedule

Activity	Team, Location	[Month=> M]								
		[M]	[M]	[M]	[M]	[M]	[M]	[M]	[M]	[M]
		1	2	3	4	5	6	7	8	9
Activity 1.1.1: Use case and user stories review	[Rasello, Tanzania (TZ)] [IntelliSOFT, Kenya (KE)]	X								
Activity 1.1.2: Requirement analysis	[Rasello, (TZ)] [IntelliSOFT, (KE)]	X								
Activity 1.1.3: Requirement translation	[Rasello, (TZ)] [IntelliSOFT, (KE)]	X	X							
Activity 1.1.4: Software requirement specification documenting	[Rasello, (TZ)] [IntelliSOFT, (KE)]		X							
Activity 1.2.1: Functional design	[Rasello, (TZ)] [IntelliSOFT, (KE)]	X	X							
Activity 1.2.2: System design Process	[Rasello, (TZ)] [IntelliSOFT, (KE)]		X							
Activity 1.2.3: Database design Process	[Rasello, (TZ)] [IntelliSOFT, (KE)]		X							
Activity 1.2.4: System design review	[Rasello, (TZ)] [IntelliSOFT, (KE)]		X							
Activity 1.2.5: System design finalization	[Rasello, (TZ)] [IntelliSOFT, (KE)]			X						
Activity 1.2.6: System design documenting	[Rasello, (TZ)] [IntelliSOFT, (KE)]			X						
Activity 1.2.7: Database design documenting	[Rasello, (TZ)] [IntelliSOFT, (KE)]			X						
Activity 2.1.1: Medic CR installation and running	[Rasello, (TZ)] [IntelliSOFT, (KE)]			X	X					
Activity 2.1.2: Module definition	[Rasello, (TZ)] [IntelliSOFT, (KE)]			X						
Activity 2.1.3: Interface definition	[Rasello, (TZ)] [IntelliSOFT, (KE)]			X						
Activity 2.1.4: Program coding	[Rasello, (TZ)] [IntelliSOFT, (KE)]			X	X	X	X	X		
Activity 2.1.5: Code documentation	[Rasello, (TZ)] [IntelliSOFT, (KE)]						X	X		
Activity 2.1.6: Configuration documenting	[Rasello, (TZ)] [IntelliSOFT, (KE)]				X	X	X	X		
Activity 2.1.7: User and system manuals documenting	[Rasello, (TZ)] [IntelliSOFT, (KE)]						X	X	X	
Activity 2.2.1: Sprint testing	[Rasello, (TZ)] [IntelliSOFT, (KE)]			X	X	X	X	X		
Activity 2.2.2: Module system testing	[Rasello, (TZ)] [IntelliSOFT, (KE)]				X	X	X	X		
Activity 2.2.3: Integration testing	[Rasello, (TZ)] [IntelliSOFT, (KE)]						X	X	X	
Activity 2.2.4: User Acceptance Testing	[Rasello, (TZ)] [IntelliSOFT, (KE)]								X	
Activity 2.2.5: Test documentation	[Rasello, (TZ)] [IntelliSOFT, (KE)]							X	X	



## Deliverables

<b>Deliverables</b>	<b>Month(M)</b>
[Work Package 1, Objective 1.1, Activity 1.1.1 -, " <b>Final Use cases and user stories</b> ".	M1
[Work Package 1, Objective 1.1, Activity 1.1.2 -" <b>Draft Requirement Documentation</b> ]	M1
[Work Package 1, Objective 1.1., Activity 1.1.3 -" <b>Final Business Requirement Documentation</b> "]	M2
[Work Package 1, Objective 1.1, Activity 1.1.4 -" <b>Software requirement Documentation</b> "]	M2
[Work Package 1, Objective 1.2, Activity 1.2.1 -" <b>System Design</b> "]	M2
[Work Package 1, Objective 1.2, Activity 1.2.2 -" <b>System architecture</b> "]	M2
[Work Package 1, Objective 1.2, Activity 1.2.3 -" <b>Database Design Diagram</b> "]	M2
[Work Package 1, Objective 1.2, Activity 1.2.5 -" <b>Final system design architecture</b> "]	M3
[Work Package 1, Objective 1.2, Activity 1.2.6 -" <b>System Mockups and wireframes</b> "]	M3
[Work Package 1, Objective 1.2, Activity 1.2.7 -" <b>Database design documentations</b> "]	M3
Work Package 2, Objective 2.1, Activity 2.1.1 -" <b>Medic CR Installation</b> "]	M4
[Work Package 2, Objective 2.1, Activity 2.1.2 -" <b>System modules details</b> "]	M3
[Work Package 2, Objective 2.1, Activity 2.1.3-" <b>System interface</b> "]	M3
[Work Package 2, Objective 2.1, Activity 2.1.4 -" <b>Progress Status Updates</b> "]	M7
[Work Package 2, Objective 2.1, Activity 2.1.5 -" <b>Source Code Documentation</b> "]	M7
[Work Package 2, Objective 2.1, Activity 2.1.6 -" <b>Configuration documentations</b> "]	M7

[Work Package 2, Objective 2.1, Activity 2.1.7 -" <b>System Guides and User Manuals</b> " ]	M8
[Work Package 2, Objective 2.2, Activity 2.2.1 -" <b>Progress Status Updates</b> " ]	M7
[Work Package 2, Objective 2.2, Activity 2.2.2 -" <b>Progress Status Updates</b> " ]	M7
[Work Package 2, Objective 2.3, Activity 2.2.3 -" <b>Integration Reports</b> " ]	M8
[Work Package 2, Objective 2.4, Activity 2.2.4 -" <b>UAT Reports</b> " ]	M8
[Work Package 2, Objective 2.5, Activity 2.2.5 -" <b>User Manuals</b> " ]	M8
Quarterly reports	M3, M6, M9
Final narrative reporting	M9

## Global Good Maturity Model Assessment

Global Good Maturity Model Assessment self-assessment included as an attached Excel in "Attachments" in open application platform as an Excel document.