E-Heza Data Solutions is a comprehensive point-of-care digital health platform that ensures high-quality, efficient care when and where it is needed most. First established to serve the Rwandan primary care ecosystem that is comprised of nurses and midwives in health centers and community health workers (CHW) in villages, E-Heza is designed to support existing government health systems and facilitates the most common workflows of frontline health workers at the community and facility levels in Sub-Saharan Africa (SSA) where large electronic medical record (EMR) systems are often impractical and where existing CHW tools struggle to adequately support the two-way communication and data management capacity that facilitates an effective and efficient local healthcare ecosystem at scale. E-Heza utilizes API integration and FHIR interoperability standards to deliver critical patient information to existing electronic medical record systems. E-Heza is a full-service primary care platform that serves multiple levels of care in one system rather than requiring cumbersome integrations at each level of the healthcare delivery system, facilitating high-quality care that encourages patient retention in care and sustained improvements in health outcomes.

E-Heza was created to inspire high-quality care by easing workloads, providing personalized care, and streamlining data reporting to national governments. E-Heza incentivizes accurate data by using data trends to celebrate success and identify problems before they become emergencies. Similarly, filterable dashboards provide real-time insight into the health of communities from the village, health center, district, and national levels. E-Heza ensures that vital individual clinical information is available at each level of care through a shared progress report that can also be sent directly to the individual via WhatsApp.

E-Heza incorporates best-practice clinical protocols established by the World Health Organization and seamlessly guides frontline health workers through assessment, diagnosis, treatment, referral, and case management. The activities are tailored for the skill level of the user based on user-type log-in identifiers, and patients are referred to the next level of care based on the severity of the patient's presentation. E-Heza provides comprehensive clinical protocol and decision support for COVID-19 screening, referral, home-based care, treatment, and contact tracing functions; integrated management of childhood illnesses (IMCI) such as malaria and diarrhea; case management; pediatric care; immunizations; early childhood development; family planning; antenatal care; HIV services; tuberculosis screening; non-communicable diseases; and laboratory and medication management.

E-Heza is built with a decoupled architecture providing both a "frontend" (where healthcare workers enter data) and a "backend" that receives and organizes that data. The frontend is developed in Elm, an open-source and functional, statically typed language that compiles to JavaScript. The backend application is served by Drupal, an open-source PHP content management system. The frontend and backend communicate through a RESTful API, which is modeled on digital health standards, including FHIR-HL7.

Drupal was chosen specifically with scalability in mind, as its sophisticated data abstraction layer is well-tested and can efficiently handle millions of nodes of data without the need for high-level infrastructure resources and management. Drupal's large open-source community (one of the largest in the world with millions of members) provides assurance that most problems we encounter have been seen before and that there will always be a large developer community from which to draw talent. A recent scalability test indicates that E-Heza could scale to serve an entire national context in a single instance without changes to architecture or infrastructure. Elm, on the other hand, was chosen for its efficiency in development, as a highly opinionated and statically typed language, it provides a smooth on ramp for new developers and a clear path for interoperability. The tool uses Docker and DDEV as packaging and containerization tools, and it is also integrated with Gitpod so it can be spun up in a single click for evaluation and testing.

The application is served to the client via progressive web app (PWA) technology. The application registers a "service worker" with the client browser, allowing the web application to use local cache and storage to deliver an offline experience and store captured data during periods of low or no connectivity.

Elm handles the sync by using a service worker to intercept requests and a custom browser feature allowing asynchronous data flow between Elm and JavaScript while keeping the context of each request for more precise, reliable syncing. In E-Heza, to mitigate sync issues, we

Access Information

SOURCE CODE

https://github.com/TIP-Global-Health/eheza-app

WEBSITE

https://tipglobalhealth.org/areas/digital-health/

CONTACT

wendy@tipglobalhealth.org

WHO System Classification

PRIMARY

A5 | A5 Electronic medical record systems

ADDITIONAL

A3 | A3 Decision support systems
B6 | B6 Logistics management information systems (LMIS)

Resources

Documentation URL
https://tip-global-health.github.io/eheza-documentation/

Architectural Documentation URL
https://tip-global-health.github.io/eheza-documentation/developer_docs/technical-specs/

Issue Tracking URL
https://github.com/TIP-Global-Health/eheza-app/issues

Community

The totality of the E-Heza community numbers over a thousand individuals and includes frontline healthcare workers, government stakeholders, experts in global and digital health, designers, QA analysts, developers, and technologists.

Among users and implementers, the community has representation among volunteer community health workers, professional nurses, health center and hospital administrators, and data managers. Most healthcare workers—professional and volunteer—are in Rwanda and work with feedback and training groups in Kinyarwanda. Engagement with government stakeholders and healthcare experts takes place in organized working group meetings in English to facilitate wider international participation.

The development community is small and growing and consists of mostly sponsored developers in the open-source project from eight different countries on five different continents and includes men and women. Developer communication takes place in the GitHub repository in English. Contributed development work is welcome from any developer according to the contribution guidelines, wherever they may reside.

Sustainability

TIP Global Health is the host organization and primary facilitator of the open-source project. As such, TIP currently drives the executive committee which sets the roadmap and development priorities, as well as fundraising, securing funding which will see the project through full development of primary health modules. TIP engages government and private partners in development and implementation efforts. Most notably, TIP has partnerships with the Government of Rwanda (through the Ministry of Health, the National Child Development Agency, and Rwanda Biomedical Center) to facilitate the use of E-Heza in targeted national programs such as Fortified Blended Food (FBF) programs and Child Scorecard development as well as broader primary care delivery. These partnerships form the basis for collaborative roadmap decision-making as well as the formation of user feedback groups that contribute to the ongoing development of the project. TIP Global Health and the E-Heza community works closely with the Africa Centres for Disease Control and Prevention to establish priority criteria for expansion of the E-Heza platform to new countries in Sub-Saharan Africa.